



**Law
Commission**
Reforming the law

Aviation autonomy: responses to the first consultation

MAY 2025



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Introduction

- 1.1 The Civil Aviation Authority (“CAA”) and the Department for Transport have asked the Law Commission to review the UK’s regulatory framework to prepare the UK for autonomy in aviation. The project forms part of, and has been partly funded by, the UK Research and Innovation Future Flight Challenge.
- 1.2 The focus of the project is on reforms that will enable autonomous and remotely piloted flight to take place safely, lawfully and with appropriate legal mechanisms for attributing criminal and civil liability when things go wrong. We have been asked to look at three use cases: drones (defined as remotely piloted, non-passenger carrying vehicles), advanced air mobility (in particular vertical take-off and landing or “VTOL” aircraft providing short journeys for up to ten people), and air traffic management and air navigation services.
- 1.3 In February 2024 we published our first consultation paper, which looked at drones and advanced air mobility (use cases 1 and 2). In the paper, we gave an overview of aviation law, introduced some key concepts and terminology relating to autonomous flight and set out the regulatory regime relating to uncrewed aircraft systems (“UAS”). Having done so, we asked several questions about potential gaps, uncertainties or provisions in the existing law which could prevent the safe deployment of highly automated and autonomous aircraft systems.
- 1.4 In April 2025 we published a second consultation paper, which considers air traffic management and air navigation services (use case 3). Following this second consultation, which will run from 16 April 2025 to 18 July 2025, we will prepare a final report with recommendations covering issues considered in both consultation papers. The final report will be published in early 2026.

THIS DOCUMENT

- 1.5 This document provides a summary of the responses to our first consultation paper and compiles all the individual responses. We are keen to share the consultation responses and our analysis with all those who may be interested in autonomy in aviation, so that people can see the range of views expressed on each issue.
- 1.6 We received over 50 responses to CP1 from a wide range of consultees which included: legal experts, UAS operators, systems developers, and regulators. We are very grateful to all those who responded, and for the detailed and thoughtful comments we received.
- 1.7 The key questions we asked related to: the airworthiness and certification framework, the rules of the air, our two use cases (drones and VTOLs), civil and criminal liability, and the impact of our proposals. The summary on the following pages considers the responses to each of these topics in turn. Throughout the document we reference the consultation question/s (CQs) most relevant to the point being discussed.

Does autonomy pose challenges to the airworthiness and certification framework?

- 1.8 In Chapter 4 of the consultation paper, we considered the current framework for certifying the airworthiness of aircraft and considered the main challenges that autonomy poses to the current airworthiness and certification system. We sought views on how the current airworthiness and certification regulations might need to be adapted or developed to accommodate highly automated and autonomous aircraft.
- 1.9 We received a range of responses. One of the most common themes was the certification of AI and datasets. Several consultees felt that these could be certified within the existing certification system, albeit with the introduction of appropriate safety standards. Others felt that the current system could not meet the demands of higher automation and autonomy in aviation. A common theme was that consultees thought the certification of aviation systems which use machine learning would be challenging.
- 1.10 More specifically, we asked whether provisions should be adopted which allow for: (1) the certification of optionally piloted and uncrewed or unoccupied versions of conventional aircraft (hybrid versions); and (2) the separate certification of command units (CQ1).¹ Several consultees took the view that provisions should be adopted in relation to both (1) and (2). A small number of consultees suggested that the existing regulations could accommodate innovation, particularly in relation to (1).
- 1.11 Finally, we asked about the current regulatory tools to support the development of highly automated and autonomous aviation technologies (CQ3). Consultees were generally of the view that these regulatory tools were inadequate. In particular, the responses highlighted the difficulties faced by new entrants to the aviation sector and the inability of the current tools to accommodate new technologies. Some consultees also expressed the view that the current regulatory tools, such as those related to approvals, are reliant on subjective reviews that apply varying standards. Consultees thought that a more objective approach should be developed. A minority of consultees took the view that the current regulatory tools are adequate. Some were of the opinion that, while current regulatory tools are adequate, adaptations are required to ensure efficiency.

¹ The term “command unit” is used in regulation to describe the equipment used to control or monitor an uncrewed aircraft, with the exception of any infrastructure supporting the data link between the aircraft and its ground station.

Adapting the rules of the air?

- 1.12 In Chapter 5 of the Consultation Paper, we considered how the rules of the air contained in UK Regulation (EU) 923/2012 establishing the Standardised European Rules of the Air (“UK SERA”) should apply to remotely piloted and autonomous aircraft. In particular, we focused on how rules made for human judgement and interpretation could be transposed to machines.
- 1.13 The rules of the air provide the pilot in command with considerable discretion about what appropriate action should be taken in an emergency situation. We therefore asked for consultees’ views on how the rules of the air governing emergency scenarios should apply to highly automated and autonomous aircraft, where there is no pilot in command on board (CQs4 and 5). Specifically, we asked whether autonomous aircraft should be given the freedom to act outside of the rules or whether a comprehensive ruleset for emergencies relating to UAS should be established. There was no clear majority for either option. Whilst many consultees favoured a comprehensive ruleset, roughly half of those responding to the consultation did not clearly favour either, or chose to advocate for a middle ground. Only a few consultees clearly favoured allowing UAS to operate outside the rules of the air with full discretion. On emergency scenarios more broadly, several responses highlighted loss of remote connection to the aircraft and lack of situational awareness as emergency situations particular to UAS which the Law Commission should consider.
- 1.14 The rules of the air have several requirements for aircraft to maintain air-ground voice communications. We therefore asked for consultees’ views on how those rules on communication should be adapted for remotely piloted and autonomous aircraft (CQ6). A majority of consultees recognised the rules of the air on communication will need to be adapted for remotely piloted and autonomous aircraft. There was variation amongst consultees as to what this meant in practice, but a common theme was that mandating electronic conspicuity would reduce communication issues regarding UAS.
- 1.15 We set out three options for changes to rules of the air: amend the current rules; apply “applicable requirements” to each operation; or establish a new set of rules of the air for remotely piloted and autonomous operations. We asked consultees to consider these options and give general views on how the rules of the air could be adapted (CQ7). Most of those who responded to this question did not clearly state a preference for any of the three options. A few consultees were in favour of developing a new ruleset, but most responses suggested more specific or minor changes to the rules of the air. Some responses supported the current approach of applying applicable requirements. A small number of consultees suggested the rules of the air were completely adequate to cover remotely piloted or automated aircraft.

Use case 1: VTOLs

- 1.16 In Chapter 6 of the Consultation Paper, we looked at our first use case: vertical take-off and landing (“VTOL”) aircraft providing short journeys for up to ten people. The chapter explored a range of legal issues relating to: the role of the pilot; the role of the operator in commercial transport; piloting multiple aircraft; autonomous operations; transitioning between remotely piloted and autonomous modes mid-operation; and accessibility.
- 1.17 There was very strong support for our provisional proposal that a person overseeing a VTOL flying automatically, who monitors its course and is able to intervene and change its course at any time, should continue to be classified as a “remote pilot”.
- 1.18 The consultation questions and provisional proposals that followed looked at the responsibilities of remote pilots in detail. Most consultees supported our provisional proposals (CQs8 to 22) to largely align the duties of the remote pilot of a VTOL with the existing responsibilities of the pilot-in-command. But some consultees also highlighted that the responsibilities of the remote pilot would need to be delegated to others in practice, and asked whether this delegation would make it inappropriate to impose a duty on the remote pilot.
- 1.19 On the role of the operator (CQs23 to 25), there was strong support for operators of passenger carrying uncrewed VTOLs to be certified and to align their responsibilities with those currently applicable to operators of crewed aviation.
- 1.20 The views of consultees were more divided on the issue of VTOL multiple simultaneous operations (“MSOs”) (CQs26 to 28). Although most consultees believed the law should permit a remote pilot to be responsible for more than one VTOL at a time, there was no consensus on imposing an upper limit to the number of aircraft a pilot can be responsible for.
- 1.21 On autonomous operations (CQ29), views were divided in relation to creating a new supervisory role. Consultees were also divided about allowing VTOLs to transition between remotely piloted and autonomous modes of operation (CQ30). Responses on these topics raised wider concerns over the definition of “autonomous” used in the consultation paper, which mirrors that used in the UAS Regulations. Under this definition, an autonomous operation is one in which no human can intervene and change the course of the aircraft. Some consultees thought this definition was too restrictive.
- 1.22 There were mixed views on whether accessibility standards should be included either in initial airworthiness specifications or licencing provisions (CQ32). Many consultees emphasised that uncrewed VTOLs should not be subject to accessibility provisions that are different to traditional crewed aviation.

Use case 2: Drones

- 1.23 In Chapter 7 of the Consultation Paper, we looked at our second use case: drones. We considered a range of legal issues arising from the current regulatory framework for UAS, such as: the definition of “remote pilot” (CQ34); potential expansion of the Open category of operations; establishing some core requirements for autonomous UAS in the specific category; flight data recorders; and transitions between remotely piloted and autonomous operations.
- 1.24 We also asked questions about the law on multiple simultaneous operations (“MSO”): operations involving many drones either flying individually or as a “swarm”, for which one pilot/supervisor is responsible (CQ38). We asked for consultees’ views on whether the concept of a “remote pilot” was compatible with MSOs and sought views on whether there should be an upper limit to the number of drones for which an individual remote pilot can be responsible (CQ39).
- 1.25 Most consultees agreed with our provisional proposal to retain the current definition of a remote pilot. Consultees were more divided on the issue of whether the concept of a remote pilot was compatible with multiple simultaneous operations. There was no consensus amongst consultees for imposing an upper limit to the number of drones a person could be responsible for. Similarly, there was no consensus for expanding the scope of the Open category of operations, which is the category of operations which does not require an operator to get operational authorisation from the CAA.
- 1.26 We also provisionally proposed that for autonomous operations in the specific category, operators should be required to only operate UAS that can, amongst other things, comply with authorised limitations and conditions (CQ36). There was broad support for this proposal, although some consultees suggested that these requirements might be part of the operational authorisation and need not be explicitly set out in legislation.
- 1.27 In order to ensure that highly automated and autonomous operations can be effectively investigated in the event of an accident, we provisionally proposed that flight data recorder systems or devices be mandatory for highly automated UAS (CQ41). There was strong support for this proposal, but many consultees expressed concern over mandating specific types of on-board equipment which may be unsuitable for smaller drones.
- 1.28 Finally, we considered the possibility that drones may be developed to transition between remotely piloted and autonomous modes of operation, and asked consultees how this should be dealt with by the law (CQ42). There was strong support for the law permitting drones to transition between remotely piloted and autonomous flight during an operation, subject to certain technical concerns. This issue was also considered in relation to VTOLs and readers are encouraged to look at the responses to that topic alongside those related to drones.

Civil liability

- 1.29 In chapter 8 we discussed what civil liability attaches to those involved in the operation of uncrewed aircraft systems, and considered how the existing framework of insurance requirements relating to air carriers and operators applies to uncrewed aircraft operations.
- 1.30 There are several strict liability regimes which apply to the aviation context. International law requires that air carriers are strictly liable for the death or injury of passengers or damage to cargo. Domestic law requires that owners of aircraft, or those that lease them, are strictly liable for “surface damage” to third parties. In our provisional view, the replacement of a pilot by a remote pilot, or the removal of the pilot altogether, will not make any significant difference to the effectiveness of these strict liability regimes (CQs44 and 45). The carrier or the owner of the UAS would be liable in a similar way to how the carrier or owner of crewed aircraft is liable now.
- 1.31 Many consultees agreed with our provisional views. But consultees also highlighted a range of other issues for us to consider. For example, some consultees suggested that we identify who the carrier is in the context of UAS operations. Another indicated that the position of search and rescue UAS would need to be clarified. Consultees also noted that, in relation to fully autonomous aircraft, carriers would seek to limit their liability where the failure was caused by a command generated by an AI system. This would be a problem for passengers because the current strict liability regime is subject to monetary limits for damage. Passengers wishing to make claims in excess of these limits may encounter difficulties because it will be difficult for them to prove fault when a complex AI is involved.
- 1.32 In Chapter 8 we also provisionally proposed that the conditions of exemption from liability for private nuisance and trespass in section 76 of the Civil Aviation Act 1982 should be modified in their application to UAS (CQ47). The result would be to require compliance with aviation legislation that is relevant to limiting intrusion into a claimant’s land (eg operating height and airspace restrictions). Many consultees agreed with the provisional proposal and only one disagreed. Consultees also raised other issues related to nuisance and trespass such as the role of local byelaws in limiting drone operations.
- 1.33 We also provisionally proposed that there should be a review of product liability law (including the Consumer Protection Act 1987) to take account of the challenges of emerging technologies like autonomous systems (CQ48). Our view was that the review should cover product liability as a whole, rather than be confined to aviation or automated vehicles. Almost all consultees agreed that a general review of product liability was necessary.

Criminal liability

- 1.34 In Chapter 9 of the Consultation Paper, we considered the issue of criminal liability.
- 1.35 There is no single piece of legislation that imposes criminal liability for breach of aviation law. Rather, there are several key pieces of legislation. One of the most significant is the Air Navigation Order 2016 (the “ANO”). We asked whether the current approach taken in the ANO, which is to make an operator vicariously liable for breaches of certain articles of the ANO and other aviation regulation, was adequate for autonomous operations (CQ52). We also asked questions on the adequacy of current defences set out in the ANO (“reasonable care” and “due diligence”) for autonomous operations (CQs53 and 54)
- 1.36 Most consultees broadly agreed the current approach in the ANO was adequate for autonomous operations. There was also strong support for our provisional proposals that the “reasonable care” defence was adequate for autonomous operations, and that the due diligence defence should apply to direct contraventions of the ANO.
- 1.37 Aside from the ANO, we also examined the liability of the remote pilot in relation to transition periods between autonomous and remote-control modes of operation. Consultees who responded to this question were generally supportive of the pilot only becoming criminally liable at the end of any transition period from autonomous to remote operation. But consultees also expressed some concerns about straying too far from the principle that a pilot was responsible for the entirety of a flight.
- 1.38 We also sought consultee views about whether the UAS-specific offences in the Air Traffic and Unmanned Aircraft Act 2021 (“ATMUAA”) operate satisfactorily (CQ58). Consultees highlighted several issues with the ATMUAA. These included practical aspects of enforcement and concerns that the powers conferred by the act may not be adequate in the future.
- 1.39 We invited views about how operator responsibilities for dangerous goods might be adapted in the case of autonomous operations (CQ59). Consultees made several suggestions for adaption including revising the current technical instructions for carriage of dangerous goods. Consultees also generally agreed that for autonomous operations it should be the operator who has a duty to inform air traffic services of dangerous goods on board their aircraft.
- 1.40 Finally, we considered the most serious aviation offences set out in the Aviation Security Act 1982 and Aviation and Maritime Security Act 1990 (CQs60 and 61). In particular, we looked at the hijacking offence and asked whether it should be amended so it could be committed remotely through digital means. There was strong support for the hijacking offence being updated.

Impact of our proposals and next steps

- 1.41 In Chapter 10 we considered the potential impact of the provisional proposals we make throughout the Consultation Paper. Relying on two influential PwC reports on the development of the drone and VTOL market in the UK, we were of the initial view that our proposals would bring significant economic benefits to the extent that they could support and enable the safe deployment of UAS. We also acknowledged there would naturally be several transitional costs associated with our proposals such as those associated with training, licensing, certification and rewriting the rules of the air for remotely piloted and autonomous aircraft.
- 1.42 To help us better assess the impact of our proposals, we asked consultees if they had any views on, or have experience or data to indicate, the likely costs and benefits of our provisional proposals in relation to drones and VTOLs (CQs 62 and 63).
- 1.43 As part of our policy formation process, we also consider how our provisional proposals could affect particular groups, or people with particular characteristics. For example, we believe the removal of the pilot from VTOLs may particularly impact those with disabilities and reduced mobility who need support whilst flying. We therefore suggested in chapter 7 that their needs should be considered at an early stage when designing both the aircraft itself and the accompanying support system.
- 1.44 To help us better assess any potential equality impacts associated with our proposals, we invited consultees to tell us if they believed or had evidence or data to suggest any of our provisional proposals could result in advantages or disadvantages to certain groups or based on particular characteristics (CQ64).
- 1.45 Few consultees provided responses to questions on impact, and those that did generally gave high level thoughts. Besides the potential of limiting the number of drones and VTOLs a pilot may be responsible for in an MSO, consultees did not suggest the costs for any of the provisional proposals contained in the Consultation Paper would outweigh potential benefits. On equality impacts, some consultees focused on the accessibility of VTOLs whilst others gave general comments on the need to have appropriate regard to equality and consumer principles.

NEXT STEPS

- 1.46 Our second Consultation Paper was published in April 2025. This second Consultation Paper focuses on the provision of air traffic management and air navigation services (ATM/ANS) to uncrewed aircraft. To operate safely in integrated airspace, uncrewed aircraft will require some form of ATM/ANS, which we refer to as uncrewed aircraft systems traffic management (“UTM”). We make provisional proposals about how UTM should be regulated, and about the legal mechanisms for establishing liability when things go wrong.
- 1.47 We will produce a report in 2026 with our recommendations on all issues from both consultation papers.

Individual responses to the consultation

The individual responses are set out in alphabetic order.

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ADS RESPONSE TO THE LAW COMMISSION'S CONSULTATION ON AVIATION AUTONOMY: JUNE 2024

INTRODUCTION

1. ADS is the trade association for the UK's aerospace, defence, security, and space industries. ADS has more than 1,300 member companies across all four sectors, with over 95% of these companies identified as Small and Medium Size Enterprises (SMEs). Our sectors are vital to the UK's growth, generating £88.4 billion turnover a year in the UK, including £38.7 billion in exports, indirectly supporting one million jobs.

BACKGROUND

2. The aerospace sector is a key driver of the UK and global economy, providing an aviation industry with requisite aircraft and services. In the UK, the sector supports £20 billion of exports, with 104,000 direct employees including 6,000 apprentices, adding £10.9 billion to the UK economy¹. The UK's aerospace sector is a hub for advanced manufacturing, generating well-paid jobs across the country developing world-leading aircraft technology, generating highly skilled employment and prosperity in every part of the country.
3. ADS already works with industry and the regulator to support new and advanced technologies for the future of Advanced Air Mobility (AAM), and has its own AAM Special Interest Group which includes members from across the aerospace ecosystem. This consultation, on behalf of the CAA, is a welcome positive step in helping to make AAM a reality. However, given the nascent nature of AAM, further direct discussions between CAA and ADS expert AAM members would be welcome and strongly encouraged. For this consultation, ADS has focussed on the questions of design manufacture more than specifically operational matters, as well as some of the questions regarding liability.
4. ADS is using in this response the nomenclature for Future Flight Systems as defined by the BSI - Flex 1903 v1.0 2023-08 (pages.bsigroup.com/l/35972/2023-09-01/3t6qgn7/35972/1693599632CBEzsR8C/BSI_Flex_1903_v1.0_DRM_free.pdf)

¹ https://www.adsgroup.org.uk/facts-figures/ads-aerospace-sector-uk-outlook-2024/?utm_source=Web&utm_medium=web&utm_campaign=Aero+2024+Web&utm_id=Aerospace+Outlook+2024

RESPONSE TO SPECIFIC CONSULTATION POLICY QUESTIONS

Consultation Question 1.

11.1 We seek views on how current airworthiness and certification regulation might need to be adapted or developed in light of highly automated and autonomous aircraft. In particular, should provisions be adopted which allow for:

- (1) the certification of optionally piloted and uncrewed or unoccupied versions of conventional aircraft (hybrid versions); and*
- (2) the separate certification of command units?*

(1) ADS notes that previous advice on the conversion of piloted to uncrewed derivatives, concentrated on replacing the pilot with an automated function with equivalent capability. Little or no advice has been provided since to articulate how well an uncrewed function should perform compared to that performed by the pilot. For example, for see and avoid, it is expected that equivalence is not good enough (largely driven by physiological limitations); therefore, a better metric for describing equivalence is required. It is more likely that industry would seek conversion from manned to uncrewed rather than vice versa. There are industry consensus standards that address this subject for design. However, it is worth recognising there is likely a difference in the needs of smaller drone operators and passenger-carrying eVTOLs. The CAA may therefore want to publish acceptance of the standards that have been developed and to support additional industry standard work that best fit each of the many different types and sizes of uncrewed operations.

(2) ADS would like to seek clarification on whether ICAO's suggestion that the Command Units (CUs) can either be incorporated as part of the Type Certification of the RPAS, or certified separately be adopted into regulation. ADS supports the approach presented in EASA Opinion 03/2023 which acknowledges that varying extents of on-aircraft autonomy require differing approaches to the approval of Communications Management Units (CMUs) and tailors the extent of and mechanism for oversight of the CMU appropriately. Industry is not comfortable with the FAA's approach of the CU being treated as an 'associated element', as the CU is a fundamental piece of the overall airworthiness and safety of a RPAS.

ADS further notes that for an unmanned aircraft, the airworthiness issue is around avoiding contact with other aircraft, and ground risk. The former is primarily a function of the ATM system and how it interacts with the RPAS; the latter is a combination of how airworthy, and

how robust and reliable any Flight Termination System (FTS) is. It would therefore be entirely feasible to have a perfectly safe aircraft (even if currently deemed unairworthy) if its ATM interface and FTS was robust. Airworthiness is well established in aviation, and advocating it to be changed is not insignificant. The focus should instead be on the concept of “safe”, and should be looked at holistically in the context of a specific operation. Both JARUS and EASA guidance utilise this approach in setting the design requirements. The main issues here are understanding the risks, the redundancies, and the causal links of any software systems on board (e.g. in what scenarios does a failure in the Flight Control Software lead to a potential failure in FTS or failure in the interaction with ATM systems, or detect and avoid capability?). The architecture of the software systems needs defined redundancy, and that needs understanding fully in order to be certified. It is less a case of the robustness or failure rate of an individual system, but more the layering of what all the systems do in extreme events. Indeed, that level of understanding is for the Regulator, rather than necessarily defining in law.

Consultation Question 2.

11.2 We welcome views on what changes to the certification system might be necessary to enable higher automation and autonomy in aviation.

ADS believes that describing the relationship between automation and autonomy needs to be standardised. Even for high autonomous functions, industry believes that current regulation is satisfactory. EASA have stated that the current regulation and certification specifications are compatible with autonomy, but what is missing is an acceptable means of compliance or a sector standard. Potential design architectures for certain AI functions output could be deterministically verified and so would not require any change to the certification system. However, some function may not lend themselves to this arrangement, and consideration should be given to a certification system that is not a binary event, i.e., evidence is acquitted until full compliance of the requirements can be demonstrated, to one where initial operations are limited, but that in-service evidence is gathered that support a gradual removal of the limitations. This would be more akin to an incremental certification system. However, this is relevant mainly to smaller drones and is currently reflected in the EASA categorisation of drones (open, specific, certified) and the FAA 107, 108 counterparts. Advocating for incremental certification for eVTOLs is a significant topic and shouldn't be confused.

Currently, most AI or ML systems use a statistical approach of a large data set. This is the same approach a human expert uses to assess whether a system is safe (to a degree of certainty, say, 10^{-9}). There is a fear about using AI whether unfounded or not. It is the same

process, but a machine makes the assessment, rather than a human, and is less prone to error. It would be helpful to assess how accurately the 10^{-9} figure is with humans assessing it, then comparing when machines assess it. There are many examples of accepting these results, even if in cases where the order of magnitude of potential errors has not been properly understood. A potential solution is to have sufficient redundancy, on systems which are not linked to, nor affected by, the primary system, which can take over in failure modes. However, there are currently multiple certification projects of ML with major authorities (EASA and FAA). Those authorities appear to believe there are sufficient data sets for the Type Certification of those projects. Therefore, the real challenge is likely to be when statistical assessments (through ML or any other manner) are made on sparse data sets. This is an area where reliance on simulation is imperative, and a similar approach to the one described above would be helpful.

Consultation Question 3.

11.3 We seek views on whether current regulatory tools to support the development of highly automated and autonomous aviation technologies are adequate.

ADS notes that the EASA AI roadmap 2.0, has delivered initial guidance for Level 1 human assistance/augmentation, and has research plans for Level 2 (human-AI teaming). But the roadmap extends well into the middle of this century. It would be helpful to understand whether the UK could contribute to the EASA roadmap to either accelerate the delivery of guidance or more importantly have access to the relevant supporting research information. Similarly, it would be helpful to know if the UK government intends to go it alone and develop its own AI guidance.

ADS further notes that current UK regulatory tools need to be updated if innovation, and industry confidence are to be maintained. Linked to this is a need for geo-fenced dedicated testing areas. With so much innovation, rather than testing in a specific area (which is essentially put out of bounds to other air users). A few dedicated test sites where all innovative, prototype and equivalent testing takes place would be a solution. This needs to be a testing environment which would encourage innovation, but more importantly, an area where a regulator could have access to vast amounts of flight data of novel aircraft, and learn about the regulatory process in a safe and ring-fenced environment.

Consultation Question 17.

11.17 We provisionally propose that passengers should be able to contact a member of crew at all times during an operation. Do you agree?

ADS agrees it is important for any passenger currently to have some means of contacting a “member of crew” during an operation. However, that does not necessarily mean that the crew member is physically on board the aircraft. For most flying passengers, not aware of the engineering and flight operations that permit safe flight, they would expect to have the ability to speak to a human. This expectation is likely to weaken within a generation.

Consultation Question 21.

11.21 We provisionally propose that a remotely piloted VTOL should be required to be capable of detecting and recording information relating to accidents and near accidents for the purposes of reporting it. Do you agree?

ADS agrees that a UAS should have an accident data recorder, but also to monitor and record key safety parameters. This has been best practice in commercial operations for many years. It provides an invaluable means of assessing technical performance / operational procedures, with continuous learning feedback. With Electronic Conspicuity as standard, all UAS flights could be recorded and simulations of the flight paths could be easily calculated to show near misses and indeed any deterioration in performance against (pre-programmed) and expected norms.

Consultation Question 31.

11.31 We seek views as to whether initial airworthiness standards for uncrewed VTOLs should include accessibility standards for persons with disabilities and reduced mobility.

ADS suggests that if disability or reduced mobility access to uncrewed VTOLs is to be regulated, then industry would request that this is dependent on number of passenger carried and/or all up-mass weight. Most general aviation design cannot meet the same requirements as a large commercial airliner. As product development for the type is only for a small number of passengers, it seems appropriate to consider these aircraft in a similar manner to those of traditional small aircraft, and thus regulation could result in a capability penalty to embody this. Therefore, this is a commercial question, rather than one that needs enshrining in law; an OEM should see the commercial benefit of designing a VTOL that accommodates a sizeable chunk of the market, and one that will only grow. Following existing laws is a sensible approach for now.

Consultation Question 32.

11.32 We seek views as to whether the CAA should be able to include accessibility standards within the licences granted to uncrewed VTOL operators.

See answer to question 31.

Consultation Question 48.

11.48 We provisionally propose that there should be a review of product liability law (including the Consumer Protection Act 1987) to take account of the challenges of emerging technologies. The review should cover product liability as a whole, rather than be confined to aviation or automated vehicles. Do you agree?

ADS believes this raises interesting and complex points which are specific to drone members. Fundamentally, the technology must have defined safety targets, based on the consequence of failure which must be demonstrated. Product liability law should be reviewed, but it should not change the overriding principles.

However, the narrative brings together disparate areas ranging from AI explainability to decision making processes to “standard” aviation liability. Unpicking that may be a challenge. The practicalities of how UAS deal with emergencies needs to be addressed as a priority. If the civilian market follows the defence market, it is likely that smaller UAS (and perhaps uncrewed VTOLs) will have a Flight Termination System (FTS) within it – such as a parachute. It is worth noting that for larger aircraft mitigation tends to focus on safe landing, and the weight differences between the two are highly significant. It is therefore likely that smaller UAS will not need the same level of reliability as other aircraft due to this in-built safety feature. If this is the case, these will be deployed regularly, which then leads to the issue of liability for goods, and when a passer-by picks up a downed UAS, whether they have a duty to protect it, and its cargo, and return it (similar to legislation about not interfering with Royal Mail letters). Current legislation will cover this (non-delivery covered by consumer protection; picking up the drone and its cargo and not returning it covered by theft) but there may be some additional protections needed for some situations, for example drone delivery of human organs urgently needed. The carrying of passengers would also need to be covered in the discussion, and whether UAS would require any different or specific “flight termination” mitigations to that of conventional aviation, given the likelihood of lower flights over populated areas etc.

Consultation Question 49.

11.49 We seek views as to whether the current law regarding liability for mid-air collisions is satisfactory in the case of collisions involving uncrewed aircraft systems.

ADS notes that for manned aviation, the pilot has a regulatory obligation to see and avoid other aircraft. The ability to do this is affected by human limitations, visibility, atmospheric conditions etc. This is where the 'manned equivalence' guidance as defined in the response to question 1 needs to be clearly defined. Issues will also arise when UAS fly in airspace they are not permitted to – that is covered by existing ANO legislation. But if there is a mid-air collision on larger vehicles, it is likely to be a failure of Detect and Avoid, or a failure of the ATM system. Liability is likely to be covered in existing legislation (e.g. corporate manslaughter), but this should be closely considered.

Consultation Question 58.

11.58 We invite consultees' views on whether the Air Traffic Management and Unmanned Aircraft Act 2021 operates satisfactorily in the case of highly automated and autonomous flight.

ADS believes that unmanned aviation is hindered by the current allocation of airspace classes in the UK. It was hoped that the flexible use of airspace (FUA) would go some way to improving the situation, but alas not. The main challenge is the extensive allocation of Class G airspace, whereby most airfields (except for large airports) do not have direct access to controlled airspace. In this respect, apart from the smaller end of the UAS market operating in UTM, it would be essential that all aircraft are cooperative from a surveillance perspective. It is recognised that reallocation of airspace is a long and involved process requiring public consultation. As noted above, having dedicated UAS flight test centres, with appropriately allocated airspace, would allow the UK the ability to safely develop the technologies in a safe environment that presents no harm to other air users or the general public.

Consideration should also be given to the practical issue of who prosecutes violations under the Acts. There is a question as to whether the National Police Air Service deem it a police matter to deal with drone incursions in restricted airspace – or rather within the CAA's remit. However, while the CAA may have limited resource to handle this, their role should not be diminished.

Consultation Question 62.

11.62 We invite consultees to tell us if they have views on, or have experience or data to indicate, the likely costs and benefits of our provisional proposals in relation to VTOLs.

See below.

Consultation Question 63.

11.63 We invite consultees to tell us if they have views on, or have experience or data to indicate, the likely costs and benefits of our provisional proposals in relation to drones.

ADS notes that the PWC report (which is heavily referenced in the document) states, “Regulation is often cited as the reason for lack of progress...”. However, the S-curve methodology for calculating the numbers of adoption of drones does not take into account the legal or regulatory challenges, which are the key issues and the key costs. Given the time required to enact legislation in this area, it is open to question whether an operator will take a legal risk in these matters ahead of becoming law. If a test case goes against the aerospace sector, it is likely to have a serious and damaging impact on an Operator, OEM, and the wider industry. Global conflict and wider security has buoyed the drone industry, but purely civil business models have struggled as evidenced by several high-profile drone companies going into administration. There will be further consolidation as UKRI’s Future Flight funding and equity investment comes to an end. The specific costs in this proposal are therefore a function of time and uncertainty. It is essential therefore to ensure well thought-through legislation is enacted as soon as practicably possible. This will accelerate progress and de-risk the industry, as well as unlocking further equity investment.

Dr Alan Mckenna

I would be grateful if you are able to consider the following comment relating just to the issue of nuisance, coming under Question 47.

The Consultation document has not referred to a potentially relevant statutory provision when considering the issue of nuisance.

Section 79(6) of the Environmental Protection Act 1990 provides, 'Subsection (1)(g) above does not apply to noise caused by aircraft other than model aircraft.' Subsection (1)(g) concerns statutory nuisance in regards to noise emitted from premises so as to be prejudicial to health or a nuisance.

This legislation does not define Model Aircraft, but CAP722D defines them as, 'An unmanned aircraft used for sporting and recreational purpose, flown by direct control inputs by the remote pilot without any autonomous capability other than for flight stabilisation purposes.'

Arguably the current absence of statutory nuisance protection outside of Model Aircraft requires potentially a wider protective proposal than is referred to in Question 47, if the proliferation of drone technology that is anticipated occurs.

Thank you

Alan Mckenna

RESPONSE TO LAW COMMISSION CONSULTATION ON AVIATION AUTONOMY

(Law Commission Consultation Paper 261)

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About you

What is the name of your organisation?

Altitude Angel Ltd

Airworthiness and certification

Consultation Question 1

We seek views on how current airworthiness and certification regulation might need to be adapted or developed in light of highly automated and autonomous aircraft. In particular, should provisions be adopted which allow for:

1. the certification of optionally piloted and uncrewed or unoccupied versions of conventional aircraft (hybrid versions); and
2. the separate certification of command units?

Please share your views below

1: We would strongly support for a move towards harmonization with EASA rules on certification. Hybrid aircraft that can be operated by both a pilot onboard and a remote pilot and/or autonomously are already coming about and it would be reasonable to have certification rules that cover these aspects, rather than having to pursue separate certification depending on how the aircraft is controlled.

2: As command units are already developing into separate systems, that can interact with different aircraft, it is logical to allow certification of the command units alone, as this would allow a universal command unit to be used for operation of several different types of aircraft, rather than only looking at each system individually.

Certification requirements should take into account the general move towards a system approach where aircraft operations will involve multiple facets including both the actual aircraft and external software and systems.

Consultation Question 2

We welcome views on what changes to the certification system might be necessary to enable higher automation and autonomy in aviation.

Please share your views below

As described in the consultation paper, certification of AI is challenging when it comes to data sets used for building the, maintaining the AI and Machine Learning.

We would encourage that data sets are met with some sort of requirements to ensure the authenticity and integrity of both the initial data, as well as any new data the AI may be updated with.

In addition, machine learning needs to be certified, so that it is kept within certain parameters.

For the development of both AI and ML, there is a defining line between automation and autonomy. Self determining systems require a complete new set of certification requirements.

AI will play an ever bigger role in aviation and needs to be included in certification work. We doubt that EASA's 2050 timeline is actually aligned with industry, and it is an opportunity for the UK to accelerate regulatory development. Noting how fast AI developments are being deployed across industries, it seems inevitable that aviation grade solutions and deployments are closer than 2050.

Consultation Question 3

We seek views on whether current regulatory tools to support the development of highly automated and autonomous aviation technologies are adequate.

Please share your views below

The CAA's use of regulatory sandboxes must be radically rethought. The current idea is that the CAA allows certain projects with the sole purpose of informing the CAA. This kind of research is better undertaken by research institutions than they are by industry. If the sandboxes are to make real sense then industry should be allowed to actually test out real life applications on commercial terms.

The FAA operates with a system based on waivers, allowing industry to operate with derogations from existing regulations. It is our understanding that the current legal arrangement in the UK does not allow the CAA to issue similar waivers. We would strongly recommend that the CAA are given similar powers and use this opportunity to support innovation and new technologies.

Rules of the air

Consultation Question 5

We seek consultee views about what challenges remotely piloting an aircraft in an emergency scenario presents and how these might be addressed

Please share your views below

One specific challenge is similar to what is known from automated vehicles. Any operation in an emergency scenario must take into account both the safety of potential occupants onboard the aircraft as well as people on the ground.

VTOLs

Consultation Question 12

We provisionally propose that the remote pilot-in-command should be responsible for, amongst other things, ensuring passengers are:

1. given a safety briefing; and
2. seated and wear seat belts during take-off and landing

Do you agree?

Other

Please expand on your answer below

This could be the responsibility of any crew at vertiports too - before the aircraft is cleared for takeoff.

Consultation Question 23

We provisionally propose that operators of remotely piloted VTOL should be certified. Do you agree?

Yes

Please expand on your answer below

Existing air operator rules and certification requirements should be applicable to eVTOLS. Perhaps in a slightly less stringent version.

Consultation Question 26

We seek views as to whether the law should permit remote pilots to act as pilot-in-command for more than one VTOL at the same time.

Please share your views below

This would be an appropriate step to take or at least prepare for. It is certainly on the roadmap for eVTOLs and will eventually be explored by other aircraft.

Drones

Consultation Question 34

We provisionally propose that a remote pilot for drones should continue to be defined as “a natural person responsible for safely conducting the flight of an unmanned aircraft by operating its flight controls, either manually or, when the unmanned aircraft flies automatically, by monitoring its course and remaining able to intervene and change its course at any time”. Do you agree?

Other

Please expand on your answer below

We would recommend extending the responsibility to a legal person. If a drone is flown autonomously, there may be good reasons that responsibility and liability is not limited to a single natural person, but could also be extended to a legal person i.e. the operator or company behind the operation.

Consultation Question 35

We seek views on whether some low risk autonomous drone operations or drone operations conducted beyond visual line of sight might be accommodated in the open category. In particular:

- (1) whether there are any such use cases which might be suitable for the open category; and
- (2) if so, what conditions should be attached to these use cases if operated in the open category.

Please share your views below

Yes, low risk BVLOS operations should be allowed in the open category. A requirement could be the continuous video feed from the drone. Atypical airspace environments or BVLOS on the other side of a building both count as low risk that could fit in open category.

Consultation Question 36

We provisionally propose that for autonomous operations in the specific category, a UAS 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 manned 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.

Do you agree? (tick all that you agree with)

Please expand on your answer below

Requirements shouldn't be limited to be on the UAS, but on the wider system incl. ATM/UTM components. Even if UAS is to be considered a full system, technology is moving towards further and finer integration of services on the ground with the aircraft.

Consultation Question 37

We seek views on what operational requirements should be applied to autonomous drone operations and drones that operate beyond visual line of sight in the specific and certified categories.

Please share your views below

The most important aspect would be to ensure that the drone stays clear of other aircraft and obstacles on the ground. For that sake, UK alignment with practices from JARUS are well worth following as outputs from JARUS are already starting to deal with Detect and Avoid technologies as well as quantifying both air and ground risk.

Consultation Question 39

We seek views on whether there should be an upper limit to the number of drones for which an individual remote pilot is responsible.

Please share your views below

Makes little sense to prescribe a number.

With the continued roll out of AI, ever greater numbers will be possible to control by

a single remote pilot. If we were to define a reasonable limit today of i.e. 5 - that could easily be 20 or 50 in a few years.

Consultation Question 41

We provisionally propose that use of flight data recorder systems or devices should be mandatory for autonomous drone operations. Do you agree?

Other

Please expand on your answer below

A physical flight recorder is outdated for drones. Similar results could be achieved through conformance monitoring service in UTM and recording or of a lighter touch data recording tool in the UAS.

Consultation Question 42

Should the law permit a drone to transition between remotely piloted and autonomous flight during an operation?

Yes

Please expand on your answer below

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

Consultation Question 43

We seek stakeholder views on any other issues with the current legal framework as it relates to operations involving autonomous drones.

Please share our views below

The airspace part of the equation is closely related to that of the operations and systems. We will comment in more detail once the Law Commission airspace paper is published.

Civil liability and insurance

Consultation Question 44

We provisionally consider that the current law governing air carrier liability for injury or death of passengers in the UK is adequate for the introduction of remotely piloted and autonomous operations. Do you agree?

Yes

Consultation Question 45

We provisionally consider that the current law governing liability for damage to cargo in the UK is adequate for the introduction of remotely piloted and autonomous operations. Do you agree?

Yes

Consultation Question 47

We provisionally propose 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. Do you agree?

Other

Please expand on your answer below

Existing nuisance and privacy laws should be respected and perhaps existing aviation law is outdated in this respect.

However, it has to be noted that the use of airspace should be generally permitted and equitable to all. The idea that landowners could start selling access right to airspace - or outright forbid drones in their airspace - is a slippery slope, that eventually would lead to drone technology not being utilized to its fullest. There are circumstances, that would allow certain landowners (tourist sites, airports etc) to manage access to airspace, but this should not be extended to landowners in general.

Consultation Question 48

We provisionally propose that there should be a review product liability law (including the Consumer Protection Act 1987) to take account of the challenges of emerging technologies. The review should cover product liability as a whole, rather than be confined to aviation or automated vehicles. Do you agree?

Yes

Please expand on your answer below

Drones are in many aspects more similar to IT products and smart devices than they are to aviation technology. Therefore it would make good sense to review existing liability and consumer protection laws to ensure they capture the technology.

Consultation Question 51

We provisionally propose that multiple simultaneous operations should be considered as the Government develops proposals for the insurance requirements applicable to uncrewed aircraft. Do you agree?

Yes

Please expand on your answer below

The only way to achieve the desired economics of scale is through multiple simultaneous operations and therefore we agree, that this should be generally permitted when the operator can ensure the safety.

Criminal liability

Consultation Question 59

We invite views on how operator responsibilities for dangerous goods might need to be adapted in light of autonomous operations.

Please share your views below

Dangerous goods limitations place an immediate blocker for several medical logistics applications. For that reason, it should be considered changing limitations around medicines, tissue samples and batteries.

Consultation Question 60

We ask for consultees' views about whether the offence of hijacking in domestic law should be updated to:

1. include the unauthorised seizure or control of autonomous or remotely piloted aircraft by technological means or by persons not on board the aircraft; and
2. expand the period in which hijacking can occur from the period when an autonomous or remotely piloted aircraft is "in flight" to the period when it is "in service".

Please share your views below

Considering that these are real risks when dealing with remotely piloted or autonomous vehicles, these updates seem in place.

Consultation Question 61

We also ask consultees for views on whether any offences against the aircraft other than hijacking need to be updated to account for increased autonomy in aviation.

Please share your views below

Manipulation or other terms could be introduced. I.e. the spoofing or blocking of satellite navigation signals with the intent to interrupt aircraft dependant on this would not directly fall under hijacking - but the malicious intent is clear.

Impact

Consultation Question 63

We invite consultees to tell us if they have views on, or have experience or data to indicate, the likely costs and benefits of our provisional proposals in relation to drones.

Please share your views below

As previously stated, this will have to be seen in the light of the upcoming airspace consultation paper.

Generally speaking, it is important to stress that there are many positive and beneficial use cases for drones - but they are extremely cost sensitive. For all practices done in a different manner with existing technology today there will be an analysis of the advantages of changing to drones. If the use of drones becomes too expensive - be it because of technology cost, compliance cost or else - the uptake of the technology will not take place. This is to be avoided by keeping regulatory constraints proportional.

RESPONSE TO LAW COMMISSION CONSULTATION ON AVIATION AUTONOMY

(Law Commission Consultation Paper 261)

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About you

What is your name?

Andrew Taylor

Rules of the air

Consultation Question 4

We seek views on how highly automated and autonomous aircraft should act in emergency scenarios. In particular:

1. should highly automated and autonomous aircraft be given the freedom to operate outside the rules of the air in emergency circumstances; or
2. should a comprehensive set of rules be developed for highly automated and autonomous aircraft in emergency situations.

Please share your views below

It must be option 2. Otherwise every manned aircraft would everywhere and always be at risk of collision with an autonomous aircraft carrying out some kind of "emergency" procedure.
If there is no aircraft commander on board to make the decision to declare an emergency and how to respond to that emergency, this would presumably be decided by the software in which case the prospect of the autonomous aircraft behaving in an entirely unpredictable manner at any moment becomes a permanent danger to manned aircraft.

Consultation Question 6

We seek consultees' views on whether the rules of the air relating to communication should be adapted for remotely piloted and autonomous aircraft.

Please share your views below

Autonomous aircraft should be required to communicate in accordance with CAP413.

Drones

Consultation Question 35

We seek views on whether some low risk autonomous drone operations or drone operations conducted beyond visual line of sight might be accommodated in the open category. In particular:

- (1) whether there are any such use cases which might be suitable for the open category; and
- (2) if so, what conditions should be attached to these use cases if operated in the open category.

Please share your views below

What is meant by "low risk"?

How "low" would the risk remain in the event of a manned aircraft suffering an engine failure in the airspace above that in which these operations are occurring?

Consultation Question 36

We provisionally propose that for autonomous operations in the specific category, a UAS 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 manned 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.

Do you agree? (tick all that you agree with)

Please expand on your answer below

For option (2), how would the requirement to "discontinue flight" be complied with? If the UAS were to suddenly decide to land, this in itself could pose a risk to other aircraft, people, animals, environment or property.

Consultation Question 39

We seek views on whether there should be an upper limit to the number of drones for which an individual remote pilot is responsible.

Please share your views below

There clearly must be an upper limit. The prospect of single operator being responsible for, say, 1000 drones at one time is absurd.

Consultation Question 41

We provisionally propose that use of flight data recorder systems or devices should be mandatory for autonomous drone operations. Do you agree?

Yes

Please expand on your answer below

In the absence of such a requirement there would simply be no way to know what went wrong in the event of an accident (other than possibly radar traces) and the opportunity to take corrective would be extremely limited or non-existent.

Civil liability and insurance

Consultation Question 49

We seek views as to whether the current law regarding liability for mid-air collisions is satisfactory in the case of collisions involving uncrewed aircraft systems.

Please share your views below

The autonomous aircraft should always be required to give way to a manned aircraft. Therefore in the event of a collision between a UAS and a manned aircraft the UAS must always be liable.

Criminal liability

Consultation Question 55

We provisionally propose that a remote pilot of an uncrewed aircraft operating in the certified category should be treated as a pilot-in-command for the purposes of criminal liability pursuant to article 265(1) of the Air Navigation Order 2016. Do you agree?

Yes

Please expand on your answer below

Someone has to be ultimately responsible, and who could this reasonably be apart from the remote pilot?

Consultation Question 60

We ask for consultees' views about whether the offence of hijacking in domestic law should be updated to:

1. include the unauthorised seizure or control of autonomous or remotely piloted aircraft by technological means or by persons not on board the aircraft; and
2. expand the period in which hijacking can occur from the period when an autonomous or remotely piloted aircraft is "in flight" to the period when it is "in service".

Please share your views below

Yes to both.

The effectiveness of Russian electronic countermeasures in the Ukraine conflict demonstrates the very real possibility of these aircraft being hijacked.

RESPONSE TO LAW COMMISSION CONSULTATION ON AVIATION AUTONOMY

(Law Commission Consultation Paper 261)

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About you

What is the name of your organisation?

Apian

Airworthiness and certification

Consultation Question 1

We seek views on how current airworthiness and certification regulation might need to be adapted or developed in light of highly automated and autonomous aircraft. In particular, should provisions be adopted which allow for:

1. the certification of optionally piloted and uncrewed or unoccupied versions of conventional aircraft (hybrid versions); and
2. the separate certification of command units?

Please share your views below

There should be consistency between international standards and UK regulations to facilitate global operations and standards regarding certification

Regulations need to remain flexible enough to accommodate future advancements without requiring constant legislative overhauls.

Should consider following the EASA model

- to simplify the certification process for aircraft that can operate both with and without a pilot.
- proposed a dedicated type certificate for these units, allowing them to be assessed either together with or separately from the aircraft.

Consultation Question 2

We welcome views on what changes to the certification system might be necessary to enable higher automation and autonomy in aviation.

Please share your views below

Alignment with international standards to ensure the UK does not continue to alienate themselves from the market

Consideration should be given to how the development and advancement of autonomous and highly automation in aviation, certification in traditional aviation takes significant time (years), current drone operators use a drone for a year or two and then move on to the next version. How the industry does not prevent the advancement of systems needs to be carefully considered.

Consultation Question 3

We seek views on whether current regulatory tools to support the development of highly automated and autonomous aviation technologies are adequate.

Please share your views below

Current regulatory tools are heavily reliant on subjective review, by technical experts in specific areas.

Regulatory tools should support more objective reviews and remove the requirement for the regulatory technical expert to know all areas.

Regulations do not support the fast pace of software development that autonomous/highly automated systems require

The regulatory issue of “pilot command” needs to be resolved and new regulation will be required for that. Alongside that issue will be the need to revise the rules of the air and also delineation of flight rules to consider approaches such as: NASA-TM-20220013225.pdf

Rules of the air

Consultation Question 4

We seek views on how highly automated and autonomous aircraft should act in emergency scenarios. In particular:

1. should highly automated and autonomous aircraft be given the freedom to operate outside the rules of the air in emergency circumstances; or
2. should a comprehensive set of rules be developed for highly automated and autonomous aircraft in emergency situations.

Please share your views below

A new set of rules should be created which is fit for purpose. Adapting the current rules is unlikely to be sufficient as they are from a completely different aviation era and based around pilots in aircraft

However, yes, they should be given the freedom to operate outside of the rules of the air in an emergency, current regulations allow for varying levels of disregard of rules based on the environment and emergency they are operating in, the same approach should be applied to drones.

The rules should though mandate consistency of behaviour by ALL autonomous/automated manufacturers so that other airspace users do not encounter unusual/unexpected type specific responses or behaviours from a highly automated or autonomous aircraft experiencing an emergency.

Consultation Question 5

We seek consultee views about what challenges remotely piloting an aircraft in an emergency scenario presents and how these might be addressed

Please share your views below

This question is too broad, engagement with drone operators and data from emergency scenario's should be used to answer the questions correctly and appropriately to ensure it's not subjective.

Consultation Question 6

We seek consultees' views on whether the rules of the air relating to communication should be adapted for remotely piloted and autonomous aircraft.

Please share your views below

Yes, technology advancements are as such that the current rules of the air relating to communication are not always appropriate or required, but this will depend upon the nature of the remotely piloted or autonomous aircraft and flight environment - technology such as rebroadcast capability via drone may be appropriate.

Interception of autonomous drones needs to be covered under illegal intent, rather than Rule of the air.

Consultation Question 7

We ask for consultees' views on how the rules of the air might be adapted or developed for remotely piloted or autonomous flight

Please share your views below

A new set of rules should be created which is fit for purpose. Adapting the current rules is unlikely to be sufficient as they are from a completely different aviation era and based around pilots in aircraft. Continuing to apply 'applicable requirements' does not provide clarity and consistency. The UAS industry requires an approach applicable to all and not one based on each operation with decisions made by the CAA.

That being said, in Class G airspace, operating VFR conditions - Other crewed airspace users may not be aware of whether an aircraft is piloted or autonomous, therefore consideration needs to be made to ensure basic rules of the air are clear and simple to follow.

Consideration should be given to ensure alignment with European regulation, to ensure safety at a wider industry level and to allow operators to apply a consistent approach to their UAS systems. Other considerations should include approaches such as: NASA-TM-20220013225.pdf

VTOLs

Consultation Question 8

We provisionally propose that a person overseeing a VTOL flying automatically, who monitors its course and is able to intervene and change its course at any time should continue to be classified as a "remote pilot". Do you agree?

Yes

Consultation Question 9

We provisionally propose 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. Do you agree?

No, whilst there is value in using existing regulations as a framework for future changes, we believe the UK Air Ops Regulations have been written for a form of aviation which is significantly different to drones. We don't think it is suitable for use as the basis to determine responsibilities. The support crew, operation of drones, delivery locations, variety of drones sizes and weights etc. is so different to commercial air transport that this approach is trying to use a regulation that is not fit for this purpose. The commercial air transport regulations apply a disproportionate level of requirements and should not automatically be applied to drone operations as the starting point with amendments then being made because to do so, assumes the CAT regulation is appropriate when we don't believe it is.

Consultation Question 10

We provisionally propose 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.

Do you agree? (Tick all that you agree with)

Please expand on your answer below

Believe these tasks can be delegated to others, for example a remote pilot may be located elsewhere from the VTOL/drone

Drones

Consultation Question 34

We provisionally propose that a remote pilot for drones should continue to be defined as “a natural person responsible for safely conducting the flight of an unmanned aircraft by operating its flight controls, either manually or, when the unmanned aircraft flies automatically, by monitoring its course and remaining able to intervene and change its course at any time”. Do you agree?

Yes

Please expand on your answer below

This seems like Common sense, and we should not seek to overcomplicate areas where a simple answer is sufficient.

Consultation Question 35

We seek views on whether some low risk autonomous drone operations or drone operations conducted beyond visual line of sight might be accommodated in the open category. In particular:

- (1) whether there are any such use cases which might be suitable for the open category; and
- (2) if so, what conditions should be attached to these use cases if operated in the open category.

Please share your views below

No. The Open Category is low risk operations which means they can be regulated with a 'light touch' with little to no oversight from the CAA. The complexity associated with the conduct of safe BVLOS flights is evidence of why they should remain in the Specific or Certified categories. In this case, autonomy is an irrelevant point because the safety risks of BVLOS extend way beyond only how the drone is controlled and the associated mitigations do require evaluation through a safety risk assessment.

Consultation Question 36

We provisionally propose that for autonomous operations in the specific category, a UAS 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 manned 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.

Do you agree? (tick all that you agree with)

Please expand on your answer below

Yes for points (1), (3) and (4).
No for point (2). This should be reviewed for future drone operations to consider why the operation is taking place. If life-saving medical supplies are on board, should the flight be discontinued if there is a risk to animals and the environment? Whilst considering how to amend regulation for the future, it feels limited to just consider the aircraft and not why it is being flown. We acknowledge a priority for emergency medical helicopters, why would drones be different. (Note - phrases like 'avoid any risk' is not an appropriate phrase, to suggest there is no risk means no one would fly at all)
No for point (5). This would be much more difficult for the UAS to comply with as many of these response efforts are not notified in any way. It is very difficult for remote pilots to do this now unless they are so close to the response situation that they can see it. In future, such responses may need to alert other air users to their presence, for example, by using aircraft that are always electronically conspicuous. Otherwise, this will be very difficult to achieve and it should apply to all aircraft, for example low flying general aviation, and not just drones.

Consultation Question 37

We seek views on what operational requirements should be applied to autonomous drone operations and drones that operate beyond visual line of sight in the specific and certified categories.

Please share your views below

This is an incredibly difficult question to answer as there are different and complex concepts included in one question. There is the Specific category where risks are identified and mitigated through a risk assessment process. The Certified category is where risk then requires certification to mitigate and finally autonomy is completely different again. The operational requirements when conducting operations in those categories are complicated. Then added onto that is how we consider the requirements of a regulation such as SERA and which of those would be considered 'applicable operational requirements'. We have done our best to answer but feel this question is far too broad and complex to adequately respond to.

One approach would be to remove reference to 'applicable operational requirements' by ensuring the regulatory framework has been reviewed and adapted for UAS and eVTOL aircraft. Rather than keeping regulations like SERA as they are and making them work by using that kind of phrase, they should be reviewed to ensure they are fit for purpose and also future-proofed as much as possible.

Certified categories should focus on robust safety systems, operational limitations, reliable communication, stringent data security and regulatory adherence. They should ensure there is flexibility in the regulations to allow future development and designs.

Existing regulations on design organisations, recognised standards and certification criteria should be maintained and remain applicable based on mass. New certification should, as has been noted in the questionnaire, be applied to items not currently subject to certification such as.

Consultation Question 38

We seek views on whether the current concept of a "remote pilot" is compatible with drone MSO. We also seek views on whether the remote pilots of drone MSO should continue to be subject to the same responsibilities as remote pilots for single drone operations.

Please share your views below

As previous, there should be allowance of delegation of some of the checks within the organisation.
The "pilot" role for MSO should be redefine.

Consultation Question 39

We seek views on whether there should be an upper limit to the number of drones for which an individual remote pilot is responsible.

Please share your views below

No. it should be for the drone operator to identify the risks and mitigate them. Any limitation may restrict the technology advancement in the future, much like ATC has developed to allow Air Traffic Controllers to manage more aircraft.

Consultation Question 40

We seek views as to what additional safeguards should be introduced for remote pilots responsible for multiple drones.

Please share your views below

We don't believe additional safeguards are necessarily needed and we think it's important not to be too prescriptive here as it risks stalling industry progress. There will also be a difference between flights in the Specific Category and those that might be conducted in the Certified Category when a licence will be awarded to the remote pilot. To keep our answer simpler, we have only focused on the Specific Category.

The fundamental areas used now for the Specific Category are a sufficient starting point and we believe provide the building blocks of the safeguards required. For example, training, competence, medical requirements etc. Any additional safeguards that are added should be proportionate to the operation and what a remote pilot is required to do within that.

The question around training and competence is more complicated to answer. If it's heavily regulated with mandated courses, the Government and CAA will not keep up with industry and will not provide requirements for that training quickly enough. However, if industry suggests training as part of their risk assessment, there is a subjective decision made by the CAA during the application process as to whether that is sufficient. That situation isn't ideal either. For training and competence to conduct operations involving multiple drones, we believe regulation and associated AMC and GM should provide more information about what the Government and CAA consider sufficient for those operations. It could be minimum training hours, exams, detailed competency tests and more guidance to those using simulators to train remote pilots. However, the CAA must be able to respond quickly enough to changes in industry to ensure they don't block innovation and progress with out of date requirements.

Consultation Question 41

We provisionally propose that use of flight data recorder systems or devices should be mandatory for autonomous drone operations. Do you agree?

No

Please expand on your answer below

No - whilst this would be beneficial and encouraged, it should follow the same as uncrewed aviation and be required based on the category of flights.

Consultation Question 42

Should the law permit a drone to transition between remotely piloted and autonomous flight during an operation?

Yes

Please expand on your answer below

Yes. When creating regulation for the drone industry, a critical part of that work must be to understand the operations you're trying to regulate. Allowing this level of flexibility will give the industry options when manufacturing systems and hardware and also when planning and conducting operations. Crewed aircraft have numerous automated systems and pilots in those aircraft take control when required. Whilst those systems may not be 'autonomous' in the way defined in this consultation, it does demonstrate that transfer of control between a human and a system already exists in aviation.

Consultation Question 43

We seek stakeholder views on any other issues with the current legal framework as it relates to operations involving autonomous drones.

Please share our views below

Although current regulations do include autonomous drones, they are essentially the framework for RPAS. When considering the difference between aircraft that are remotely piloted and autonomous aircraft, it is likely that regulations such as Assimilated Regulation (EU) 2019/947 will be easier to understand if it's separated and perhaps a new regulation written for autonomous drones.

The current regulations do broadly seem sufficient for RPAS but autonomy is likely to develop rapidly and the Government and CAA are just not able to move quickly enough to keep up. One approach could be to ensure regulations are flexible enough to enable the CAA to create AMC, GM or policy which is more efficiently updated. However, there must be enough oversight of the CAA to ensure safe

innovation and progress doesn't get blocked by entrenched, legacy thinking in the organisation which slows progress.

Civil liability and insurance

Consultation Question 44

We provisionally consider that the current law governing air carrier liability for injury or death of passengers in the UK is adequate for the introduction of remotely piloted and autonomous operations. Do you agree?

Other

Please expand on your answer below

Question has other dependencies. Autonomous will potentially mean the Operator has a liability for a product over which their level of influence and knowledge of its behaviours has been "restricted" by the design organisation. Needs more clarification of the liability boundary between Design Organization and Operator.

Consultation Question 45

We provisionally consider that the current law governing liability for damage to cargo in the UK is adequate for the introduction of remotely piloted and autonomous operations. Do you agree?

Other

Please expand on your answer below

See repeat of comments to Question 44. Additional factor though is that the Operator should be liable for loading as an example.

Consultation Question 46

We provisionally propose that liability for surface damage, in the case of UAS, should transfer to the lessee when the lease:

- (1) is for more than 14 days; and
- (2) specifies the aircraft is to be operated under the responsibility of the lessee.

Do you agree?

Other

Please expand on your answer below

Clearer definition of surface damage be needed to make a considered response.

Consultation Question 47

We provisionally propose 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. Do you agree?

Other

Please expand on your answer below

The term 'reasonable height' should be clarified but expanding the regulation further would undoubtedly result in an overwhelming number of complaints and legal action from people about drones. Who would they complain to? How would the body be funded to deal with all the complaints and legal action? There are regulations about noise and privacy, they should be evaluated to ensure they give people the protection they need. However, it would be disproportionate to go further and the range of legislation should not be increased unless other current regulation is deemed insufficient.

Consultation Question 48

We provisionally propose that there should be a review product liability law (including the Consumer Protection Act 1987) to take account of the challenges of emerging technologies. The review should cover product liability as a whole, rather than be confined to aviation or automated vehicles. Do you agree?

Yes

Consultation Question 49

We seek views as to whether the current law regarding liability for mid-air collisions is satisfactory in the case of collisions involving uncrewed aircraft systems.

Please share your views below

Would the current law cover liability for damage to a drone? A mid-air collision will not always be the fault of the remote pilot or autonomous system. A pilot in another aircraft could enter airspace without approval (something that commonly happens as evidenced by infringement statistics) which then results in a mid-air collision with a drone. The law must also be able to identify liability for damage in situations like that too.

Consultation Question 51

We provisionally propose that multiple simultaneous operations should be considered as the Government develops proposals for the insurance requirements applicable to uncrewed aircraft. Do you agree?

Other

Please expand on your answer below

Multiple simultaneous operations do not automatically increase the risk of an operation. In fact, human error continues to be a frequent reason for aviation accidents and incidents so replacing human decisions with a system does not necessarily increase risk. Perhaps insurance regulations could consider more factors than mass as mass does not always correlate to safety risk. Additional considerations could be type of operations, hours flown, location of operations etc. When approaching the requirements in that way, multiple simultaneous operations would be considered.

Criminal liability

Consultation Question 52

We provisionally consider that the current approach in the Air Navigation Order 2016 placing criminal liability on an operator is adequate for autonomous operations.

Do you agree?

Yes

Consultation Question 53

We provisionally consider that the “reasonable care” defence in article 265(3) of the Air Navigation Order 2016 applies adequately for “direct contraventions” under Article 265(5) to (8) involving autonomous operations. Do you agree?

Yes

Consultation Question 55

We provisionally propose that a remote pilot of an uncrewed aircraft operating in the certified category should be treated as a pilot-in-command for the purposes of criminal liability pursuant to article 265(1) of the Air Navigation Order 2016. Do you agree?

Yes

Consultation Question 56

We ask for consultees’ views on the criminal liability of pilots (or remote pilots) when an aircraft operating autonomously returns control to the pilot or vice-versa. In particular, should a pilot (or remote pilot) only become criminally liable for the piloting of the aircraft at the end of a transition period?

Please share your views below

Yes. A pilot should become criminally liable at the point they have control of the flight.

Consultation Question 57

We provisionally propose that the pilot-in-command of aircraft in a multiple simultaneous operation should be criminally liable for breach of operating requirements in the same way as a pilot in command of a single aircraft would be. Do you agree?

Yes

Consultation Question 60

We ask for consultees' views about whether the offence of hijacking in domestic law should be updated to:

1. include the unauthorised seizure or control of autonomous or remotely piloted aircraft by technological means or by persons not on board the aircraft; and
2. expand the period in which hijacking can occur from the period when an autonomous or remotely piloted aircraft is "in flight" to the period when it is "in service".

Please share your views below

1. yes
2. yes

ARPAS-UK

General Comments

If the Law Commission feels it useful, ARPAS-UK as the UK's drone trade association, could support this consultation in a paid capacity to develop any areas that may need further support.

Also although drafted by Aleks Kowalski, a Director of ARPAS-UK and with a slant to drones - the opinions included thereafter are my own but if a wider ranging ARPAS-UK view is beneficial we would be happy to discuss further, as referenced in the previous paragraph.

Consultation Question 1.

4.51 We seek views on how current airworthiness and certification regulation might need to be adapted or developed in light of highly automated and autonomous aircraft. In particular, should provisions be adopted which allow for:

- (1) the certification of optionally piloted and uncrewed or unoccupied versions of conventional aircraft (hybrid versions); and
- (2) the separate certification of command units?

ARPAS Response

The debate continues about the merits between man and machine. However, in an uncrewed scenario more reliance needs to be given on the technological characteristics of both hardware and software. Hence there needs to be as much deterministic verification and validation of aircraft and command units – which could be separate but need to be certified in scope.

Consultation Question 2.

4.72 We welcome views on what changes to the certification system might be necessary to enable higher automation and autonomy in aviation.

ARPAS Response

The question should be what is the highest level of autonomy that is desired within the system, as it could be that the existing levels of automation are sufficient to enable most future operations. So the question being asked is incorrect, why are higher automation levels being sought beyond what is currently being used in aviation which already has an enviable safety record.

Consultation Question 3.

4.86 We seek views on whether current regulatory tools to support the development of highly automated and autonomous aviation technologies are adequate.

ARPAS Response

The current regulatory tools are adequate, its that the regulator has developed a complete inability to accept risk as part of a mature ecosystem and is scarred by not understanding and learning in parallel. Early pioneers would develop alongside the regulator, whereas with a 24/7 news cycle perfection is being sought after that even other facets of the CAA accept is not achievable, hence TLS. (<https://verticalmag.com/opinions/understanding-aircraft-system-safety-assessments/>)

Consultation Question 4.

5.59 We seek views on how highly automated and autonomous aircraft should act in emergency scenarios. In particular:

- (1) should highly automated and autonomous aircraft be given the freedom to operate outside the rules of the air in emergency circumstances; or
- (2) should a comprehensive set of rules be developed for highly automated and autonomous aircraft in emergency situations.

ARPAS Response

By offering the freedom to operate outside the rules, the development of AI becomes challenging. It is also impossible for manned aviation to know the boundaries of what the aircraft will themselves do, whereas remaining within the rules of the air will permit airborne PICs to take action as necessary, knowing that the automated vehicles will continue to operate to a series of known boundaries.

A comprehensive set of rules could and should be developed, but, no solution should go outside of the Rules of the Air, noting that even Flight 1549 did not go outside of the Rules of the Air but used the rules developed from experience to make a judgement call.

Consultation Question 5.

5.63 We seek consultee views about what challenges remotely piloting an aircraft in an emergency scenario presents and how these might be addressed.

ARPAS Response

As discussed, developing RP situation awareness, needs a few factors that currently do not exist for a majority of existing RP, that of low-altitude aviation physical flying experience. Standing or sitting in a Ground Station is not the same as being in the sky, operating at 1000ft in a circuit or within Class G airspace. Thus, training and giving that experience is Part 1 as you understand what the airspace environment is like once an emergency happens.

Secondly the key aspects of FNC (fly, navigate, communicate) are likely to be a lot different when using fully automated solutions. Given a loss link could result in the lack of capability to fly or navigate, the communications protocol would be more important around the conspicuity information domain (which is not the same as EC) but of informing multiple stakeholders not just aviation users.

Consultation Question 6.

5.73 We seek consultees' views on whether the rules of the air relating to communication should be adapted for remotely piloted and autonomous aircraft.

ARPAS Response

The examples in the report illustrate the complexity of existing Rules of the Air, and if there are means to adapt the Rules they should be looked at, but not in a void of uncrewed aviation but almost designed by existing aviation such that it is backwards compatible.

Consultation Question 7.

5.95 We ask for consultees' views on how the rules of the air might be adapted or developed for remotely piloted or autonomous flight.

ARPAS Response

The issue with DFR is rightly suggested in 5.94 is that of coexistence, currently there is no explanation how in unusual circumstances the two sides communicate as the assumption remains Air-to-Air, so there is a possible means of starting with current rules of the air, and in constrained areas, developing certified platforms (so eliminating the airworthiness aspects) and iterating rules on current aviation, concentrating on edge cases where uninterruptable communications exist – particularly in Controlled Airspace, moving to Class F/G in due course.

Consultation Question 8.

6.62 We provisionally propose that a person overseeing a VTOL flying automatically, who monitors its course and is able to intervene and change its course at any time should continue to be classified as a “remote pilot”.

Do you agree?

ARPAS Response

No. The responsibilities of a pilot are a lot greater as indicated by the whole of Section 6. Therefore, the term needs to have a different implication of the wider areas of coverage not just the legal definition, the suggestion of remote flight supervisor is accurate and thus the concept of a remote pilot would not exist. Such that the concept of a pilot is one which has on-board interaction. We propose a remote flight simply concentrates on the flying aspect and not the wider ancillary functions.

Consultation Question 9.

6.66 We provisionally propose 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.

Do you agree?

ARPAS Response

No. They are very different as explained in 6.25-6.42, therefore a remote pilot/flight supervisor fulfils duties that do not come with the responsibilities taken on board by someone with the legal qualifications (ATPL) and experience gained to date. So it's a very odd approach by the Law Commission to parallel that expertise with that of a A320 large scale commercial operation.

Consultation Question 10.

6.73 We provisionally propose 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.

Do you agree?

ARPAS Response

No. This is the challenge by reference to a remote pilot instead of flight supervisor. The RP may be in a control room separated by 100s of miles and cannot guarantee for instance all baggage has been loaded properly whereas if there is any doubt in crewed operations the option exists for the PIC to check and verify any of that information themselves, nearly impossible to do remotely. Hence the duties of an RP should be restricted to a purely flying function.

Consultation Question 11.

6.74 We seek views as to whether there are additional operational responsibilities that a remote VTOL pilot should be required to fulfil.

ARPAS Response

No. Infact the responsibilities need to dial down away to only focus on the operation of the flight and not the ancillary work. For instance in a one to many scenario, there may be a large degree of context switching involved so a focus on the operational matters is crucial than concerning oneself in area such as passenger boarding that being remote makes it impossible to fulfil effectively.

Consultation Question 12.

6.83 We provisionally propose that the remote pilot-in-command should be responsible for, amongst other things, ensuring passengers are:

1. given a safety briefing; and
2. seated and wear seat belts during take-off and landing.

ARPAS Response

No. Cabin crew have a far better knowledge of SEP than a pilot, notwithstanding the small business jet operation where even so a cabin crew can often be found and present similarly for disruptive passenger and de-escalation techniques whereas the pilots have to be mission focussed hence Hijack protocols etc. So the operator should have this done by qualified ground crew prior to departure and similarly for landing, otherwise if the RPIC is giving the instruction and verifying compliance, especially within challenging landing circumstances, the operator should remote link in to verify this and simply indicate (akin to Airbus Landing Memo) that the action is complete.

Consultation Question 13.

6.84 We provisionally propose that air operators (rather than the remote pilot-in-command) should be responsible for preventing passengers from boarding:

1. who appear drunk or under the influence of drugs; or
2. whose carriage would, in the view of the operator's employees, endanger the safety of the aircraft or other passengers.

ARPAS Response

Yes, as per 6.83 an argument would be (akin to ground staff who sometimes move the problem to the cabin crew) is that the air operators perform breathalyser testing on passengers prior to boarding. As drunken behaviour with no persons on board is something that needs to be proactively addressed not at the in-flight resolution situation. Consider fear of flying and or other issues.

Consultation Question 14.

6.85 We provisionally propose that the remote pilot-in-command 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.

Consultation Question 15.

6.86 We provisionally propose that a person on board a VTOL aircraft (other than a crew member) should be able to take reasonable measures to protect the safety of the aircraft or of persons or property on board.

ARPAS Response to 14,15

Yes, but this needs to be made clear as part of any briefing prior to departure, else the fear of liability may inhibit any passengers intervening whilst onboard the aircraft. Stating cameras are monitoring actions, could (a) breach privacy laws, but also (b) be covered up by bad actors very quickly so this is a non-starter as well.

Consultation Question 16.

6.87 We seek views on whether the powers of crew on board a VTOL aircraft should be broadened to reflect those of the pilot-in-command under the Civil Aviation Act 1982 to:

1. take reasonable measures to protect the safety of the aircraft or persons or property on board;
2. maintain good order and discipline; or
3. enable the crew to disembark or deliver a person.

ARPAS Response

Yes, as long as it does not relate to any flight control systems or piloting requirements but simply from a disciplinary perspective. What is not clear is whether there would be any functions as exist in commercial aircraft, for instance restraint kits due to their possible misuse by passengers in a small 1v2 scenario

Consultation Question 17.

6.88 We provisionally propose that passengers should be able to contact a member of crew at all times during an operation.

ARPAS Response

The issue is what does contact mean, an ACARS style text based system, or video/phone link. Given there are areas with patchy cell comms, even at low altitude, there is a risk of creating panic if crew members cannot be contacted at all times. So there needs to be a means of stating that if comms cannot happen, that is to be expected i.e. managing expectations

Consultation Question 18.

6.91 We provisionally propose 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.

ARPAS Response

Yes

Consultation Question 19.

6.92 We provisionally propose that it should be a criminal offence for a person to act as the remote pilot of a VTOL when the level of alcohol in their blood, breath or urine is over a prescribed limit.

ARPAS Response

Yes

Consultation Question 20.

6.95 We provisionally propose that the remote pilot should be subject to the reporting obligations currently applicable to pilots under the Air Operations Regulation.

ARPAS Response

Yes

Consultation Question 21.

6.96 We provisionally propose that a remotely piloted VTOL should be required to be capable of detecting and recording information relating to accidents and near accidents for the purposes of reporting it.

ARPAS Response

Yes

Consultation Question 22.

6.99 We provisionally propose that licences should be required for remote VTOL pilots. So far as appropriate, these should follow the classes and ratings adopted for crewed VTOLs.
Do you agree?

ARPAS Response

Yes

Consultation Question 23.

6.108 We provisionally propose that operators of remotely piloted VTOLs should be certified.
Do you agree?

ARPAS Response

Yes

Consultation Question 24.

6.109 We provisionally propose that operators of remotely piloted VTOLs should continue to be required to:

- (1) have the means necessary for the scale and scope of operations planned;
- (2) use only suitably qualified and trained personnel;
- (3) implement a management system to ensure safety;
- (4) ensure operations only take place in accordance with the operations manual;
- (5) establish procedures to minimise the consequences to safe flight operations of disruptive passenger behaviour;
- (6) develop and maintain security programmes suitable for the aircraft and type of operation;

- (7) have a management system to prevent fatigue;
 - (8) ensure the continuing airworthiness of the aircraft; and
 - (9) establish procedures for any reasonably foreseeable emergency situation.
- Do you agree?

ARPAS Response

Yes

Consultation Question 25.

6.110 We seek views as to whether there are additional responsibilities that operators of remotely piloted VTOLs should need to fulfil.

ARPAS Response

Akin to the drone industry, the operator must also ensure some technical responsibilities outside of the platform itself, such as developing a multiple communication methodology with the aircraft - which may not necessarily be part of the airworthiness criteria.

They should also promote the highest standards being taken of aviation safety and transparently demonstrate a just culture. Reason being as a new industry, one needs to be whiter than white and avoid any sort of impropriety or accusations of burying any sort of bad news.

Consultation Question 26.

6.118 We seek views as to whether the law should permit remote pilots to act as pilot-in command for more than one VTOL at the same time.

ARPAS Response

Yes MSO should be permitted, but with strict constraints as alluded to in 6.117 for instance and also prior to this, developing 1-2-1 expertise to ensure a correct sizing of PIC down the line, this needs to be worst case scenarios and ensuring personnel planning can deal with these emergencies.

Consultation Question 27.

6.119 We seek views on whether there should be an upper limit to the number of VTOLs for which a remote pilot can act as pilot-in-command at the same time.

ARPAS Response

Yes - This can be changed as experience develops but until scaffolded solutions have been developed, and confidence in the all-weather aspects of eVTOLS, then there should be planned to have as a minimum - 1 pilot per 3 aircraft. This is a balance between emergency actions in a phase of flight, but also showcasing resilience across the operation.

Consultation Question 28.

6.120 We seek views as to what additional safeguards should be introduced for remote pilots piloting multiple VTOLs.

ARPAS Response

Additional MSO training, the Airservices Australia EVE Air Mobility Study showcased the challenge of even 1-2 eVTOL heavily increasing workload. So appropriate EBT dealing with

the 9 core pilot competencies will have to be considerably done. In addition, new metrics such as handover time, how to effectively brief a handover, RP incapacitation will need specific actions. It's worth considering some of the Horizon FP7 projects such as ACROSS, which developed mechanisms for doing this.

Consultation Question 29.

6.135 We seek views as to whether there should be a role for a person supervising the flight of an autonomous passenger-carrying VTOL and acting as a point of contact in relation to it. What powers or responsibilities should such a person have?

ARPAS Response

The fact the Law Commission has struggled to articulate this effectively within the brief showcases that this is a thorny issue and that should be parked in the face of many other challenges. The only comment to say is the qualification of any supervisor may need to be similar to that of an existing pilot (or more so that person should have been a pilot) in order to be able to communicate with effectiveness remotely as they have been there before and done it and experienced what a passenger might feel (Fear of Flying courses, that sort of thing).

Consultation Question 30.

6.140 Should the law permit an uncrewed VTOL to transition between remotely piloted and autonomous flight during an operation?

ARPAS Response

No, either the aircraft is or is not able to be taken over by an RP, otherwise it's not autonomous by definition. The only situation one could envisage this happening would be an unrecognised system state where the AI system has the self-awareness to act like a human and says "I don't know" and can automatically hand back to a human who might be able to deduce something that the AI cannot work out for itself, e.g. QF32 the A380, Hudson etc. But not in an elective manner.

Consultation Question 31.

6.160 We seek views as to whether initial airworthiness standards for uncrewed VTOLs should include accessibility standards for persons with disabilities and reduced mobility.

ARPAS Response

The crucial part is in the initial, as the goal would be to develop access to all, but if that is at the cost of the eVTOL even making it to market and the fiscal viability - what is the balance between potentially competing interests.

Consultation Question 32.

6.161 We seek views as to whether the CAA should be able to include accessibility standards within the licences granted to uncrewed VTOL operators.

ARPAS Response

Reference previous answer.

Consultation Question 33.

6.163 We seek consultees' views on any other issues with the current legal framework as it relates to operations involving remotely piloted and autonomous VTOLs.

ARPAS Response

Electronic systems liability, a favourite of autonomous systems and in an edge case situation, without a pilot on board and an incident occurs, will the systems be able to provide sufficient evidence to determine where fault lied, with the systems designer, the operator and/or occupants onboard.

There could also be situations where passengers are put into a position where they were not expecting to be part of an autonomous situation (e.g. swap of a flight from piloted to autonomous eVTOL in a rural area but had a requirement to be on that due a medical emergency. The simple answer is they could refuse the flight, but, circumstances dictate a necessity of travel. How does the law deal with that.

Consultation Question 34.

7.14 We provisionally propose that a remote pilot for drones should continue to be defined as “a natural person responsible for safely conducting the flight of an unmanned aircraft by operating its flight controls, either manually or, when the unmanned aircraft flies automatically, by monitoring its course and remaining able to intervene and change its course at any time”.

Do you agree?

ARPAS Response

Yes, this is a sensible definition

Consultation Question 35.

7.20 We seek views on whether some low risk autonomous drone operations or drone operations conducted beyond visual line of sight might be accommodated in the open category. In particular:

- (1) whether there are any such use cases which might be suitable for the open category; and
- (2) if so, what conditions should be attached to these use cases if operated in the open category.

ARPAS Response

No for BVLOS - the fact the operator will be interacting with other potentially larger scale crewed aircraft demands a degree of airmanship that an autonomous system operated by a natural person with a lack of aviation training and education should not be combined.

In terms of VLOS autonomous systems, this could be feasible but training, checking and education would have to be competently given so that there is an understanding of liability - the current Open requirements are insufficient for this.

Consultation Question 36.

7.28 We provisionally propose that for autonomous operations in the specific category, a UAS 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.
Do you agree?

ARPAS Response

No. The Operator needs to remain the arbiter of determining risk as the AI system may not have the capability to determine situations where the complexity overwhelms the system, the Trolley problem for instance.

Consultation Question 37.

7.41 We seek views on what operational requirements should be applied to autonomous drone operations and drones that operate beyond visual line of sight in the specific and certified categories.

ARPAS Response

There are a few ways to address this challenge. Firstly a legal framework around Target Levels of Safety and Risk Ratios that the regulator is unwilling to stake liability on which means it cannot be transferred to clarity on any autonomous system design.

Secondly NASA as alluded to has developed a concept of Digital Flight Rules (DFR), however the regulatory arm remains in the CAA. Noting that in recent times the MAA was formed to deal with issues emanating outside of CAA purview and expertise, the query could be whether a dedicated regulatory body (Uncrewed Aviation Authority - UAA) would be better established to develop a highly detailed knowledge and understanding of said autonomous systems for implementation alongside DFR.

There is also a discussion started about what the rules of the air should be for autonomous systems, and relevant to (1) whether there is a concept of risk-budgeting to determine an overall risk and thus dynamic risk adjustments in-flight for concepts such as right-of-way (uncrewed medical) vs light recreational aircraft - assuming both have Conspicuity (which may not be EC) where does primacy exist in such a scenario.

Consultation Question 38.

7.52 We seek views on whether the current concept of a “remote pilot” is compatible with drone MSO. We also seek views on whether the remote pilots of drone MSO should continue to be subject to the same responsibilities as remote pilots for single drone operations.

ARPAS Response

The concept of a remote pilot can remain the same for MSO, if the responsibilities are clear. Note also the term “aircraft” could refer to a swarm and thus the overall performance is what is key, as alluded to in 7.50. If this is legally incompatible there could be a concept known as a remote MSO coordinator, such that it is clear there is one role which has legal accountability for all drones in an MSO.

Consultation Question 39.

7.53 We seek views on whether there should be an upper limit to the number of drones for which an individual remote pilot is responsible.

Consultation Question 40.

7.54 We seek views as to what additional safeguards should be introduced for remote pilots responsible for multiple drones.

ARPAS Response

Unlike an eVTOL with passenger carrying aircraft, the notion of drones performing tasks autonomously (albeit not with AGI, but simple capabilities) for Atypical Air Environments is close at hand. The upper boundary for this would ultimately be determined by case law in the event of an incident, however the key aspect is defensible liability so can an operator claim in the event of any MSO incident that the remote MSO coordinator was in control of all other systems.

It's interesting to note that some global operators with an MSO of 1:20 have simplified the requirements akin to V1 on an aircraft with a simple continue the mission or abort using a parachute - to keep MSO operations for a single operator black and white. There may be empirical examples that can be taken from eg Human Factors in Pilot Monitoring and subtle differences in values that inhibit the actual time spent on a single monitoring of a single aircraft, and in addition a handover to a further pilot

Therefore the handover akin to eVTOLs should be considered here, arousal/fatigue, active monitoring capacity - very much human elements to allow for effective MSO operation at scale.

Consultation Question 41.

7.58 We provisionally propose that use of flight data recorder systems or devices should be mandatory for autonomous drone operations.
Do you agree?

ARPAS Response

Yes, but furthermore the reporting culture needs to improve for all operations, as earlier failure modes e.g. ESCs would be signified by trends if transparently reported. Therefore beyond 7.58, any flight data recorder system should be mandatory for any BVLOS (even semi-automated operation and its subsequent) operation with a view to developing a proactive reporting culture to ECCAIRS, MORs to the CAA, and CHIRP to understand human factors influences.

Consultation Question 42.

7.60 Should the law permit a drone to transition between remotely piloted and autonomous flight during an operation?

ARPAS Response

We have the same response to that for eVTOL. No, either the aircraft is or is not able to be taken over by an RP, otherwise it's not autonomous by definition. The only situation one could envisage this happening would be an unrecognised system state where the AI system has the self-awareness to act like a human and says "I don't know" and can automatically hand back to a human who might be able to deduce something that the AI cannot work out for itself, e.g. QF32 the A380, Hudson etc. But not in an elective manner.

Consultation Question 43.

7.62 We seek stakeholder views on any other issues with the current legal framework as it relates to operations involving autonomous drones.

ARPAS Response

The legal burden will come in a court of law as the limitation of understanding of an inherent autonomous system could concern drone operators. So education and training standards need to be made legally clear about what that will involved in terms of expected outcomes.

Autonomous drones can purvey into other jurisdictions, not just aviation. Consider medical, security to name core ones. This requires a comprehensive cross-departmental government approach to understanding how does an autonomous system determine prioritisation between different stakeholder demands from a regulatory position. For instance the CAA have a ruleset, but the Police need to extend past that for the safety of life of a person on the ground. How does that get codified within an autonomous system and how does the operator accept/take on the responsibility if the coding was done by the manufacturer, or secondly by themselves.

If coding is implemented at a later date, using concepts such as EuroCAE WG-127, for assured systems - are both sets of AI compatible with each other or written to different standards/frameworks. The legal framework here needs substantive development as unlike commercial aviation the use of drones needs to include these aspects.

Consultation Question 44.

8.20 We provisionally consider that the current law governing air carrier liability for injury or death of passengers in the UK is adequate for the introduction of remotely piloted and autonomous operations.

Do you agree?

ARPAS Response

Yes

Consultation Question 45.

8.27 We provisionally consider that the current law governing liability for damage to cargo in the UK is adequate for the introduction of remotely piloted and autonomous operations.

Do you agree?

ARPAS Response

Yes

Consultation Question 46.

8.44 We provisionally propose that liability for surface damage, in the case of UAS, should transfer to the lessee when the lease:

- (1) is for more than 14 days; and
- (2) specifies the aircraft is to be operated under the responsibility of the lessee.

Do you agree?

ARPAS Response

Yes. But for concepts such as Drone in a Box operated by multiple parties from a single point - there could be multiple long-term lessees who could be liable, or the manufacturer/operator is tasked depending on the lessee experience on an individual flight basis, which does complicate the matter somewhat.

Consultation Question 47.

8.62 We provisionally propose 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.

Do you agree?

ARPAS Response

No. When operating to commercially film someones rooftop, it is impractical to not film an adjoining land, even when not intentional. Section 76 could be modified but not as to restrict the use of drones overflying a person potentially below rooftop level (e.g. landing) and therefore we are concerned about the concept of intrusion, and suggest the Law Commission return with a further definition such that a more detailed review can be carried out.

It's also worth pointing out the Law Commission has incorrectly attributed research on drone noise (8.56) with eVTOL aircraft noise to which the studies (references 549, 550 refer) and therefore the reasonable height argument is inappropriate to state here, a VX4 is nothing a like a small drone. It would be better to refer to Manna or Zipline with their own assessments of noise - hence the opinion offered in 8.56 is incorrect. Similarly 8.57 which does not have counter arguments mentioned from flight trials and studies in the USA.

Consultation Question 48.

8.89 We provisionally propose that there should be a review of product liability law (including the Consumer Protection Act 1987) to take account of the challenges of emerging technologies. The review should cover product liability as a whole, rather than be confined to aviation or automated vehicles.

Do you agree?

ARPAS Response

Yes

Consultation Question 49.

8.97 We seek views as to whether the current law regarding liability for mid-air collisions is satisfactory in the case of collisions involving uncrewed aircraft systems.

ARPAS Response

Until such times as the AI behaviour (if ever possible) can be explainable to an independent 3rd party the issue of an uncrewed air system is determining whether the DAA system worked or not, as if it did not work correctly - then can 8.96 work, especially if the collision was not the fault of the Air Carrier (i.e. the DAA system didn't even detect a sUAS). Therefore we're not convinced the current law is fit for purpose.

Consultation Question 50.

8.113 We seek consultees' views on whether they expect any difficulties applying existing insurance requirements to uncrewed aircraft systems.

ARPAS Response

As long as any Government continues with the pledge to increase the insurance oversight for all drones <20kg, then we have no further comment.

Consultation Question 51.

8.114 We provisionally propose that multiple simultaneous operations should be considered as the Government develops proposals for the insurance requirements applicable to uncrewed aircraft.

Do you agree?

ARPAS Response

Yes

Consultation Question 52.

9.39 We provisionally consider that the current approach in the Air Navigation Order 2016 placing criminal liability on an operator is adequate for autonomous operations.

Do you agree?

ARPAS Response

No. The area which would need further clarity would be on the use of autonomous operations, where the system is tasked as part of a pre-set of rules that are tasked by operators who may wish to enact dynamic flight operations, outside of the ANO. Consider a Police Force who need to take a risk in a live crime situation and use a drone. Unless the AI has been tasked to go outside the ANO, then the mission is not doable. But given its AI, how does the drone know whether it can do that itself.

Consultation Question 53.

9.45 We provisionally consider that the “reasonable care” defence in article 265(3) of the Air Navigation Order 2016 applies adequately for “direct contraventions” under Article 265(5) to (8) involving autonomous operations. Do you agree?

ARPAS Response

Yes

Consultation Question 54.

9.46 We seek views on whether for autonomous operations the reasonable care defence should be applicable to the vicarious liability created in article 265(1) of the ANO.

ARPAS Response

Yes

Consultation Question 55.

9.61 We provisionally propose that a remote pilot of an uncrewed aircraft operating in the certified category should be treated as a pilot-in-command for the purposes of criminal liability pursuant to article 265(1) of the Air Navigation Order 2016. Do you agree?

ARPAS Response

Yes - If they are actively piloting the aircraft.

Consultation Question 56.

9.62 We ask for consultees’ views on the criminal liability of pilots (or remote pilots) when an aircraft operating autonomously returns control to the pilot or vice-versa. In particular, should a pilot (or remote pilot) only become criminally liable for the

piloting of the aircraft at the end of a transition period?

ARPAS Response

As per Consultation Question 42 - either the aircraft is or is not able to be taken over by an RP, otherwise it's not autonomous by definition. Hence this is not a question that makes logical sense and is not achievable, nor desirable.

Consultation Question 57.

9.63 We provisionally propose that the pilot-in-command of aircraft in a multiple simultaneous operation should be criminally liable for breach of operating requirements in the same way as a pilot-in-command of a single aircraft would be. Do you agree?

ARPAS Response

Yes - as long as the aircraft remains under the control of the pilot and not under autonomous control, as in, they can intervene within the flight at any point to perform an action.

Consultation Question 58.

9.69 We invite consultees' views on whether the Air Traffic Management and Unmanned Aircraft Act 2021 operates satisfactorily in the case of highly automated and autonomous flight.

ARPAS Response

The area which could be problematic is in 9.65(1) where the aircraft, given it is not under the control of the pilot, cannot be grounded or brought under direct control. In such circumstances it is not clear what/how are the powers able to be applied.

Consultation Question 59.

9.85 We invite views on how operator responsibilities for dangerous goods might need to be adapted in the case of autonomous operations.

ARPAS Response

An individual would be responsible for Dangerous Goods (pilot, dispatcher, supervisor) prior to take off or after landing. However, unless there is any means to deal with DG in flight which would be capable during autonomous operations - independent of the flight operation e.g. deploying a Fire Extinguisher then the responsibility cannot lie with a pilot-in-command.

Consultation Question 60.

9.107 We ask for consultees' views about whether the offence of hijacking in domestic law should be updated to:

- (1) include the unauthorised seizure or control of autonomous or remotely piloted aircraft by technological means or by persons not on board the aircraft; and
- (2) expand the period in which hijacking can occur from the period when an autonomous or remotely piloted aircraft is "in flight" to the period when it is "in service".

ARPAS Response

For Part (1) yes but for Part (2) no and it should remain "in flight". The duration before and/or after the operation of 24hrs based on the Beijing Protocol is too long based on multiple flights and storage to consider this to be hijacking. An alternative suggestion would

be to consider the concept of data breaches based on some form of cyber-security threat - which although not amounting to hijack does result in the future potential to exercise control.

Consultation Question 61.

9.109 We also ask consultees for views on whether any offences against the aircraft other than hijacking need to be updated to account for increased autonomy in aviation.

ARPAS Response

Yes - See response to Consultation Question 60 above. In addition there is the possibility of additional physical damage to a small pilotless eVTOL that isn't designed to cause hijack but is something unlikely to impair the flight controls of a larger aircraft. What might need to be considered is whether there is something about what is defined as an aircraft and the offences involved as in, should a DJI Mini 2 carry the same offence as a VoloCity versus a VX4 - and how that is categorised.

Consultation Question 62.

10.15 We invite consultees to tell us if they have views on, or have experience or data to indicate, the likely costs and benefits of our provisional proposals in relation to VTOLs.

ARPAS Response

This is not an area in which we have expertise and so are unable to comment further

Consultation Question 63.

10.16 We invite consultees to tell us if they have views on, or have experience or data to indicate, the likely costs and benefits of our provisional proposals in relation to drones.

ARPAS Response

ARPAS have produced a number of quantified use cases which goes into more specific detail alongside the PwC Skies without limits v2 study and these can be supplied on request. <https://www.arpas.uk/drones-in-action-report-january-2024/>

Consultation Question 64.

10.19 We invite consultees to tell us if they believe or have evidence or data to suggest that any of our provisional proposals could result in advantages or disadvantages to certain groups or based on particular characteristics (with particular attention to age, disability, transgender identity, marriage and civil partnership, pregnancy and maternity, race, religion or belief, sex or gender, and sexual orientation).

ARPAS Response

No

RESPONSE TO LAW COMMISSION CONSULTATION ON AVIATION AUTONOMY

(Law Commission Consultation Paper 261)

Please note that this consultation response has been reproduced from information entered on the Citizen Space online portal.

Any personal email addresses and phone numbers have been excluded from this document.

Unanswered questions have been deleted from this document.

About you

What is the name of your organisation?

The Association for Uncrewed Vehicle Systems International (AUVSI)

Airworthiness and certification

Consultation Question 1

We seek views on how current airworthiness and certification regulation might need to be adapted or developed in light of highly automated and autonomous aircraft. In particular, should provisions be adopted which allow for:

1. the certification of optionally piloted and uncrewed or unoccupied versions of conventional aircraft (hybrid versions); and
2. the separate certification of command units?

Please share your views below

Yes, provisions for certification of unoccupied and uncrewed aircraft, including retrofits of existing certified manned aircraft, should be adopted. The approach to approving command units (also known as command monitoring units, CMUs, and ground control stations, GCSs) should be tailored to the role that said unit and the person utilizing them plays in the overall operation of the aircraft system. We support the approach presented in EASA Opinion 03/2023 which acknowledges that varying extents of on-aircraft autonomy require differing approaches to the approval of CMUs and tailors the extent of and mechanism for oversight of the CMU appropriately.

Consultation Question 2

We welcome views on what changes to the certification system might be necessary to enable higher automation and autonomy in aviation.

Please share your views below

The safety intent of existing airworthiness requirements are applicable and sufficient from a regulatory basis perspective. The use of "autonomy" or even artificial intelligence and machine learning (AI/ML) should not result in an assumption that existing certification systems or tools are not appropriate for a given application. The approach to certification should be performance-based and allow means of compliance to be leveraged for systems and aircraft that employ automation and autonomy.

Consultation Question 3

We seek views on whether current regulatory tools to support the development of highly automated and autonomous aviation technologies are adequate.

Please share your views below

To promote continued growth and efficiently, scalable and tailored regulation, including as it pertains to autonomous and uncrewed aircraft, are needed. Specifically, tools to support the certification of AI/ML within the existing regulatory landscape, such as means of compliance and accepted verification and validation techniques, must be developed and accepted. However there is no need to fundamentally change the regulatory landscape or core processes to accommodate highly automated and autonomous aviation technologies.

Rules of the air

Consultation Question 4

We seek views on how highly automated and autonomous aircraft should act in emergency scenarios. In particular:

1. should highly automated and autonomous aircraft be given the freedom to operate outside the rules of the air in emergency circumstances; or
2. should a comprehensive set of rules be developed for highly automated and autonomous aircraft in emergency situations.

Please share your views below

The same principles for handling an emergency should remain. If an aircraft system has the capability to mitigate an off-nominal or emergency situation, it should be allowed to do so, particularly in the event of a pre-approved flight plan with contingencies or pre-programmed failure response management. If an aircraft does not have the capability to automatically mitigate a given set of situations then operational limitations should be able to be imposed to allow the safe operation of that aircraft by avoiding said situations (e.g., by staying out of airspace types or traffic densities). Any requirement for automated emergency handling should not be universally applied without the opportunity for hazard analyses to show whether or

not it is necessary.

Both manned and autonomous system designers may benefit from the expansion and clarification of priorities for emergency response. For example, 1st regaining or maintaining control of the aircraft, 2nd protecting human life, and 3rd avoiding damage to real property. Even with (especially with?) autonomous systems, multiple individuals are involved in deciding (often in advance) what the system response will be, from software engineers to dispatchers to those approving a given flight plan. Having a clear set of priorities would align these decisions; stating what is an acceptable approach with which to approach anticipatory emergency planning would be beneficial.

Consultation Question 5

We seek consultee views about what challenges remotely piloting an aircraft in an emergency scenario presents and how these might be addressed

Please share your views below

The necessity for quick response to an emergency situation may be exacerbated by the need for an uncrewed aircraft to have to communicate with a remote pilot. Situational awareness of the remote pilot may not be complete due to their remote location and the nature of the emergency. It is also possible that an emergency situation occurs when the UA is out of communication with the control unit (aka "lost link") and as such human intervention is not only time consuming but not possible. As such, particularly for larger UA, all expected emergency scenarios should be able to be addressed at a minimally acceptable level by systems on board the aircraft. The emergency procedures included in the pilot operating handbook (POH), where such a document exists, would ideally be covered in this way. If a flight plan is required, contingency landing locations should also be included therein; other off-nominal flight termination procedures may be used in lieu of this as appropriate. These can be validated by the pilot prior to takeoff as appropriate and should include the ability for the aircraft to declare an emergency.

For applications where it is acceptable from a risk management perspective for the remote pilot to actively respond to an emergency situation, they should be provided with situational awareness that is equivalent to what a pilot would see from the cockpit of an aircraft (e.g., NOT a full 360deg) and the ability to declare an emergency.

Consultation Question 6

We seek consultees' views on whether the rules of the air relating to communication should be adapted for remotely piloted and autonomous aircraft.

Please share your views below

For many remotely piloted and remotely monitored operations the existing rules for the need for two way communication and for procedures to follow in the event of the loss of communications are sufficient. However, given that this framework presupposes that there will be a pilot on board who can communicate via voice, it is not ideal for highly automated uncrewed aircraft systems. Allowing digital communications and ground-to-ground communication would facilitate communications between the remote pilot and air traffic management and increase the robustness of the communications system more generally.

Establishing electronic conspicuity in UK airspace will be a vital cornerstone of this undertaking, as it will increase situational awareness and cooperation of airspace users in the surrounding airspace.

The CAA has already done important work on electronic conspicuity, and we would encourage regulators and lawmakers to prioritise policy development that does not prescribe technology-specific solutions (such as mandating ADS-B Out for UAS, which is cost-prohibitive and impractical to implement on all aircraft but allows for ease of access).

Consultation Question 7

We ask for consultees' views on how the rules of the air might be adapted or developed for remotely piloted or autonomous flight

Please share your views below

Generally, the existing rule structure works for all types of operations. If adaptations are to be done to support remotely piloted and autonomous flight they should focus on the ability to utilize technological alternatives to human senses and other capabilities, such as detect and avoid, and the requirements therefor.

Interoperability and cooperative conspicuousness for all airspace users would increase safety and efficiency of the airspace.

As traffic density increases in a given volume of airspace, communications requirements for entering and using that airspace should also increase (e.g., establishing two-way communications) and the expansion of other 'traffic control' techniques (e.g., cruising altitude requirements) may be necessary. Any adjustment to operational procedures, such as for right of way, should however retain the concept of maneuverability as a determining factor. However, given the rapid and accelerating pace of technology development, we recommend that the CAA maintain a flexible and performance-based approach to any new requirements that lends itself to international harmonization.

VTOLs

Consultation Question 8

We provisionally propose that a person overseeing a VTOL flying automatically, who monitors its course and is able to intervene and change its course at any time should continue to be classified as a “remote pilot”. Do you agree?

Yes

Please expand on your answer below

Yes, as the core duties of the pilot in command are decision making and oversight, not the direct manipulation of controls or performance of other delegatable tasks, the person described would still qualify as the a pilot in command of the aircraft. Neither the location of the individual nor their lack of direct control manipulation changes their role of "pilot." Increasing extents of autonomy may however result in an increased reliance on other certification mechanisms to ensure broader operational suitability of the aircraft for the mission and appropriate qualifications for all personnel to whom traditional pilot functions are delegated (e.g., preflight inspection, passenger safety briefings). This may lead to a future construct in which the duties of "pilot in command" are assigned to and officially distributed throughout an operating organization, but this is a long term possibility not a near term need.

Consultation Question 10

We provisionally propose 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.

Do you agree? (Tick all that you agree with)

Please expand on your answer below

Yes, however to be clear, in practice the pilot in command of a remotely operated aircraft will need to extensively delegate many of these tasks to other members of the air carrier organization. This is an expansion of current operational best practices and the typical extent of delegation seen today.

Consultation Question 11

We invite views as to whether there are additional operational responsibilities that a remote VTOL pilot should be required to fulfil.

Please share your views below

No additional responsibilities have been identified at this time. Utilization of the Operator's training program and manuals can ensure that any additional, aircraft- or operation- specific responsibilities are identified and appropriately fulfilled without regulatory expansion.

Consultation Question 12

We provisionally propose that the remote pilot-in-command should be responsible for, amongst other things, ensuring passengers are:

1. given a safety briefing; and
2. seated and wear seat belts during take-off and landing

Do you agree?

Yes

Please expand on your answer below

Yes, provided that the remote PIC can continue to utilize delegation to ground crew or hospitality personnel and tools such as recordings and sensors to ensure these tasks are fulfilled.

Consultation Question 13

We provisionally propose that air operators (rather than the remote pilot-in-command) should be responsible for preventing passengers from boarding:

1. who appear drunk or under the influence of drugs; or
2. whose carriage would, in the view of the operator's employees, endanger the safety of the aircraft or other passengers.

Do you agree?

Other

Please expand on your answer below

If this is to be retained as PIC responsibility, it will have to be heavily delegated to ground personnel, but this would be acceptable within the existing regulatory construct. Officially assigning this responsibility to the operating organization more

clearly recognizes that extent of delegation and may be a step towards a more scalable future in which organizational responsibility is expanded to more elegantly represent the needs of highly autonomous operations.

Consultation Question 14

We provisionally propose that the remote pilot-in-command should have the power to take reasonable measures, including restraint of passengers, as set out in section 94 of the Civil Aviation Act 1982. Do you agree?

Yes

Please expand on your answer below

Yes, just as a PIC can order this to be done from a secured cockpit, a remote PIC would have this authority. There are however practical challenges associated with occupied uncrewed flights in this area that will need to be addressed to an appropriate level of efficacy and risk mitigation.

Consultation Question 15

We provisionally propose that a person on board a VTOL aircraft (other than a crew member) should be able to take reasonable measures to protect the safety of the aircraft or of persons or property on board. Do you agree?

Yes

Please expand on your answer below

Yes, a person on board could receive delegation for this responsibility, but considerations of personal liability would have to be carefully addressed.

Consultation Question 17

We provisionally propose that passengers should be able to contact a member of crew at all times during an operation. Do you agree?

Yes

Please expand on your answer below

Yes, it should be possible for a passenger to contact a member of the operating organization at all times throughout the flight, however it does not have to be the PIC in direct communications with the passenger(s).

Consultation Question 18

We provisionally propose 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. Do you agree?

Yes

Please expand on your answer below

Yes, the location of the PIC ground or air should not make a difference and as long as a remote pilot is designated as a PIC there does not seem to be a need to revise any regulations.

Consultation Question 19

We provisionally propose that it should be a criminal offence for a person to act as the remote pilot of a VTOL when the level of alcohol in their blood, breath or urine is over a prescribed limit. Do you agree?

Yes

Please expand on your answer below

Yes, the location of the PIC ground or air should not make a difference and as long as a remote pilot is designated as a PIC there does not seem to be a need to revise any regulations.

Consultation Question 20

We provisionally propose that the remote pilot should be subject to the reporting obligations currently applicable to pilots under the Air Operations Regulation. Do you agree?

Yes

Please expand on your answer below

Yes, the location of the PIC ground or air should not make a difference and as long as a remote pilot is designated as a PIC there does not seem to be a need to revise any regulations.

Consultation Question 21

We provisionally propose that a remotely piloted VTOL should be required to be capable of detecting and recording information relating to accidents and near accidents for the purposes of reporting it. Do you agree?

Yes

Please expand on your answer below

Yes, the location of the PIC ground or air should not make a difference and as long as a remote pilot is designated as a PIC there does not seem to be a need to revise any regulations.

Consultation Question 22

We provisionally propose that licences should be required for remote VTOL pilots. So far as appropriate, these should follow the classes and ratings adopted for crewed VTOLs. Do you agree?

No

Please expand on your answer below

The skills that are needed to safely fly an aircraft while on board that aircraft, particularly those traditional stick and rudder skills assumed to be necessary to control and aircraft's flight path, are not relevant to the remote operator. For remote operators of extensively autonomous aircraft, this discrepancy is even greater as there are certified systems actively manipulating the aircraft's flight controls and preventing LOC, CFIT, or other human-error accidents. Instead, systems management and situational awareness of a different sort become of primary importance for a remote pilot, especially as the capabilities of the aircraft they are overseeing become increasingly complex. Requiring traditional licencing for remote VTOL pilots is unnecessary, will exacerbate the existing pilot shortage, and will take valuable training time away from experience that is much more relevant to the remote operation of highly autonomous aircraft.

Consultation Question 23

We provisionally propose that operators of remotely piloted VTOL should be certified. Do you agree?

Other

Please expand on your answer below

There is no objection to some type of certification and/or licensing for remote pilots of VTOLs, however this must be tailored appropriately for their actual responsibilities and the certified capabilities of the aircraft. This presents an opportunity for a base level of certification that can then be 'customized' by the operator through their training program.

Consultation Question 24

We provisionally propose that operators of remotely piloted VTOLs should continue to be required to:

- ☒ (1) have the means necessary for the scale and scope of operations planned;
- ☒ (2) use only suitably qualified and trained personnel;
- ☒ (3) implement a management system to ensure safety;
- ☒ (4) ensure operations only take place in accordance with the operations manual;
- ☒ (5) establish procedures to minimise the consequences to safe flight operations of disruptive passenger behaviour;
- ☒ (6) develop and maintain security programmes suitable for the aircraft and type of operation;
- ☒ (7) have a management system to prevent fatigue.
- ☒ (8) ensure the continuing airworthiness of the aircraft; and.
- ☒ (9) establish procedures for any reasonably foreseeable emergency situation.

Do you agree? (tick all that you agree with)

Please expand on your answer below

Yes, this aligns with existing air carrier requirements. Looking to scalable future operations, by expanding the responsibilities of the operating organization to encompass more of the traditional PIC responsibilities, then requiring those to be clearly delegated out to personnel that have been appropriately trained and vetted, greater flexibility and safety can be achieved.

Consultation Question 25

We seek views as to whether there are additional responsibilities that operators of remotely piloted VTOLs should need to fulfil.

Please share your views below

While neither is expected to require a change to the existing operator regulatory requirements, expansion of operating manuals (e.g., with procedures for operating beyond 1:1::pilot:aircraft), and the determination of operational suitability for each aircraft will both be areas of operator responsibility that take on increased relevance for remotely piloted aircraft. These should be handled through existing air carrier documentation approval mechanisms not through regulatory change.

Consultation Question 26

We seek views as to whether the law should permit remote pilots to act as pilot-in-command for more than one VTOL at the same time.

Please share your views below

Yes, this should be allowed and is essential for the broader benefits of VTOL operations to be realized at scale. Approval should be based on demonstrated capability and the specific characteristics of a proposed operation.

Consultation Question 27

We seek views as to whether there should be an upper limit to the number of VTOLs for which a remote pilot can act as pilot-in-command at the same time.

Please share your views below

For a more durable regulation, performance-based requirements that do not include a "bright line" limitation are preferable. As long as it can be credibly demonstrated that all aircraft are under "operational control" under reasonably expected conditions and contingencies, then multiple simultaneous aircraft oversight should be permitted.

Consultation Question 28

We seek views as to what additional safeguards should be introduced for remote pilots piloting multiple VTOLs.

Please share your views below

Any requirements for M:N operations should be performance based and include emergency management for not just the aircraft but the remote pilot and other essential personnel and equipment. There is currently a wide range of extents of autonomy in development with a correspondingly wide range of remote pilot workload. Guidelines to be used when evaluating an air carrier's procedures and conducting a risk assessment for M:N operations would be beneficial to both operators and regulators conducting oversight.

Consultation Question 29

We seek views as to whether there should be a role for a person supervising the flight of an autonomous passenger-carrying VTOL and acting as a point of contact in relation to it. What powers or responsibilities should such a person have?

Please share your views below

Yes, this role should exist and be defined. For a truly autonomous operation in which the concept of pilot in command is no longer credible, this role may require a different title than "pilot" to clearly convey their level of interaction with the aircraft. There continues to be value in having a dedicated individual overseeing the flight(s) however, particularly for interfacing with air traffic control and providing detailed understanding of the aircraft's anticipated off-nominal or contingency response behaviours.

Consultation Question 30

Should the law permit an uncrewed VTOL to transition between remotely piloted and autonomous flight during an operation?

Yes

Please expand on your answer below

Yes, this is necessary for emergencies - if a reversionary mode has been employed and an individual must intervene in an otherwise autonomous flight - and lost link scenarios - in which a remotely piloted aircraft may become autonomous.

Consultation Question 31

We seek views as to whether initial airworthiness standards for uncrewed VTOLs should include accessibility standards for persons with disabilities and reduced mobility.

Please share your views below

Regarding airworthiness standards addressing persons with disabilities and reduced mobility any requirements should be the same for all aircraft and not unique to VTOL's.

Consultation Question 32

We seek views as to whether the CAA should be able to include accessibility standards within the licences granted to uncrewed VTOL operators.

Please expand on your answer below

Accessibility standards, separate from the aircraft (ref question 31) should be addressed as they currently are under law and no specific VTOL standards should be required.

Drones

Consultation Question 34

We provisionally propose that a remote pilot for drones should continue to be defined as “a natural person responsible for safely conducting the flight of an unmanned aircraft by operating its flight controls, either manually or, when the unmanned aircraft flies automatically, by monitoring its course and remaining able to intervene and change its course at any time”. Do you agree?

No

Please expand on your answer below

No, there are operations for which the continuous oversight of an UA by an individual does not provide an increase in safety. In these instances, particularly for small non-passenger carrying drones operating in low risk environments, highly automated systems represent a decrease in associated risk when compared to a traditional human-in-the-loop operation.

The extent of autonomy in use on board the UA, and the actual responsibilities and influence of an individual that may be overseeing or otherwise monitoring their operation, should be taken into account when considering the definition and application, or not, of the term "remote pilot." Different terms and legal/oversight constructs may be needed for operations in which "remote pilot" is not appropriate. Failure to define when a human that interacts with the drone is or is not a “pilot” risks over- or mis-regulation of that role.

Consultation Question 35

We seek views on whether some low risk autonomous drone operations or drone operations conducted beyond visual line of sight might be accommodated in the open category. In particular:

- (1) whether there are any such use cases which might be suitable for the open category; and
- (2) if so, what conditions should be attached to these use cases if operated in the open category.

Please share your views below

1. Yes, there are low risk autonomous drone BVLOS use cases that are appropriate for the open category. These include flights at low altitudes over private property for which access can be credibly controlled, such as industrial facilities, electrical substations, refineries, power stations, and other secure infrastructure.
2. Conditions of conducting these types of operations in the open category could include controlled ground area, limited operating volume, and transient flight over people. Others should be allowable pending an acceptable operational hazard assessment.

That being said, we would encourage the CAA to generally retain the category boundaries as defined for "certified" and "open" and leverage "specific" category as needed to fill any gaps.

Consultation Question 36

We provisionally propose that for autonomous operations in the specific category, a UAS 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 manned 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.

Do you agree? (tick all that you agree with)

Please expand on your answer below

While we support the safety goals that underly the proposed requirements, we urge caution in their implementation and request that a performance- and risk-based approach be applied that is in alignment with international precedents and the existing regulatory framework. We do not generally agree with requirement (2) as proposed and urge caution generally with the implementation of all five items. For example: the requirement in (2) to discontinue a flight is seen as both vaguely written and excessively prescriptive for highly automated flights which are able to offer other mitigations and the requirement in (5) to not fly "close to" such an area could cause confusion if translated into a prescriptive requirement.

Consultation Question 38

We seek views on whether the current concept of a "remote pilot" is compatible with drone MSO. We also seek views on whether the remote pilots of drone MSO should continue to be subject to the same responsibilities as remote pilots for single drone operations.

Please share your views below

As discussed in the answer to Q34, increasing extents of autonomy call into question the appropriateness of the term "pilot in command, but to the extent that an individual is a "pilot" in a given operation, responsibility for multiple aircraft alone does not violate that designation if they have oversight and operational control of the UA. However it should be noted that MSO typically relies on a significant extent of autonomy for a single individual to safely manage what could otherwise be excessive workload in a "multiple cockpit" operational model. This results in MSO often resembling air traffic management more than traditional flying but regardless the remote pilot (or other trained person utilizing a different term) can still be responsible for the safety of flight. Reliance on system automation (both aircraft and control station) for aspects of real-time execution of the flight then becomes a matter of system and operational suitability.

This shift to increasingly autonomous aircraft and the potential for 1:N (or m:N) operations that it unlocks, will render certain requirements that are currently placed upon the remote pilot impractical. Instead, operational requirements should focus on the oversight role of the "remote pilot" and consider an alternate designation for this individual.

Consultation Question 39

We seek views on whether there should be an upper limit to the number of drones for which an individual remote pilot is responsible.

Please share your views below

Requirements for remote operation of aircraft should be performance- and risk-based across aircraft types, employing a safety continuum approach. Thus, as for with VTOL aircraft, there should be no hard upper limit for drone M:N operations but rather a performance-based requirement that ensures that "operational control" can be maintained for nominal and contingency operations. The extent of autonomy applied to the full uncrewed aircraft system will heavily impact the practical limitation of any given operation.

Consultation Question 40

We seek views as to what additional safeguards should be introduced for remote pilots responsible for multiple drones.

Please share your views below

Requirements should be consistent for other areas of remotely piloted aviation. (see answer 28) The Operator must demonstrate safety based on their particularly operation; prescriptive requirements are not in the interest of safety or the industry as a whole.

Consultation Question 41

We provisionally propose that use of flight data recorder systems or devices should be mandatory for autonomous drone operations. Do you agree?

Yes

Please expand on your answer below

Yes, such provisions may be appropriate for certain high risk operations, however provisions should be made to transmit and store data on the ground in lieu of on-board data hardening requirements, especially for smaller UA. Safety benefits for a particular type or operation or class of UA should be considered and "right sized" across the full spectrum of operational risk.

Consultation Question 42

Should the law permit a drone to transition between remotely piloted and autonomous flight during an operation?

Yes

Please expand on your answer below

Yes, this should be permitted and in a fashion that is consistent with other types of uncrewed aircraft operations. (see answer 30) Drone pilots should also be able to decide the appropriate mode, if available multiple options are available, for the aircraft and operation, is appropriate for a particular operation, operating area, or phase of flight.

RESPONSE TO LAW COMMISSION CONSULTATION ON AVIATION AUTONOMY

(Law Commission Consultation Paper 261)

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About you

What is the name of your organisation?

Boeing

Airworthiness and certification

Consultation Question 1

We seek views on how current airworthiness and certification regulation might need to be adapted or developed in light of highly automated and autonomous aircraft. In particular, should provisions be adopted which allow for:

1. the certification of optionally piloted and uncrewed or unoccupied versions of conventional aircraft (hybrid versions); and
2. the separate certification of command units?

Please share your views below

The existing relationship between airworthiness certification and operational approvals is built on the assumption that there is a human pilot on board the aircraft. To apply the existing requirements and processes to uncrewed, and particularly highly automated and autonomous, aircraft requires a shift in this paradigm. This does not, however, require a significant shift in the airworthiness regulations themselves. The safety intent of the existing airworthiness requirements is applicable and sufficient from a regulatory basis perspective. The performance-based nature of CS-23 as amended in 2017 means that the system intended functions and means and methods of compliance that are specific to uncrewed and autonomous aircraft can be handled within the existing regulatory framework.

Where this paradigm shift is most acutely felt is thus not in the regulations themselves but rather in the interaction between a certified aircraft and its ability to operate as desired. For uncrewed and highly automated and autonomous aircraft, diligence must be taken to ensure that the capabilities of the aircraft, particularly the intended functions, are aligned with what the aircraft must be able to do to perform

its concept of operations. This is not a change in the provisions of the regulations but rather a shift in how the airworthiness and operational regulations interface with each other. As such, effort should be invested in coordination between the means and methods of compliance used in conjunction with the existing regulations and requirements for operational approval rather than in modifications to the performance-based airworthiness regulations themselves.

The existing airworthiness regulations can already be applied to provide an airworthiness certification path for optionally piloted and uncrewed versions of existing and conventional aircraft, particularly for modifications to aircraft that already have a type design. This ability should be preserved and streamlined.

As for command units, also referred to as command monitoring units (CMUs) and ground control stations (GCS), we recommend an adoption of the approach found in EASA's Opinion 03/2023 which has recently been adopted. To paraphrase, the extent of autonomy and automation on board the aircraft itself is a key factor in the method by which oversight is provided to a CMU. This can be done through a separate type certificate, by including it in the type certificate of the aircraft, or through other approval and oversight means as appropriate for the characteristics of the system and the risk profile of the operation. It should not be a one-size-fits-all solution but rather follow a tailored approach that acknowledges the range in criticality of role of the CMU within different unmanned aircraft systems.

Consultation Question 2

We welcome views on what changes to the certification system might be necessary to enable higher automation and autonomy in aviation.

Please share your views below

Per the discussion provided in the answer to Question 1, there are no fundamental airworthiness regulatory changes that must be made to enable airworthiness certification of uncrewed and highly automated and autonomous aircraft. However, within the broader certification system, in which a performance-based regulation is supported by more detailed means and methods of compliance, there are gaps in the means and methods of compliance that must be developed to enable higher automation and autonomy in aviation. Such means and methods of compliance are under development in international standards development organizations.

These enabling means and methods include a verification and validation approach for systems developed with machine learning algorithms, specifically a probabilistic approach to determining acceptable reliability and performance, and requirements for how training data is acquired, secured, managed, and maintained.

Additionally, existing regulatory language makes use of the words "pilot" and "flightcrew" to express safety intent that is not necessarily tied to the actions or abilities of an onboard pilot but rather to basic characteristics of the aircraft itself

(e.g., apparent stability and repeatable takeoff performance). Policy and means/methods of compliance that highlights the regulatory safety intent and clarifies how these requirements can be applied to uncrewed aircraft would streamline the airworthiness certification processes.

Looking beyond initial airworthiness certification, a streamlined approach by which continued operational safety can be enhanced through algorithm and system updates based on operational and other flight data is needed. While Artificial Intelligence and Machine Learning algorithms are not intended to be actively learning post-initial airworthiness certification (aka they are static in operations), operational experience or ongoing fleet leader testing may uncover necessary updates or generate additional data that can be used to improve the safety of the software. These updates should not have to be delayed because of cumbersome type design amendment processes but there should be a process by which they can be incorporated into existing aircraft to continuously increase fleet safety.

Consultation Question 3

We seek views on whether current regulatory tools to support the development of highly automated and autonomous aviation technologies are adequate.

Please share your views below

In addition to the means and methods of compliance that are mentioned in the answer provided to Question 2, a regulatory and/or requirement set for third-party service providers for uncrewed aircraft (known alternatively as 3PSPs, PSUs, and TSPs) would be supportive of industry growth. Having an oversight and approval mechanism for third party services, such as weather data and communications networks, would provide a means of standardization and validation of performance across providers. Similarly to how engines and propellers are currently independently certified from the aircraft in which they are installed, a regulatory structure for TSPs would streamline their ability to support uncrewed operations and ensure that their capabilities and reliability are adequate for a given application.

VTOLs

Consultation Question 8

We provisionally propose that a person overseeing a VTOL flying automatically, who monitors its course and is able to intervene and change its course at any time should continue to be classified as a “remote pilot”. Do you agree?

Other

Please expand on your answer below

Wisk’s concept of operations defines a remote Multivehicle Supervisor (MVSor) that is overseeing up to three aircraft in flight at any given time from the ground control station (or command unit). Given the current understood definitions and roles of the

Pilot in Command (PIC), the MVSor is the most logical individual to assign as PIC within the existing regulatory and operational structure. During nominal operations, the MVSor has the ability to command changes to the aircraft's flight plan, interact with airspace management, and perform other contingency management and flight oversight duties. As such, defining the MVSor as PIC is a reasonable expediency within the existing regulatory structure.

Looking past initial operations and the existing regulatory structure, however, the high level of delegation that is required from the MVSor for other typical PIC responsibilities, such as the preflight inspection of the aircraft, which will have to be done by ground crew at the vertiport, an alternative paradigm for PIC is worth considering. This alternative would be to rely in the air carrier organization, its policies, manuals, training, and procedures, and the certification there-of, to fill the official role of "pilot in command." This approach would place legal responsibility (and liability, per questions later in the Consultation) for the flight on the air carrier organization, more accurately reflecting the ability of the MVS or or any single individual within the organization, to truly guarantee safety of flight. Delegation of duties to appropriately trained and approved personnel within the organization would be clearly defined and aligned with the suitability of the aircraft's certified highly automated and/or autonomous capabilities would be aligned at the concept of operations level.

Contingency operations, such as those during a lost communications link with the aircraft, would also fit more cleanly into a construct in which the organization is defined as the PIC. While many details remain to be considered, an organizational definition of pilot in command should be considered as a long-term approach that would be in the interest of both safety and industry growth.

Consultation Question 10

We provisionally propose 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.

Do you agree? (Tick all that you agree with)

Please expand on your answer below

The remote pilot for any aircraft is going to have to rely by geographic necessity on systems and other operator personnel for information about the physical aircraft. This is not without precedent as airline pilots today rely heavily on maintenance reports and ground crew inspections to ensure airworthiness and on cabin crew and baggage handlers to ensure proper loading and stowing of luggage and cargo. Thus, while it is reasonable to require that the remote pilot confirm that each of these required tasks have been completed prior to authorizing takeoff and flight plan execution, it is important to recognize that the actual performance of these tasks will have to be delegated to others. This extremely high degree of delegation should be kept in mind when considering appropriate training and liability for remote pilots.

Consultation Question 22

We provisionally propose that licences should be required for remote VTOL pilots. So far as appropriate, these should follow the classes and ratings adopted for crewed VTOLs. Do you agree?

Other

Please expand on your answer below

In practice, there is minimal overlap between the manual skills needed to directly manipulate the onboard flight controls of an aircraft and to oversee the remote operation of a highly automated or autonomous aircraft from a ground-based command unit. Instead of traditional stick and rudder skills, remote pilots must be adept at systems management and oversight. Airspace awareness, flight planning, and voice communications are skills that are applicable to both conventional onboard and remote pilots. Experience gained in a conventionally piloted aircraft may or may not be relevant to remote operations, particularly for uncrewed aircraft with a high degree of automated or autonomous contingency handling. Thus, care should be taken when applying the same requirements to pilots for both crewed and uncrewed aircraft. The ability for the air carrier to work with aircraft OEMs to customize training for their operation, and to right-size the certifications, ratings, or other approvals required for their remote pilots is essential to both maximize safety by ensuring that the appropriate skill set has been gained and to facilitate workforce development by not adding training cost that is not in the direct interest of safety.

Consultation Question 23

We provisionally propose that operators of remotely piloted VTOL should be certified. Do you agree?

Yes

Please expand on your answer below

Yes, it is appropriate for the organization operating a VTOL commercial on-demand service to be certified in accordance with other commercial on-demand air carriers. In fact, this organizational certification and the internal structure that it provides can be leveraged to accommodate the highly coupled nature of aircraft capabilities and human responsibilities that exist for highly automated and autonomous aircraft operations.

Consultation Question 24

We provisionally propose that operators of remotely piloted VTOLs should continue to be required to:

- ☒ (1) have the means necessary for the scale and scope of operations planned;
- ☒ (2) use only suitably qualified and trained personnel;
- ☒ (3) implement a management system to ensure safety;
- ☒ (4) ensure operations only take place in accordance with the operations manual;
- ☒ (5) establish procedures to minimise the consequences to safe flight operations of disruptive passenger behaviour;
- ☒ (6) develop and maintain security programmes suitable for the aircraft and type of operation;
- ☒ (7) have a management system to prevent fatigue.
- ☒ (8) ensure the continuing airworthiness of the aircraft; and.
- ☒ (9) establish procedures for any reasonably foreseeable emergency situation.

Do you agree? (tick all that you agree with)

Please expand on your answer below

Yes, these responsibilities for an operator of a VTOL commercial on-demand service are aligned with existing air carrier requirements and are appropriate for VTOL operations. Leveraging these internal organizational structures to accommodate unique aircraft capabilities, concepts of operation, and pilot-aircraft interactions is in the interest of both operational safety and scalability.

Consultation Question 25

We seek views as to whether there are additional responsibilities that operators of remotely piloted VTOLs should need to fulfil.

Please share your views below

Two areas of existing operator responsibility will become increasingly important for highly automated and increasingly autonomous VTOL operations. These are: the determination of operational suitability and continued operational safety for all aircraft in the fleet; and, training and procedures for M:N operations. Operational suitability ensures that the certified intended functions and capabilities of the aircraft align with the expected roles and responsibilities of the pilot and other operator personnel. Continued operational safety ensures that the correct version of software is in use on each aircraft, that all maintenance and updates have been conducted appropriately, and that airworthiness can be ensured for each flight. For concepts of operations that pair one remote pilot with multiple aircraft (1:N) or have a team approach where multiple remote pilots oversee multiple aircraft during different phases of flight (M:N), it is essential that the operating manuals and training adequately cover the necessary procedures.

New needs may emerge with new technologies and new concepts of operations. Ultimately, the more that the air carrier organization can be relied upon to ensure that the unique needs of their operation are being met, the safer and more efficient the operation can be.

Consultation Question 26

We seek views as to whether the law should permit remote pilots to act as pilot-in-command for more than one VTOL at the same time.

Please share your views below

Yes, it should be permitted for the individual serving as pilot in command to be responsible for more than one aircraft at a time, VTOL or otherwise. This is essential for the advanced air mobility industry to be able to deliver on its promise to make aviation more accessible to more people in more localities. Ever increasing extents of automation and autonomy allow one individual to supervise multiple aircraft at a level of safety that is comparable to or higher than current conventionally piloted aircraft operations.

Consultation Question 27

We seek views as to whether there should be an upper limit to the number of VTOLs for which a remote pilot can act as pilot-in-command at the same time.

Please share your views below

No, there should not be a predetermined “bright line” limit for the number of aircraft, VTOL or otherwise, that a pilot in command can be responsible for at any given time. The evaluation of the acceptability of a given operation should be based on performance-based requirements that take the entire risk mitigation environment into account. An operational hazard assessment that considers the responsibilities

of the PIC, the extent of automation and/or autonomy on board the aircraft, other operational risk mitigations that are in place, the likelihood of an off-nominal condition that could require additional attention from a human supervisor, and whether or not there are reversionary modes for automated/autonomous functions should all be taken into account when determining the acceptable aircraft-to-human pilot ratio for a given operation.

Consultation Question 28

We seek views as to what additional safeguards should be introduced for remote pilots piloting multiple VTOLs.

Please share your views below

Due to the unique nature of each aircraft's capabilities and each operation, any additional requirements for M:N operations should be at a performance-based level and focus on components of training and procedures that should be in place not on prescriptive aspects of those procedures. The existing operator certification, with its emphasis on training, procedures, maintenance, and operating manuals, is already well configured to support appropriate safeguards being implemented for a given operation.

Consultation Question 29

We seek views as to whether there should be a role for a person supervising the flight of an autonomous passenger-carrying VTOL and acting as a point of contact in relation to it. What powers or responsibilities should such a person have?

Please share your views below

Using the term "pilot" to describe the role of the person supervising one or more highly automated or autonomous aircraft, even when that person has the ability to provide direction to the aircraft under their control, could be considered misleading. Another officially defined role could be helpful for individuals that are not remotely manipulating the aircraft's control surfaces or directing the flight path of the aircraft in real time. Wisk's concept of operations uses the term "Multivehicle Supervisor" to describe the person that is overseeing the aircraft in flight and fulfilling the legal definition of pilot in command. As the extent of automation and autonomy in use continues to increase, the real-time responsibilities and influence of this supervisory role is expected to continue to decrease, making the difference between this role and that of a traditional pilot even greater. However, this supervisory role is still beneficial to the safety and efficiency of operations and has key responsibilities for communication, record-keeping, validation of flight planning, and other important functions. As such, yes, formally defining a new term for a supervisory role would be beneficial and reduce potential confusion.

Civil liability and insurance

Consultation Question 44

We provisionally consider that the current law governing air carrier liability for injury or death of passengers in the UK is adequate for the introduction of remotely piloted and autonomous operations. Do you agree?

Yes

Consultation Question 49

We seek views as to whether the current law regarding liability for mid-air collisions is satisfactory in the case of collisions involving uncrewed aircraft systems.

Please share your views below

For questions concerning liability, whether civil or criminal, it is important to have alignment between the extent to which an individual is capable of effecting the outcome of a particular event and the extent to which they are held liable for said outcome. A mismatch between actual influence and liability, either in extent or in assignment, will be detrimental to both safety and the scalability of the industry.

Criminal liability

Consultation Question 55

We provisionally propose that a remote pilot of an uncrewed aircraft operating in the certified category should be treated as a pilot-in-command for the purposes of criminal liability pursuant to article 265(1) of the Air Navigation Order 2016. Do you agree?

Other

Please expand on your answer below

Increased autonomy in uncrewed aircraft operations requires a balancing of liability, whether civil or criminal, to address the reduction of the pilot-in-command's ability to affect the operation of an uncrewed aircraft. We note the Law Commission's proposal to treat a remote pilot of an UAS as a pilot-in-command for the purposes of attributing vicarious liability for offences under the ANO 2016. It is important to have alignment between the extent to which a pilot-in-command has the ability to affect an outcome during an uncrewed aircraft operation and whether the pilot-in-command exhibits reasonable care during the course of reaching the outcome, with the extent to which the pilot-in-command is held criminally liable for said outcome. The application of the current legal position to UAS operations would have the unintended consequence of introducing a strict liability criminal offence, notably on a vicarious basis, for which the sole legal 'due diligence' defence is conceptually unworkable (for the reasons identified by the Law Com at 9.44). In this context, we propose an extension of the 'reasonable care' defence under Art 265(3) to both the UAS operator (as the Law Commission seeks views on in Consultation Question 54), as well as the remote pilot. This would ensure that liability for the pilot-in-command is appropriately linked to the degree of care exercised and the extent of

control that the pilot-in-command has over the uncrewed aircraft, both in situations of UAS malfunction, but also where such limited control exists as a feature of the UAS' design. A mismatch would be detrimental to both safety and the scalability of the industry.

RESPONSE TO LAW COMMISSION CONSULTATION ON AVIATION AUTONOMY

(Law Commission Consultation Paper 261)

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About you

What is the name of your organisation?

British Gliding Association Limited

Airworthiness and certification

Consultation Question 1

We seek views on how current airworthiness and certification regulation might need to be adapted or developed in light of highly automated and autonomous aircraft. In particular, should provisions be adopted which allow for:

1. the certification of optionally piloted and uncrewed or unoccupied versions of conventional aircraft (hybrid versions); and
2. the separate certification of command units?

Please share your views below

Airworthiness certification has evolved to manage risk to first and third parties, i.e crew and pax and those in other aircraft and on the ground.

1. Piloted and uncrewed highly automated or autonomous aircraft should be certified to achieve the same level of risk as required by aircraft under current regulation.
2. Command units should be certified to support at least the level of risk described at 1.

Consultation Question 2

We welcome views on what changes to the certification system might be necessary to enable higher automation and autonomy in aviation.

Please share your views below

Current certification in large part is based on long term learning from data re success and failure of design, materials, and operational use.

In the absence of any significant level of data re high automation and autonomy in aviation to support any change in certification system, it's difficult to see how any lightening of the current system could be possible.

Consultation Question 3

We seek views on whether current regulatory tools to support the development of highly automated and autonomous aviation technologies are adequate.

Please share your views below

Probably not.

Rules of the air

Consultation Question 4

We seek views on how highly automated and autonomous aircraft should act in emergency scenarios. In particular:

1. should highly automated and autonomous aircraft be given the freedom to operate outside the rules of the air in emergency circumstances; or
2. should a comprehensive set of rules be developed for highly automated and autonomous aircraft in emergency situations.

Please share your views below

1. Yes, providing the programmed logic used in response to an emergency is based on minimum risk to other aircraft and third parties.

2. Yes.

Consultation Question 6

We seek consultees' views on whether the rules of the air relating to communication should be adapted for remotely piloted and autonomous aircraft.

Please share your views below

They would need to be adapted to provide an alternative to voice communication. Electronic information services may facilitate that.

Consultation Question 7

We ask for consultees' views on how the rules of the air might be adapted or developed for remotely piloted or autonomous flight

Please share your views below

The rules of the air do need to accommodate remotely piloted or autonomous flight.

The changes need to prioritise the safety of third parties and crewed/pax flights over un-crewed flight.

Remotely piloted or autonomous flight must give way to crewed flight.

Changes to support remotely piloted or autonomous flight should not result in additional burdens for crewed flight.

VTOLs

Consultation Question 8

We provisionally propose that a person overseeing a VTOL flying automatically, who monitors its course and is able to intervene and change its course at any time should continue to be classified as a "remote pilot". Do you agree?

Yes

Please expand on your answer below

Someone has to be responsible for the flight. This approach makes most sense.

Consultation Question 9

We provisionally propose 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. Do you agree?

Yes

Please expand on your answer below

That's logical.

Consultation Question 10

We provisionally propose 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.

Do you agree? (Tick all that you agree with)

Please expand on your answer below

The remote pilot should have the same responsibilities as any pilot in command as defined in 965/2012.

Consultation Question 11

We invite views as to whether there are additional operational responsibilities that a remote VTOL pilot should be required to fulfil.

Please share your views below

Compliance by the operator should the operator be separate from the remote pilot.

It's possible to imagine a scenario of remotely pilots VTOL operators in one location and remote pilots elsewhere (as per the current situation with military RPAS).

Consultation Question 12

We provisionally propose that the remote pilot-in-command should be responsible for, amongst other things, ensuring passengers are:

1. given a safety briefing; and
2. seated and wear seat belts during take-off and landing

Do you agree?

Yes

Please expand on your answer below

See previous response re PIC responsibilities.

Consultation Question 13

We provisionally propose that air operators (rather than the remote pilot-in-command) should be responsible for preventing passengers from boarding:

1. who appear drunk or under the influence of drugs; or
2. whose carriage would, in the view of the operator's employees, endanger the safety of the aircraft or other passengers.

Do you agree?

Other

Please expand on your answer below

Yes, but that must be confirmed by the remote pilot.

Consultation Question 14

We provisionally propose that the remote pilot-in-command should have the power to take reasonable measures, including restraint of passengers, as set out in section 94 of the Civil Aviation Act 1982. Do you agree?

Yes

Please expand on your answer below

Will need delivering by the operator.

Consultation Question 15

We provisionally propose that a person on board a VTOL aircraft (other than a crew member) should be able to take reasonable measures to protect the safety of the aircraft or of persons or property on board. Do you agree?

Yes

Please expand on your answer below

Good luck with that if there are no employed crew on board!

Consultation Question 16

We seek views on whether the powers of crew on board a VTOL aircraft should be broadened to reflect those of the pilot-in-command under the Civil Aviation Act 1982 to:

1. take reasonable measures to protect the safety of the aircraft or persons or property on board;
2. maintain good order and discipline; or
3. enable the crew to disembark or deliver a person.

Please share your views below

Seems reasonable.

Consultation Question 17

We provisionally propose that passengers should be able to contact a member of crew at all times during an operation. Do you agree?

Yes

Consultation Question 18

We provisionally propose 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. Do you agree?

Yes

Please expand on your answer below

Medical and related compliance should be the same as for a manned flight pilot.

Consultation Question 19

We provisionally propose that it should be a criminal offence for a person to act as the remote pilot of a VTOL when the level of alcohol in their blood, breath or urine is over a prescribed limit. Do you agree?

Yes

Please expand on your answer below

Compliance should be the same as for a manned flight pilot.

Consultation Question 20

We provisionally propose that the remote pilot should be subject to the reporting obligations currently applicable to pilots under the Air Operations Regulation. Do you agree?

Yes

Please expand on your answer below

Compliance should be the same as for a manned flight pilot.

Consultation Question 21

We provisionally propose that a remotely piloted VTOL should be required to be capable of detecting and recording information relating to accidents and near accidents for the purposes of reporting it. Do you agree?

Yes

Please expand on your answer below

Compliance should be the same as for a manned flight pilot.

Consultation Question 22

We provisionally propose that licences should be required for remote VTOL pilots. So far as appropriate, these should follow the classes and ratings adopted for crewed VTOLs. Do you agree?

Yes

Please expand on your answer below

Compliance should be the same as for a manned flight pilot.

Consultation Question 23

We provisionally propose that operators of remotely piloted VTOL should be certified. Do you agree?

Yes

Please expand on your answer below

It will be the only way of establishing safe standards in what will be a highly commercial and low experience environment.

Consultation Question 24

We provisionally propose that operators of remotely piloted VTOLs should continue to be required to:

- ☒ (1) have the means necessary for the scale and scope of operations planned;
- ☒ (2) use only suitably qualified and trained personnel;
- ☒ (3) implement a management system to ensure safety;
- ☒ (4) ensure operations only take place in accordance with the operations manual;
- ☒ (5) establish procedures to minimise the consequences to safe flight operations of disruptive passenger behaviour;
- ☒ (6) develop and maintain security programmes suitable for the aircraft and type of operation;
- ☒ (7) have a management system to prevent fatigue.
- ☒ (8) ensure the continuing airworthiness of the aircraft; and.
- ☒ (9) establish procedures for any reasonably foreseeable emergency situation.

Do you agree? (tick all that you agree with)

Please expand on your answer below

As per manned flight.

Consultation Question 25

We seek views as to whether there are additional responsibilities that operators of remotely piloted VTOLs should need to fulfil.

Please share your views below

That the remote pilot is compliant.

Consultation Question 26

We seek views as to whether the law should permit remote pilots to act as pilot-in-command for more than one VTOL at the same time.

Please share your views below

If proven and certified technology can facilitate that, it may be a regulatory need.

Consultation Question 27

We seek views as to whether there should be an upper limit to the number of VTOLs for which a remote pilot can act as pilot-in-command at the same time.

Please share your views below

No expertise - suggest that's one for experts based on behavioural studies etc.

Consultation Question 29

We seek views as to whether there should be a role for a person supervising the flight of an autonomous passenger-carrying VTOL and acting as a point of contact in relation to it. What powers or responsibilities should such a person have?

Please share your views below

The remote pilot should be in charge. If the remote pilot is unqualified, they will need supervising, with the supervisor taking full responsibilities.

Consultation Question 31

We seek views as to whether initial airworthiness standards for uncrewed VTOLs should include accessibility standards for persons with disabilities and reduced mobility.

Please share your views below

The option should be available aligned with current legislation regarding existing aircraft.

Consultation Question 32

We seek views as to whether the CAA should be able to include accessibility standards within the licences granted to uncrewed VTOL operators.

Please expand on your answer below

Same as existing requirements.

Consultation Question 33

We seek consultees' views on any other issues with the current legal framework as it relates to operations involving autonomous VTOLs.

Please share your views below

The regulation of remotely piloted and autonomous VTOLs operations should not add burdens to existing manned aviation.

Drones

Consultation Question 34

We provisionally propose that a remote pilot for drones should continue to be defined as “a natural person responsible for safely conducting the flight of an unmanned aircraft by operating its flight controls, either manually or, when the unmanned aircraft flies automatically, by monitoring its course and remaining able to intervene and change its course at any time”. Do you agree?

Yes

Consultation Question 35

We seek views on whether some low risk autonomous drone operations or drone operations conducted beyond visual line of sight might be accommodated in the open category. In particular:

1. whether there are any such use cases which might be suitable for the open category; and
2. if so, what conditions should be attached to these use cases if operated in the open category.

Please share your views below

1. Very low mass and speed and therefore re low risk.
2. Operations in very low risk airspace only (to be defined, but probably around buildings/activity) that does not impact other airspace users.

Consultation Question 36

We provisionally propose that for autonomous operations in the specific category, a UAS 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 manned 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.

Do you agree? (tick all that you agree with)

Consultation Question 37

We seek views on what operational requirements should be applied to autonomous drone operations and drones that operate beyond visual line of sight in the specific and certified categories.

Please share your views below

These operations should not impact existing manned flight.

Consultation Question 39

We seek views on whether there should be an upper limit to the number of drones for which an individual remote pilot is responsible.

Please share your views below

We suggest this is one for experts in human behaviour and limitations.

Consultation Question 41

We provisionally propose that use of flight data recorder systems or devices should be mandatory for autonomous drone operations. Do you agree?

Yes

Please expand on your answer below

This will support compliance and flight safety requirements.

Consultation Question 42

Should the law permit a drone to transition between remotely piloted and autonomous flight during an operation?

Yes

Please expand on your answer below

See earlier response re VTOL.

Consultation Question 43

We seek stakeholder views on any other issues with the current legal framework as it relates to operations involving autonomous drones.

Please share our views below

The regulation of the operation of autonomous drones should not result in additional regulation for existing manned flight.

Civil liability and insurance

Consultation Question 44

We provisionally consider that the current law governing air carrier liability for injury or death of passengers in the UK is adequate for the introduction of remotely piloted and autonomous operations. Do you agree?

Other

Please expand on your answer below

Insurance requirements are based on measured risk. We'll see.

Consultation Question 45

We provisionally consider that the current law governing liability for damage to cargo in the UK is adequate for the introduction of remotely piloted and autonomous operations. Do you agree?

Yes

Consultation Question 48

We provisionally propose that there should be a review product liability law (including the Consumer Protection Act 1987) to take account of the challenges of emerging technologies. The review should cover product liability as a whole, rather than be confined to aviation or automated vehicles. Do you agree?

Yes

Consultation Question 49

We seek views as to whether the current law regarding liability for mid-air collisions is satisfactory in the case of collisions involving uncrewed aircraft systems.

Please share your views below

As long as it is clear in law who is the responsible pilot of an un-crewed air system and they are made aware via certification or licensing requirements and examination of their responsibilities to avoid a collision, then yes.

Consultation Question 51

We provisionally propose that multiple simultaneous operations should be considered as the Government develops proposals for the insurance requirements applicable to uncrewed aircraft. Do you agree?

Other

RESPONSE TO LAW COMMISSION CONSULTATION ON AVIATION AUTONOMY

(Law Commission Consultation Paper 261)

Any personal email addresses and phone numbers have been excluded from this document.

Unanswered questions have been deleted from this document.

About you

What is the name of your organisation?

British Hang Gliding and Paragliding Association (BHPA)

Airworthiness and certification

Consultation Question 1

We seek views on how current airworthiness and certification regulation might need to be adapted or developed in light of highly automated and autonomous aircraft. In particular, should provisions be adopted which allow for:

1. the certification of optionally piloted and uncrewed or unoccupied versions of conventional aircraft (hybrid versions); and
2. the separate certification of command units?

Please share your views below

Airworthiness certification has evolved to manage risks to both first and third parties, including crew, passengers, and those in other aircraft or on the ground.

1. Crewed and uncrewed highly automated or autonomous aircraft should be certified to meet the same risk levels as those required by current regulations for crewed aircraft. Human operators of aircraft are expected to be competent and careful, and existing legislation ensures this standard. Authorised self-driving airborne vehicles must achieve a safety level that is equivalent to or higher than that of trained, licensed, and competent crew.
2. Command units should be certified to support at least the level of risk outlined in point 1.

Consultation Question 2

We welcome views on what changes to the certification system might be necessary to enable higher automation and autonomy in aviation.

Please share your views below

Current certification in large part is based on long term learning from data on success and failure of design, materials, and operational use. The BHPA is not aware of any substantial and independent data supporting a change in the certification system. Therefore, it is challenging to envisage how any relaxation of the current system could be feasible.

Consultation Question 3

We seek views on whether current regulatory tools to support the development of highly automated and autonomous aviation technologies are adequate.

Please share your views below

The British Hang Gliding and Paragliding Association (BHPA) does not have expertise in the current regulatory framework specific to automated and autonomous aviation.

However, it is important that any UK body considering regulations enabling autonomous and automated flight understands the extent of hang gliding and paragliding in UK, and the hurdles that would be faced when legislating to enable highly automated and autonomous aviation into the airspace in which unpowered and powered hang gliders and paragliders and other General Aviation operate. Hang gliding and paragliding are deregulated forms of aviation in the United Kingdom and are Non-Part 21 Aircraft (EASA Annex I aircraft). There is no legal requirement to register hang gliders and paragliders on the UK national aircraft registration database, and no requirement to hold a national pilot's licence to fly them.

Hang gliders and paragliders are the lightest and most portable types of crewed aircraft, comprising over a quarter of the UK's manned General Aviation fleet. They can be flown both unpowered and powered. These aircraft require no national license or hangar space, are inexpensive to buy and maintain (there is a strong second-hand market offering complete aircraft for under £1,000). Participation in these airsports, especially paragliding, remains strong in the UK and other European countries.

The BHPA has effectively self-regulated for over 40 years, offering robust training, qualifications, and continuous education through its registered schools and clubs. BHPA members benefit from insurance that provides third-party cover and indemnifies landowners.

The BHPA has over 7,000 members, who primarily fly hang gliders, paragliders, and their motorized variants. The majority of UK hang glider and paraglider pilots are BHPA members, though over 50% of powered paraglider (paramotor) pilots are not, often self-taught or trained outside BHPA oversight.

Each BHPA member typically owns at least one aircraft, with many owning more. The estimated active fleet size of UK hang gliders and paragliders, including powered variants, exceeds 10,000.

The BHPA does not support mandatory EC equipage for all crewed aircraft in all UK airspace. It is essential that any regulatory solution, and the burdens that it places upon pilots and aircraft owners, be proportionate to the benefits obtained. A modest reduction in GA-GA or GA-UAS collision risk would not justify mandating the carriage of certified Commercial Air Traffic-grade equipment. EC put in place for the reduction of risk in one class of aviation must furthermore not impose costs or re-equipage obligations in another.

Any adopted EC solution should, as a minimum, not degrade the effectiveness provided by current systems, which are designed and have evolved to enhance

situational awareness and provide timely, effective alerts in practical situations. Any system that promotes head-down flight, creates false alerts in dense, thermalling / soaring / manoeuvring traffic, encourages complacency, creates distractions, reduces international compatibility, or simply lacks performance and reliability, may lead to reduced safety and must be considered unsuitable for official promotion or mandatory adoption.

Hang gliders and paragliders (including their powered variants - powered hang gliders and powered paragliders/paramotors) are open cockpit aircraft with no electrical system. They do not routinely carry radios, nor have licences in place to talk to Air Traffic Control.

Detection of hang gliders and paragliders in UK FIR using CAP 1391 EC devices has not yet been demonstrated to BHPA to be effective and reliable across the range of environments and diverse flying scenarios regularly enjoyed by our members.

EC in its current form brings little or no benefit to the majority of hang gliders and paragliders. We fly in close proximity to other hang gliders and paragliders and maintain a good lookout and separation using 'see and avoid'. Using a screen instead of using good lookout will increase the risk of mid-air collisions.

The effect of legislation to mandate EC would drive a percentage of hang glider and paraglider pilots to operate 'rogue'.

For these reasons, and based on current and foreseeable technical and operational performance, the BHPA supports developing a multi-platform EC approach incorporating existing systems, and leading to an ecosystem of compatible conspicuity devices and platforms.

The BHPA advocates for a proportional, benefit-driven, and evidence-based approach to EC for General Aviation. Costs should be borne by the automated and autonomous flight industry, which stands to gain the most benefit, as the newcomer to airspace usage.

Flying "tourism" in mainland Europe is an activity enjoyed by large proportions of BHPA members. EASA's ADS-L protocol appears to present viable solutions for all our aircraft types to access U-Space in mainland European states. We have encouraged UK CAA to review ADS-L for possible adoption in UK. A UK-only EC requirement, or a requirement incompatible with EASA's approach would prevent overseas operation of UK based aircraft. It would effectively prevent overseas aircraft from flying in the UK unless they equip with a UK-specific device.

The BHPA recommends further reading on HG and PG and the Association's role in connection with these airports in UK. This information, and the Association's position on EC can be found at this link:

https://www.bhpa.co.uk/documents/index.php?doc=BHPA_EC_Position.pdf

Rules of the air

Consultation Question 4

We seek views on how highly automated and autonomous aircraft should act in emergency scenarios. In particular:

1. should highly automated and autonomous aircraft be given the freedom to operate outside the rules of the air in emergency circumstances; or
2. should a comprehensive set of rules be developed for highly automated and autonomous aircraft in emergency situations.

Please share your views below

The BHPA's primary position is that highly automated and autonomous aircraft must be required to comply with the existing rules of the air at all times. Our aircraft are slow moving and have only a limited ability to take avoiding action. Our pilots must be able to rely upon highly automated and autonomous aircraft taking collision avoidance actions in a predictable manner, independent of our ability to take such collision avoidance action.

Depending on the lift source used by a highly automated and autonomous aircraft, collision avoidance may well include proximity avoidance since the effects of turbulent air can be as disastrous upon our aircraft as physical collision.

For safety reasons applying to crewed / uncrewed / third parties (whether interacting with aviation or not), uncrewed aircraft (whether carrying passengers or not) shall give way to crewed aircraft in both standard and emergency situations.

Consultation Question 6

We seek consultees' views on whether the rules of the air relating to communication should be adapted for remotely piloted and autonomous aircraft.

Please share your views below

The BHPA responds to this request, simply to highlight that the majority of our aircraft are "non-radio" and do not communicate with Air Traffic Control, Airfields and aircraft of other types.

Consultation Question 7

We ask for consultees' views on how the rules of the air might be adapted or developed for remotely piloted or autonomous flight

Please share your views below

The rules of the air need to accommodate remotely piloted or autonomous flight. Changes must prioritise the safety of third parties and crewed flight over un-crewed / remotely piloted and autonomous flight.

Remotely piloted and autonomous aircraft must be required to comply with the existing rules of the air at all times.

Remotely piloted and autonomous aircraft (including those carrying passengers) must be required to give way to crewed aircraft.

They must be able to detect hang gliders and paragliders and take whatever action necessary to avoid a collision, and maintain such a distance that does not cause hang gliders and paragliders to be affected by any turbulent air created by the autonomous / uncrewed aircraft. The effects of turbulent air can be as disastrous upon our aircraft as physical collision.

Our aircraft are slow moving and have only a limited ability to take avoiding action. Our pilots must be able to rely upon highly automated and autonomous aircraft taking collision avoidance actions in a predictable manner, independent of our ability to take such collision avoidance action.

VTOLs

Consultation Question 8

We provisionally propose that a person overseeing a VTOL flying automatically, who monitors its course and is able to intervene and change its course at any time should continue to be classified as a “remote pilot”. Do you agree?

Yes

Please expand on your answer below

Someone has to be responsible for the flight. This approach makes sense.

Consultation Question 9

We provisionally propose 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. Do you agree?

Yes

Please expand on your answer below

That's logical.

Consultation Question 10

We provisionally propose 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.

Do you agree? (Tick all that you agree with)

Please expand on your answer below

The remote pilot should have the same responsibilities as any pilot in command as defined in 965/2012.

Consultation Question 11

We invite views as to whether there are additional operational responsibilities that a remote VTOL pilot should be required to fulfil.

Please share your views below

Compliance by the operator, should the operator be separate from the remote pilot. It is possible to imagine a scenario of remote VTOL operators in one location and remote pilots elsewhere.

Consultation Question 12

We provisionally propose that the remote pilot-in-command should be responsible for, amongst other things, ensuring passengers are:

1. given a safety briefing; and
2. seated and wear seat belts during take-off and landing

Do you agree?

Yes

Please expand on your answer below

See above response concerning Pilot In Command responsibilities.

Consultation Question 13

We provisionally propose that air operators (rather than the remote pilot-in-command) should be responsible for preventing passengers from boarding:

1. who appear drunk or under the influence of drugs; or
2. whose carriage would, in the view of the operator's employees, endanger the safety of the aircraft or other passengers.

Do you agree?

Other

Please expand on your answer below

It must be confirmed by the remote pilot.

Consultation Question 14

We provisionally propose that the remote pilot-in-command should have the power to take reasonable measures, including restraint of passengers, as set out in section 94 of the Civil Aviation Act 1982. Do you agree?

Yes

Please expand on your answer below

Will need delivering by the operator.

Consultation Question 15

We provisionally propose that a person on board a VTOL aircraft (other than a crew member) should be able to take reasonable measures to protect the safety of the aircraft or of persons or property on board. Do you agree?

Other

Please expand on your answer below

If there are no crew onboard it is difficult to envisage how you propose this will work.

Consultation Question 16

We seek views on whether the powers of crew on board a VTOL aircraft should be broadened to reflect those of the pilot-in-command under the Civil Aviation Act 1982 to:

1. take reasonable measures to protect the safety of the aircraft or persons or property on board;
2. maintain good order and discipline; or
3. enable the crew to disembark or deliver a person.

Please share your views below

Seems reasonable.

Consultation Question 17

We provisionally propose that passengers should be able to contact a member of crew at all times during an operation. Do you agree?

Yes

Please expand on your answer below

Seems reasonable.

Consultation Question 18

We provisionally propose 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. Do you agree?

Yes

Please expand on your answer below

Medical and related compliance should be the same as for the pilot of a a crewed flight.

Consultation Question 19

We provisionally propose that it should be a criminal offence for a person to act as the remote pilot of a VTOL when the level of alcohol in their blood, breath or urine is over a prescribed limit. Do you agree?

Yes

Please expand on your answer below

Compliance should be the same as for the pilot of a crewed flight.

Consultation Question 20

We provisionally propose that the remote pilot should be subject to the reporting obligations currently applicable to pilots under the Air Operations Regulation. Do you agree?

Yes

Please expand on your answer below

Compliance should be the same as for the pilot of a crewed flight.

Consultation Question 21

We provisionally propose that a remotely piloted VTOL should be required to be capable of detecting and recording information relating to accidents and near accidents for the purposes of reporting it. Do you agree?

Yes

Please expand on your answer below

Compliance should be the same as for the pilot of a crewed flight.

Consultation Question 22

We provisionally propose that licences should be required for remote VTOL pilots. So far as appropriate, these should follow the classes and ratings adopted for crewed VTOLs. Do you agree?

Yes

Please expand on your answer below

Compliance should be the same as for the pilot of a crewed flight.

Consultation Question 23

We provisionally propose that operators of remotely piloted VTOL should be certified. Do you agree?

Yes

Please expand on your answer below

It will be the only way of establishing safe standards in what will be a highly commercial and low experience environment.

Consultation Question 24

We provisionally propose that operators of remotely piloted VTOLs should continue to be required to:

- ☒ (1) have the means necessary for the scale and scope of operations planned;
- ☒ (2) use only suitably qualified and trained personnel;
- ☒ (3) implement a management system to ensure safety;

- ☒ (4) ensure operations only take place in accordance with the operations manual;
- ☒ (5) establish procedures to minimise the consequences to safe flight operations of disruptive passenger behaviour;
- ☒ (6) develop and maintain security programmes suitable for the aircraft and type of operation;
- ☒ (7) have a management system to prevent fatigue.
- ☒ (8) ensure the continuing airworthiness of the aircraft; and.
- ☒ (9) establish procedures for any reasonably foreseeable emergency situation.

Consultation Question 25

We seek views as to whether there are additional responsibilities that operators of remotely piloted VTOLs should need to fulfil.

Please share your views below

The remote pilot is compliant with all appropriate standards.

Consultation Question 26

We seek views as to whether the law should permit remote pilots to act as pilot-in-command for more than one VTOL at the same time.

Please share your views below

If proven and certified technology can enable this, it might become a regulatory necessity.

Consultation Question 27

We seek views as to whether there should be an upper limit to the number of VTOLs for which a remote pilot can act as pilot-in-command at the same time.

Please share your views below

We have no expertise in this area.

Consultation Question 29

We seek views as to whether there should be a role for a person supervising the flight of an autonomous passenger-carrying VTOL and acting as a point of contact in relation to it. What powers or responsibilities should such a person have?

Please share your views below

The remote pilot should be in charge. If the remote pilot is unqualified, they will need supervision, and the supervisor will assume full responsibility.

Consultation Question 31

We seek views as to whether initial airworthiness standards for uncrewed VTOLs should include accessibility standards for persons with disabilities and reduced mobility.

Please share your views below

The option should be available aligned with current legislation regarding existing aircraft.

Consultation Question 32

We seek views as to whether the CAA should be able to include accessibility standards within the licences granted to uncrewed VTOL operators.

Please expand on your answer below

Same as existing requirements.

Consultation Question 33

We seek consultees' views on any other issues with the current legal framework as it relates to operations involving autonomous VTOLs.

Please share your views below

The regulation of remotely piloted and autonomous VTOLs operations must not add burdens to existing crewed aviation.

Drones

Consultation Question 34

We provisionally propose that a remote pilot for drones should continue to be defined as "a natural person responsible for safely conducting the flight of an unmanned aircraft by operating its flight controls, either manually or, when the unmanned aircraft flies automatically, by monitoring its course and remaining able to intervene and change its course at any time". Do you agree?

Yes

Consultation Question 36

We provisionally propose that for autonomous operations in the specific category, a UAS 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 manned 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.

Consultation Question 37

We seek views on what operational requirements should be applied to autonomous drone operations and drones that operate beyond visual line of sight in the specific and certified categories.

Please share your views below

These operations should not impact existing manned flight.

Consultation Question 41

We provisionally propose that use of flight data recorder systems or devices should be mandatory for autonomous drone operations. Do you agree?

Yes

Please expand on your answer below

This will support compliance and flight safety requirements.

Consultation Question 42

Should the law permit a drone to transition between remotely piloted and autonomous flight during an operation?

Other

Please expand on your answer below

Should this be permitted, it should not add burdens to existing crewed aviation.

Consultation Question 43

We seek stakeholder views on any other issues with the current legal framework as it relates to operations involving autonomous drones.

Please share our views below

The regulation of the operation of autonomous drones should not result in additional regulation for existing crewed flight.

Civil liability and insurance

Consultation Question 44

We provisionally consider that the current law governing air carrier liability for injury or death of passengers in the UK is adequate for the introduction of remotely piloted and autonomous operations. Do you agree?

Other

Please expand on your answer below

Insurance requirements are based on measured risk. Requires further independent analysis.

Consultation Question 45

We provisionally consider that the current law governing liability for damage to cargo in the UK is adequate for the introduction of remotely piloted and autonomous operations. Do you agree?

Yes

Consultation Question 48

We provisionally propose that there should be a review product liability law (including the Consumer Protection Act 1987) to take account of the challenges of emerging technologies. The review should cover product liability as a whole, rather than be confined to aviation or automated vehicles. Do you agree?

Yes

Consultation Question 49

We seek views as to whether the current law regarding liability for mid-air collisions is satisfactory in the case of collisions involving uncrewed aircraft systems.

Please share your views below

As long as it is clear in law who is the responsible pilot of an un-crewed air system and they are made aware via certification or licensing requirements and examination of their responsibilities to avoid a collision, then yes.

Law Commission

Response to Aviation Autonomy Consultation

Dear [REDACTED]

Following our recent meeting, please find enclosed a response to the Aviation Autonomy Consultation that covers the areas we discussed. Standards play a key role in enabling government to deliver smart, safe and sustainable transport systems, including the transition to more autonomous forms of aviation.

BSI is appointed by government as the UK's National Standards Body (NSB) and is responsible for developing national technical and management standards covering all sectors of the economy as well as representing UK interests in international standards through our membership of the international and European standards organizations.

Standards are a smart, low-cost, and pro-business way to resolve policy problems in a way that is compatible with inclusive growth, productivity, and market access. Standards protect the wellbeing and safety of UK citizens, help secure our supply chains, promote innovation, and advance our international competitiveness.

We bring together businesses, civil society, and policymakers, to define what 'good' looks like and identify practical, consensus-led solutions to the challenges facing the country.

Standards and compliance with them have a crucial role to play in supporting government's interests in harnessing innovation for the public good while also fostering productivity and efficiency in public services, within a cash constrained environment and as part of the regulatory landscape through product or systems certification, earned recognition or co-regulation.

Standards have a crucial role to play in delivering safe and sustainable transport whilst supporting growth and innovation in areas such as aviation autonomy.

I look forward to continuing to engage with the Law Commission on this important emerging regulation.

Yours sincerely,

Chris Gee

Head of Sector, Air Mobility

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Response to Aviation Autonomy Consultation

	Theme	Description and recommendation
1.	Co-regulatory approach	Many areas where the consultation seeks input on regulation, there is existing best practice from other sectors demonstrating how standards can be used to influence the market in advance of new regulation. Examples include: • Competency (Questions 26 and 27) – PAS1884 Safety Operators in Automated Vehicle Testing and Trialling • Accessibility (Questions 31 and 32) - PAS 1899: 2022 – Electric vehicles – Accessible charging – Specification
2.	Designated standards	From 1 January 2021, the GB regulatory framework enables the relevant Secretary of State to ‘designate’ standards for regulatory conformity purposes. Further details of the designation process can be found on the government website: https://www.gov.uk/guidance/designated-standards Within the aviation sector, as far as we are aware, the use of designated standards is limited to UK Delegated Regulation (EU) 2019/945 relating to the product class marking of UAS. We recommend exploring a co-regulatory approach that makes more effective use of designated standards and the National Quality Infrastructure (NQI). Further details on the NQI can be found on the government website: https://www.gov.uk/guidance/the-uks-national-quality-infrastructure
3.	Standards as Acceptable Means of Compliance (AMC)	National Aviation Authorities (NAAs) and regional authorities (e.g. EASA) are more progressive in specifying formal standards as AMC, such that if the standard is met this fulfils the intent of the regulation. We recommend that the UK explores lessons learnt from other NAAs and regional authorities to understand how formal standards can be more effectively used as AMC.
4.	Parallel development of regulation and AMC	We recommend exploring more effective collaboration models with Standards Development Organisations (SDOs) to enable parallel development of regulation and AMC to safely accelerate innovation within the aviation sector

5.	Public acceptance and social licence	Commercialisation and industrialisation of new forms of more autonomous aircraft will be highly dependent on achieving public acceptance and social licence. Formal research conducted Future Flight Social Insight (funded by the UKRI Future Flight Challenge) has highlighted that formal standards provide a key role in providing trust and assurance to the public to facilitate acceptance and social licence. We recommend that this important role of standards is recognised within policy and regulation, enabling a more strategic co-regulatory approach that utilises formal standards more effectively.
6.	Knowledge of standards within emerging aviation and Future Flight	There is significant confusion within the sector regarding terminology – policy, regulation, guidance material (GM), acceptable means of compliance (AMC) and formal standards. These terms are often used interchangeably, creating confusion and uncertainty across the sector. We recommend that clear definitions and inter-relationship between these constructs are clearly defined. BSI Flex 1903 - Future Flight Systems Vocabulary and PAS 1905, Future flight systems – Regulatory principles, management systems and design assurance processes – Guide are example standards helping to provide clarity on definitions and navigation of regulation.
7.	Proportionality of regulation	There are instances where target level of safety (TLOS) has been reduced compared with existing aviation. An example of this is flightworthiness in the specific category compared with airworthiness in the certified category. This has created confusion in the sector as it is not clear how this reduction in TLOS will be managed within the design assurance validation and verification lifecycle that relies on existing recommended practice standards such as ARP 4754B and ARP 4761A. We recommend that new proportionate standards be developed and recognised as AMC in situations where new TLOS are defined.
8.	Collaborative rulemaking	In the US, the FAA make use of Advisory and Rulemaking Committees (ARCs). A rulemaking committee provides information, advice and recommendations to the FAA. The FAA has the sole authority to establish and task ARCs. ARCs are formed on an ad hoc basis, for a specific purpose, and are typically of limited duration. Further information can be found on the FAA website:

		https://www.faa.gov/regulations_policies/rulemaking/committees We recommend that a similar approach be adopted in the UK to address capacity and capability constraints within the CAA post Brexit. BSI may be well placed to support the governance and management of UK ARC equivalent processes given the convening and consensus led similarities to standards development.
9.	CAP1616 - Airspace change	CAP1616 sets out the process for managing a proposed change to the airspace design. This is a well-defined process and can take a considerable amount of time to execute. We recommend exploring whether there may be a potential to develop an expedited airspace change process for lower level airspace change requests such as Temporary Reserved Areas (TRAs). This will be required to accelerate the benefits of more autonomous forms of aviation.
10.	The role of Local Government	Through our convening role in standards development, we recognise the importance of Local Government and their role within the Future Flight Ecosystem, particularly as the interface with local residents and businesses. We recommend exploring the role local authorities have in the governance of lower level airspace and how this integrates with multi-modal transport.
11.	Maintaining the consultation document as a CAP	The consultation document provides a comprehensive overview of the complex regulatory landscape for aviation which in itself is of significant value. We recommend that the consultation document is published and maintained as a CAP to provide an up to date, single point of reference for UK aviation regulation.

RESPONSE TO LAW COMMISSION CONSULTATION ON AVIATION AUTONOMY

(Law Commission Consultation Paper 261)

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About you

What is the name of your organisation?

BT Group Plc

Drones

Consultation Question 34

We provisionally propose that a remote pilot for drones should continue to be defined as “a natural person responsible for safely conducting the flight of an unmanned aircraft by operating its flight controls, either manually or, when the unmanned aircraft flies automatically, by monitoring its course and remaining able to intervene and change its course at any time”. Do you agree?

Yes

Please expand on your answer below

We agree with the proposed definition for a remote pilot. However, we would like to note that in some use cases, the natural person responsible for a highly automated or autonomous flight may not be the individual on-site (or nearby).

For example, an on-site individual who is holding a controller may be more akin to a safety-marshal, rather than being the “guiding mind” of the drone. The remote pilot could be located elsewhere, and we suggest that the remote pilot should be aligned to the person who’s taken on accountability for the flight.

We suggest the remote pilot could be the individual responsible for signing off the risk assessment, because they are creating the flight conditions and making decisions about whether the risks are appropriate. Therefore, we believe that the legislation should allow for flexibility in terms of the operations and proximity of the remote pilot.

Consultation Question 35

We seek views on whether some low risk autonomous drone operations or drone operations conducted beyond visual line of sight might be accommodated in the open category. In particular:

1. whether there are any such use cases which might be suitable for the open category; and
2. if so, what conditions should be attached to these use cases if operated in the open category.

Please share your views below

As drone operations are scaled up in the future, we believe that the following low-risk autonomous drone operations could be considered for integration into the Open Category:

1. Operations where the piece of the flight beyond visual line of sight will be momentary and will not have the potential for the drone to enter any higher level of risk.

For example, a pilot is conducting a survey of a building. Flying well above head height, they wish to send the drone around the fourth wall of the building, only for 60-90 seconds, to capture imagery of the final building wall. They are able to assess via drone camera that there are no people in the area, they know they're in atypical airspace where the air risk is naturally lowered, and they're able to check the very predictable line of the building for any collision risks. Flying around the final side, keeping a minimum 10m separation distance from the building wall, poses no notable additional risks.

2. Operations where the drone will stay within a well-defined operating volume with clear geo-fences set up for the drone.

3. Any mission that currently requires a non-qualified visual observer to support the flight.

Consultation Question 36

We provisionally propose that for autonomous operations in the specific category, a UAS 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 manned 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.

Do you agree? (tick all that you agree with)

Please expand on your answer below

We generally agree with the UAS conditions. However, we have a comment on condition 2, where point two states that "any" risk of collision with crewed manned aircraft must be avoided. This is too strict and impossible to achieve, as there is always a slight risk of manned aircraft crashing into each other. Therefore, we suggest deleting the word "any" to make the legislation more feasible. strike a balance between encouraging an excellent safety culture, and permitting responsible use of drones where some risks remain but have been appropriately mitigated against. It is common practice in the current industry to ensure risks are "As Low As Reasonably Possible" (ALARP).

In addition, we point out that the emergency response effort areas may differ in size and we would appreciate if the legislation could give some flexible guidance in determining what is considered as "close" or "inside" emergency response zones more precisely. For instance, we currently think 150 metres would be a fair distance limit from the edge of the operational area, with the emergency services defining what the operational area should be based upon the incident type. Moreover, we would like to have more clarity on the shape of the emergency response area (whether the zone would be cylindrical or dome-like).

Consultation Question 37

We seek views on what operational requirements should be applied to autonomous drone operations and drones that operate beyond visual line of sight in the specific and certified categories.

Please share your views below

We feel to ensure the safety of actual flying, there needs to be one clear set of operational requirements per category, so that drone operators have the easiest possible way to understand and follow the requirements.

Consultation Question 38

We seek views on whether the current concept of a "remote pilot" is compatible with drone MSO. We also seek views on whether the remote pilots of drone MSO should continue to be subject to the same responsibilities as remote pilots for single drone operations.

Please share your views below

For the type of MSO described in (1) our response is Yes.

Our answer is yes for the MSO type mentioned in (2) as long as this person is the one who assumes responsibility for the safety of each drone's flight. Based on our remarks on Question 34, this would agree with our proposed definition of Remote Pilot.

Consultation Question 39

We seek views on whether there should be an upper limit to the number of drones for which an individual remote pilot is responsible.

Please share your views below

Although we are unable to comment on what we believe the upper limit to the number of drones for which an individual pilot is responsible, we believe that there should be an upper limit and that it should be set by the category of MSO operation. For instance, a remote pilot operating a swarm of drones would be able to control a different number of drones depending on MSO category.

Also, the number of drones may be the incorrect view. The amount of risk may be more appropriate (i.e. mapped to something like SAIL score – higher the SAIL category the more pilot involvement required).

We recommend when evaluating SAIL score, for a swarm acting as one body e.g. MSO (1), the SAIL score should be determined by the maximum score for any individual drone in the swarm.

For drones operating independently, there needs to be an evaluation of the risk of the operation overall. The process of deciding the upper limit of number of drones for which an individual remote pilot should be responsible will need to consider the cognitive ability of a human pilot to control and pay attention to the spatial position of multiple objects. Although we do not know what to suggest to quantify this, we feel it is self-evidently harder to control multiple drones operating independently e.g. MSO (2) than the same number of drones acting as one body e.g. MSO (1).

Consultation Question 40

We seek views as to what additional safeguards should be introduced for remote pilots responsible for multiple drones.

Please share your views below

Operating environment should be appropriate to aid concentration. This means it shouldn't be exposed to weather, have seating/desks, power, and be somewhere the pilot will not be distracted by other people or events e.g. Office.

Internet Connection & Resilience & Robustness should be sufficient and in keeping with the requirements of the operation.

There may need to be a competency and currency requirement specifically for assessing suitability of the remote pilot to be responsible for the drone MSO, akin to the existing GVC qualification. Perhaps there should be subtypes for MSO (1) and MSO (2) as there is at present for Fixed Wing and Rotary drone piloting.

Consultation Question 41

We provisionally propose that use of flight data recorder systems or devices should be mandatory for autonomous drone operations. Do you agree?

Yes

Please expand on your answer below

We agree that recording of flight data for autonomous drone operations should be mandatory, to enable investigation in the event of an incident. However we note the pragmatic implications of siting this in data recorder systems physically on the drone, and the additional weight and complexity of protecting these against crash damage. We would like to propose that solutions can exist where flight data is continuously streamed off the autonomous drone (or drones) over a C2 link and stored for a determined period of time after a flight sufficient to allow recovery and longer-term storage if an incident did subsequently occur e.g. 30 days.

The depth and accuracy of the data required should be aligned with the proposed CAA class marking framework and mission risk assessment/SAIL framework.

Consultation Question 42

Should the law permit a drone to transition between remotely piloted and autonomous flight during an operation?

Yes

Please expand on your answer below

Yes, we believe this should be permitted. We believe the law should allow flexibility for the most appropriate and safe flying method for each part of the flight to be used. This would enable e.g. remote piloting to a delivery corridor, then handover to autonomous flight within the delivery corridor protected by UTM. Or, autonomous flying over low risk airspace to a location where a detailed inspection close to a structure is carried out under remote pilot supervision.

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About you

What is the name of your organisation?

The Civil Aviation Authority

Airworthiness and certification

Consultation Question 1

We seek views on how current airworthiness and certification regulation might need to be adapted or developed in light of highly automated and autonomous aircraft. In particular, should provisions be adopted which allow for:

1. the certification of optionally piloted and uncrewed or unoccupied versions of conventional aircraft (hybrid versions); and
2. the separate certification of command units?

Please share your views below

1. The current system for assessing airworthiness caters for new and novel innovation through special conditions, see para 4.23 and 4.24 which describes this well. Modern certified aircraft are complex and highly automated, with decisions made without the pilots input. So pilotless aircraft are an evolution, with many systems on existing aircraft needing only minor changes, but, recognising other aspects/challenges of removing the pilot are completely new. Some upfront work in requirements and standards are a benefit to develop/adapt existing regulation and certification, not all gaps are an issue. They can initially filled by special conditions which promotes innovation by not confining applicants to existing rules/norms.

New platforms may be developed incrementally, as piloted at first and then transition towards autonomous operation, once enough operational data have been collected through piloted operations to develop and assure the autonomous version.

2. Command units are unlikely to be a product in their own right, but could be equipment, as some existing equipment and parts are certified in their own right

through Technical Standard Order Authorisations. For UAS in the Specific category this would be considered in the development of the Flightworthiness Scheme subject to future CAA consultations.

Consultation Question 2

We welcome views on what changes to the certification system might be necessary to enable higher automation and autonomy in aviation.

Please share your views below

Some considerations regarding the challenges of enabling higher automation and autonomy in aviation.

- Clear separation between implementation option (AI) and end result (Higher-Automation/Autonomy).

AI is a new generation of software development methods and should be treated as such; novel software possibly running on novel hardware. Therefore, challenges related to AI should be addressed at lower level; development standards, CS, AMC, and GM should be developed to address the challenges like explainability, data correctness and completeness, and 'adaptability' or 'unpredictability'.

Higher automation/autonomy is a result that may or may not be achieved through the use of AI. Challenges related to higher automation/autonomy, should be addressed at a higher level; policies, regulations and laws should be developed to address challenges like accountability and liability in absence of a human-in-command.

The former should reflect the latter.

- Particularly for AI, development of novel assurance methods to underpin CS, AMC and GM fit for the capabilities of the technology.

There should be a clear distinction between learning/adaptive systems and learnt/non-adaptive systems. The former are systems that are allowed to adapt their behaviour whilst in operation and it is an open question whether they would ever be appropriate for safety critical applications. The latter are systems that learn and adapt their behaviour during development (a.k.a. training in AI language) and then remain 'frozen' (i.e., no longer adapt their behaviour) once deployed. These systems are adaptable in the sense that they are trained to handle large and complex inputs, but they are deterministic (i.e., same inputs lead to the same outputs) once deployed in operation. In that sense, these systems are adaptive enough to accomplish tasks complex enough to require AI in the first place, but also predictable, to the extent that a known instance of the frozen system's inputs will always yield the same output.

However, even for non-adaptive systems, novel assurance methods will be required. For example, quantitative testing frameworks might need to be developed to compensate for the lack of formal verification, which is difficult to achieve for ML

methods. After all, AI methods are used to implement software capable of more complex tasks than ‘traditional software’ – if we need more advanced methods in order to perform those tasks, it is reasonable to argue that we will also need more advanced methods in order to assure that they are performed correctly and, above all, safely.

Moreover, since the whole purpose is to increase automation by reducing human activity, it might be reasonable to argue that there could be compliance mechanisms based on demonstrating quantitatively human-equivalent or super-human performance in performing the automated tasks. If we can quantitatively demonstrate that a highly automated system consistently equals that or outperforms human experts in a specific task, it might be possible to defend safety arguments about it.

Consultation Question 3

We seek views on whether current regulatory tools to support the development of highly automated and autonomous aviation technologies are adequate.

Please share your views below

The current regulatory tools available are sufficient to support the development of new aviation technologies. As the Law Commission outlines, these tools include a number of ways to conduct experimental test flights. It is important to support the development of new aviation technologies whilst maintaining a high standard of safety.

Permits to fly, for example, allow flying to enable the testing of an aircraft in support of development, albeit in a more limited capacity. Moreover, operating an aircraft under E Conditions is a way of flying a prototype to test certain concepts without the need to obtain a permit to fly. Both options allow a safe and controlled way to test prototypes and develop technology. In respect of regulatory sandboxes and test and evaluation activities, the evidence collected through the use of this tool can help assuage regulatory uncertainty and thus allow more innovative technologies to reach the market, ultimately leading to major benefits for consumers.

Rules of the air

Consultation Question 4

We seek views on how highly automated and autonomous aircraft should act in emergency scenarios. In particular:

1. should highly automated and autonomous aircraft be given the freedom to operate outside the rules of the air in emergency circumstances; or
2. should a comprehensive set of rules be developed for highly automated and autonomous aircraft in emergency situations.

Please share your views below

1. The agility and manoeuvrability of these platforms means that they could have the freedom to operate outside the rules of the air in an emergency situation, eg to avoid a collision with a less manoeuvrable platform
2. Applicability of extant rules and any development of such should be described appropriate for the conditions

Consultation Question 5

We seek consultee views about what challenges remotely piloting an aircraft in an emergency scenario presents and how these might be addressed

Please share your views below

During precautionary or emergency landings, it would be difficult for the remote pilot to find a suitable landing spot that minimises the ground risk. Technologies and systems could be developed with appropriate performance and assurance that enable adequate detection to mitigate risk.

Consultation Question 6

We seek consultees' views on whether the rules of the air relating to communication should be adapted for remotely piloted and autonomous aircraft.

Please share your views below

Yes. There are some circumstances where communications with a remote pilot will be required. Some of the rules pertaining to voice comms are more easily converted to remotely piloted/autonomous aircraft (for example, using sensors for relaying weather reports) but as the consultation paper highlights, an issue arises when comms rely on human vision of another's signals. Should the data comms system fail, there would be no human back up for an intercept scenario. Scenarios need to be considered.

Consultation Question 7

We ask for consultees' views on how the rules of the air might be adapted or developed for remotely piloted or autonomous flight

Please share your views below

There should be consideration that uncrewed platforms are more agile and could be the avoiding party in a mid-air scenario, including early avoidance to prevent the other platform having to either manoeuvre excessively or have to react first. A cooperative surveillance environment would support many scenarios.

The ability of any new airspace user to operate in low level airspace under IFR will clearly place considerable demand on ATS provision within airspace classifications where separation is required to be delivered between IFR flights. Any change to those separation agreements or to the core requirements of the flight rules (such as Digital Flight Rules) should be progressed internationally but contributed to and anticipated nationally.

VTOLs

Consultation Question 8

We provisionally propose that a person overseeing a VTOL flying automatically, who monitors its course and is able to intervene and change its course at any time should continue to be classified as a “remote pilot”. Do you agree?

Yes

Please expand on your answer below

A certified VTOL being flown remotely, should be flown by a remote pilot. This person will be charged with the safety of passengers, even if not directly manipulating the controls of the aircraft.

Consultation Question 9

We provisionally propose 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. Do you agree?

Yes

Consultation Question 10

We provisionally propose 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.

Do you agree? (Tick all that you agree with)

Consultation Question 11

We invite views as to whether there are additional operational responsibilities that a remote VTOL pilot should be required to fulfil.

Please share your views below

The responsibilities should remain the same - they can be delegated with appropriate means for providing assurance to the PiC. The practicalities of being remote from the operation means that it will be very difficult for the pilot to assume those responsibilities without highly robust systems in place to ensure the safety outcomes we are trying to achieve.

Consultation Question 12

We provisionally propose that the remote pilot-in-command should be responsible for, amongst other things, ensuring passengers are:

1. given a safety briefing; and
2. seated and wear seat belts during take-off and landing

Do you agree?

Yes

Please expand on your answer below

Given the duration of the flights that industry are proposing, it might be the case that seatbelts are continuously worn. There is no toilet or anywhere for the passengers to move around the aircraft in the flight.

Consultation Question 13

We provisionally propose that air operators (rather than the remote pilot-in-command) should be responsible for preventing passengers from boarding:

1. who appear drunk or under the influence of drugs; or
2. whose carriage would, in the view of the operator's employees, endanger the safety of the aircraft or other passengers.

Do you agree?

Yes

Please expand on your answer below

Agreed. Is 'air operators' the appropriate term for intended purposes, for example, in leasing scenarios when responsibilities are nuanced?

Consultation Question 14

We provisionally propose that the remote pilot-in-command should have the power to take reasonable measures, including restraint of passengers, as set out in section 94 of the Civil Aviation Act 1982. Do you agree?

Yes

Please expand on your answer below

Although they will not be present on the aircraft, and neither may any cabin crew, so unlikely this will be feasible. If the pilot is going to authorise the restraint of a passenger remotely, it would require briefing of passengers as part of the safety briefing, as current industry plans do not have cabin crew on board to supervise the process. In this instance there needs to be measures to prevent the abuse of this power and to protect vulnerable passengers. This may need to be an operator responsibility as opposed to a PiC.

Consultation Question 15

We provisionally propose that a person on board a VTOL aircraft (other than a crew member) should be able to take reasonable measures to protect the safety of the aircraft or of persons or property on board. Do you agree?

Yes

Please expand on your answer below

We can see this is a practical issue that will need considered in the drafting of the legislation. There would need to be some safeguarding in the drafting that recognises the passengers are not 'experts' but recognise that the law must consider some action to be taken by the passenger.

Consultation Question 16

We seek views on whether the powers of crew on board a VTOL aircraft should be broadened to reflect those of the pilot-in-command under the Civil Aviation Act 1982 to:

1. take reasonable measures to protect the safety of the aircraft or persons or property on board;
2. maintain good order and discipline; or
3. enable the crew to disembark or deliver a person.

Please share your views below

The same powers and duties should apply to VTOL crew as are currently in force. If no PIC, we agree that these should be broadened.

Consultation Question 17

We provisionally propose that passengers should be able to contact a member of crew at all times during an operation. Do you agree?

Yes

Please expand on your answer below

This is vital for safeguarding. 'Member of crew' does not need to be the PIC. In fact for VTOL with crew onboard, it might be better if the passengers contacted ground crew who would then relay a message, to avoid distraction to the PIC.

Consultation Question 18

We provisionally propose 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. Do you agree?

Yes

Please expand on your answer below

We would expect that the same rules for a current commercial pilot should apply. This could also include fatigue, illness or other condition that could impair performance.

Consultation Question 19

We provisionally propose that it should be a criminal offence for a person to act as the remote pilot of a VTOL when the level of alcohol in their blood, breath or urine is over a prescribed limit. Do you agree?

Yes

Consultation Question 20

We provisionally propose that the remote pilot should be subject to the reporting obligations currently applicable to pilots under the Air Operations Regulation. Do you agree?

Yes

Please expand on your answer below

Agree, however, in some of the activities normally carried out by a traditionally crewed pilot will be undertaken by ground staff at the vertiport. This could be extended to any other personnel associated with operating the aircraft.

Consultation Question 21

We provisionally propose that a remotely piloted VTOL should be required to be capable of detecting and recording information relating to accidents and near accidents for the purposes of reporting it. Do you agree?

Yes

Please expand on your answer below

The CAA will need to do more technical work to define what the detecting 'criteria' are. It may be different to current operations based on the operating models. The remote pilot may not have the visual and audio queues associated with bird strike, vibration etc and whilst the responsibility sits with the pilot, it is the operator whom must ensure that such events are brought to their attention for reporting.

Consultation Question 22

We provisionally propose that licences should be required for remote VTOL pilots. So far as appropriate, these should follow the classes and ratings adopted for crewed VTOLs. Do you agree?

Yes

Please expand on your answer below

Remote pilots will be licenced. Whether or not it is appropriate for the crewed pilot classes and ratings to be followed for remote VTOL pilots is not possible to say at this stage.

Consultation Question 23

We provisionally propose that operators of remotely piloted VTOL should be certified. Do you agree?

Yes

Please expand on your answer below

If in this context, VTOL refers to a certified operation (e.g. pax carrying).

Consultation Question 24

We provisionally propose that operators of remotely piloted VTOLs should continue to be required to:

- ☒ (1) have the means necessary for the scale and scope of operations planned;
- ☒ (2) use only suitably qualified and trained personnel;
- ☒ (3) implement a management system to ensure safety;
- ☒ (4) ensure operations only take place in accordance with the operations manual;
- ☒ (5) establish procedures to minimise the consequences to safe flight operations of disruptive passenger behaviour;
- ☒ (6) develop and maintain security programmes suitable for the aircraft and type of operation;
- ☒ (7) have a management system to prevent fatigue.
- ☒ (8) ensure the continuing airworthiness of the aircraft; and.
- ☒ (9) establish procedures for any reasonably foreseeable emergency situation.

Do you agree? (tick all that you agree with)

Please expand on your answer below

Yes. In 2, we would suggest "only suitably qualified and 'competent' personnel", instead of 'trained' personnel. Training does not necessarily imply competence; the latter also requires experience.

Consultation Question 25

We seek views as to whether there are additional responsibilities that operators of remotely piloted VTOLs should need to fulfil.

Please share your views below

Additional responsibilities could include but not limited to:

- Accident reporting
- Whistleblowing procedures
- Having an accountable manager

- Security of Remote Pilot Stations
- Cyber Security Compliance
- Assurance of integrity of C2 Link (could be via C2 CSP)

There are unknowns in this operating environment that will undoubtedly require addressing.

Consultation Question 26

We seek views as to whether the law should permit remote pilots to act as pilot-in-command for more than one VTOL at the same time.

Please share your views below

Remote pilots may be authorised to act as PiC for more than one VTOL at the same time if the operator can demonstrate to the satisfaction of the Regulator that the relevant procedures are in place, including emergency procedures, processes to quickly bring in other PiCs in cases of emergency or complex scenarios, human factor limitations and mitigations, etc. With sufficient mitigation a single emergency situation can be handled without compromising the other operation(s).

The development of the regulatory framework would be dependent on industry demand and capability.

Consultation Question 27

We seek views as to whether there should be an upper limit to the number of VTOLs for which a remote pilot can act as pilot-in-command at the same time.

Please share your views below

The limit to the number of VTOL a single remote PiC can control should be determined by an assessment relevant to the particular operation, and include inter alia, the complexity of the airspace, possible non-normal operational scenarios, accessibility and availability of relief pilots, availability of additional support to the PiC, robustness of the communication etc. This process should be approved by the Regulator.

Consultation Question 28

We seek views as to what additional safeguards should be introduced for remote pilots piloting multiple VTOLs.

Please share your views below

There are unknowns in this operating environment that will undoubtedly require addressing. This list is not exhaustive, considerations include:

- Introduction of robust safety cases and operating experience without CAT passengers to prove the extension of operation.
- A method by which the operator can quickly bring in a 'relief' pilot or additional pilot in circumstances which that may cognitively overload the remote pilot.

Additional RP(s) available to allow more capacity for emergency situations so that one RP would then be able to deal with the emergency.

Consultation Question 29

We seek views as to whether there should be a role for a person supervising the flight of an autonomous passenger-carrying VTOL and acting as a point of contact in relation to it. What powers or responsibilities should such a person have?

Please share your views below

Yes, there must be such a role, with a set of responsibilities. For a fully autonomous RPA, there will be no remote pilot. The operator is accountable for the safe operation, and responsibility must be delegated to an appropriate person(s) in the organisation. The operator management structure and Nominated Persons associated with it are key here. Ground operations becomes a significant role with many of the pilots' responsibilities in practice devolved at a working level to ground staff.

Duties would include inter alia: passenger liaison and welfare, passenger information (e.g. in cases of emergency what to do); pre-flight safety checks

There are unknowns in this operating environment that will undoubtedly require addressing.

Consultation Question 30

Should the law permit an uncrewed VTOL to transition between remotely piloted and autonomous flight during an operation?

Yes

Please expand on your answer below

It should be permissible in defined circumstances. It may be more appropriate to be in an autonomous mode for one phase of flight, and manually piloted in another. This could be addressed at regulatory level, for example, permitted when a safety

case is demonstrated, leaving the option to allow it with some stringent conditions at a later date.

Consultation Question 31

We seek views as to whether initial airworthiness standards for uncrewed VTOLs should include accessibility standards for persons with disabilities and reduced mobility.

Please share your views below

We expect organisations that we regulate to comply with their legislative obligations in respect of accessibility for people with disabilities and/or reduced mobility. These include UK Regulation (EU) 1107/2006, as well as any relevant obligation under the Equality Act 2010 and the objectives of the Public Sector Equality Duty to the extent that these apply. We await with interest the detailed views of respondents in respect of this proposal. Before introducing any accessibility standards within special conditions or certification specifications for passenger-only VTOLs, we would carry out further consultation with stakeholders and consider any responses through the prism of our own obligations under the Equality Act 2010. We are conscious of the necessity to have due regard to the Public Sector Equality Duty in respect of all relevant policies and decisions, and of how we are able to use our role as the regulator to effect positive change in this area.

Consultation Question 32

We seek views as to whether the CAA should be able to include accessibility standards within the licences granted to uncrewed VTOL operators.

Please expand on your answer below

This would be a pragmatic approach as opposed to including it within the type certification. The operator can determine how to accommodate accessibility requirements in line with law and regulation referenced in response to question 31.

Consultation Question 33

We seek consultees' views on any other issues with the current legal framework as it relates to operations involving autonomous VTOLs.

Please share your views below

The transport of mobility aids in a VTOL must take into account the various types of self-powered mobility aids, namely with regards to electric mobility aids (powered by lithium ion batteries or other types of batteries) with the consideration of safety

systems such as fire detection and suppression and certification standards for these systems.

Drones

Consultation Question 34

We provisionally propose that a remote pilot for drones should continue to be defined as “a natural person responsible for safely conducting the flight of an unmanned aircraft by operating its flight controls, either manually or, when the unmanned aircraft flies automatically, by monitoring its course and remaining able to intervene and change its course at any time”. Do you agree?

Yes

Please expand on your answer below

We see no reason to change this definition.

Consultation Question 35

We seek views on whether some low risk autonomous drone operations or drone operations conducted beyond visual line of sight might be accommodated in the open category. In particular:

1. whether there are any such use cases which might be suitable for the open category; and
2. if so, what conditions should be attached to these use cases if operated in the open category.

Please share your views below

Some BVLOS operations are already permitted in the open category. VLOS is specifically defined in the regulations, and operations such as first person view, or 'follow me' mode fall outside this definition. These are both by definition, BVLOS. We do not see the need to expand beyond these two examples BVLOS in the open cat is not required.

Consultation Question 36

We provisionally propose that for autonomous operations in the specific category, a UAS 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 manned 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.

Do you agree? (tick all that you agree with)

Please expand on your answer below

Agree in principle, although it might not need to be contained in regulation. A more helpful change to the regulation here, would be to determine that it may be possible for there to be no remote pilot for a fully autonomous operation. Currently, a remote pilot is always required, which is fine for highly automated ops, but not fully automated. This is not always true. Perhaps a new definition for UAS would be helpful. The ICAO model could be appropriate for such, and differentiate between RPAS and UAS, to better reflect the types of aircraft, and the requirements that should apply to each of them.

Clarification on what constitutes an autonomous operation would be helpful. Autonomous flight might not be interpreted in the same way as autonomous operations. If the concept is that the whole operation is autonomous, then consideration must be given to loading/unloading/securing of cargo or dangerous goods and safety elements inherent to ground handling of a UAS and the people involved in the ground servicing of the aircraft.

There should be some form of validation of safety critical software that is used to operate the UAS.

Consultation Question 37

We seek views on what operational requirements should be applied to autonomous drone operations and drones that operate beyond visual line of sight in the specific and certified categories.

Please share your views below

For the certified category- the operational rules (SERA) should be broadly the same as the ruleset for other aircraft, and indeed those rules are likely to apply (though will need some amendment).

For the Specific category - those operational rules already set out in AMC for

2019/947 specific category, should be sufficient- regardless of whether the aircraft is autonomous or not. The rules the aircraft follows, and which other aircraft expect it to follow, should be the same.

Consultation Question 38

We seek views on whether the current concept of a “remote pilot” is compatible with drone MSO. We also seek views on whether the remote pilots of drone MSO should continue to be subject to the same responsibilities as remote pilots for single drone operations.

Please share your views below

Yes, MSO operations are compatible with both the definition of a remote pilot, and the responsibilities of a remote pilot. These should be able to be carried out by a remote pilot of one aircraft, manipulating the controls of the UA to fly it, or a fleet of UA within an MSO. The role of the pilot will change, and so will the training and operational requirements, and perhaps name (AMC/GM), but the framework in 2019/947 should still work.

Consultation Question 39

We seek views on whether there should be an upper limit to the number of drones for which an individual remote pilot is responsible.

Please share your views below

This is subject to the safety case of the operation, the competency of the remote pilot, the flightworthiness of the aircraft, and the technology enabling the automated aspects. There are too many variables to put this into legislation.

Consultation Question 40

We seek views as to what additional safeguards should be introduced for remote pilots responsible for multiple drones.

Please share your views below

The CAA do not see this needing to be required in legislation. In AMC/GM, the CAA would review the requirements with respect to pilot competency, the operator (including emergency scenarios procedures), flightworthiness and C2 link. The robustness of the procedures and mitigations would be expected to be in keeping with the number of aircraft operated by a single pilot.

Consultation Question 41

We provisionally propose that use of flight data recorder systems or devices should be mandatory for autonomous drone operations. Do you agree?

Yes

Please expand on your answer below

Operations in the Certified category should already be subject to these requirements.

Autonomous operations in the Specific category should require some sort of data recording, but possibly not the whole suite of certified FDR requirements. Some guidance is already set out in GM1 UAS.SPEC.050(1)(g)(iii). In the Specific category, an appropriate standard could be built into flightworthiness requirements for the Specific category.

Consultation Question 42

Should the law permit a drone to transition between remotely piloted and autonomous flight during an operation?

Yes

Please expand on your answer below

There are some aspects of a flight that may be better suited to autonomous flight, and some that may require a more tactical manipulation of controls by a remote pilot e.g. High Altitude Platform Stations (HAPS)

Consultation Question 43

We seek stakeholder views on any other issues with the current legal framework as it relates to operations involving autonomous drones.

Please share our views below

We welcome the outputs of the Law Commissions consultation to bring forward the issues identified with the current legal framework as it related to operations involving autonomous drones.

Civil liability and insurance

Consultation Question 44

We provisionally consider that the current law governing air carrier liability for injury or death of passengers in the UK is adequate for the introduction of remotely piloted and autonomous operations. Do you agree?

Other

Please expand on your answer below

We await with interest the detailed views of respondees in respect of civil liability and insurance requirements in the context of UAS operations. As the Law Commission has noted, having straightforward mechanisms for compensation following an accident has been crucial for commercial success. Moreover, having and maintaining insurance requirements ensures operators can cover their liability, though we appreciate insurance requirements and details thereof for uncrewed aircraft are being explored by government.

Consultation Question 45

We provisionally consider that the current law governing liability for damage to cargo in the UK is adequate for the introduction of remotely piloted and autonomous operations. Do you agree?

Other

Please expand on your answer below

We await with interest the detailed views of respondees in respect of civil liability and insurance requirements in the context of UAS operations. As the Law Commission has noted, having straightforward mechanisms for compensation following an accident has been crucial for commercial success. Moreover, having and maintaining insurance requirements ensures operators can cover their liability, though we appreciate insurance requirements and details thereof for uncrewed aircraft are being explored by government.

Consultation Question 46

We provisionally propose that liability for surface damage, in the case of UAS, should transfer to the lessee when the lease:

- (1) is for more than 14 days; and
- (2) specifies the aircraft is to be operated under the responsibility of the lessee.

Do you agree?

Other

Please expand on your answer below

We await with interest the detailed views of respondents in respect of civil liability and insurance requirements in the context of UAS operations. As the Law Commission has noted, having straightforward mechanisms for compensation following an accident has been crucial for commercial success. Moreover, having and maintaining insurance requirements ensures operators can cover their liability, though we appreciate insurance requirements and details thereof for uncrewed aircraft are being explored by government.

Consultation Question 47

We provisionally propose 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. Do you agree?

Other

Please expand on your answer below

We await with interest the detailed views of respondents in respect of civil liability and insurance requirements in the context of UAS operations. As the Law Commission has noted, having straightforward mechanisms for compensation following an accident has been crucial for commercial success. Moreover, having and maintaining insurance requirements ensures operators can cover their liability, though we appreciate insurance requirements and details thereof for uncrewed aircraft are being explored by government.

Consultation Question 48

We provisionally propose that there should be a review product liability law (including the Consumer Protection Act 1987) to take account of the challenges of emerging technologies. The review should cover product liability as a whole, rather than be confined to aviation or automated vehicles. Do you agree?

Other

Please expand on your answer below

We await with interest the detailed views of respondents in respect of civil liability and insurance requirements in the context of UAS operations. As the Law Commission has noted, having straightforward mechanisms for compensation following an accident has been crucial for commercial success. Moreover, having and maintaining insurance requirements ensures operators can cover their liability, though we appreciate insurance requirements and details thereof for uncrewed aircraft are being explored by government.

Consultation Question 49

We seek views as to whether the current law regarding liability for mid-air collisions is satisfactory in the case of collisions involving uncrewed aircraft systems.

Please share your views below

We await with interest the detailed views of respondents in respect of civil liability and insurance requirements in the context of UAS operations. As the Law Commission has noted, having straightforward mechanisms for compensation following an accident has been crucial for commercial success. Moreover, having and maintaining insurance requirements ensures operators can cover their liability, though we appreciate insurance requirements and details thereof for uncrewed aircraft are being explored by government.

Consultation Question 50

We seek consultees' views on whether they expect any difficulties applying existing insurance requirements to uncrewed aircraft systems.

Please share your views below

We await with interest the detailed views of respondents in respect of civil liability and insurance requirements in the context of UAS operations. As the Law Commission has noted, having straightforward mechanisms for compensation following an accident has been crucial for commercial success. Moreover, having and maintaining insurance requirements ensures operators can cover their liability, though we appreciate insurance requirements and details thereof for uncrewed aircraft are being explored by government.

Consultation Question 51

We provisionally propose that multiple simultaneous operations should be considered as the Government develops proposals for the insurance requirements applicable to uncrewed aircraft. Do you agree?

Yes

Criminal liability

Consultation Question 52

We provisionally consider that the current approach in the Air Navigation Order 2016 placing criminal liability on an operator is adequate for autonomous operations.

Do you agree?

Yes

Please expand on your answer below

We agree in principle that autonomous operations should be incorporated into the broader aviation regulatory regime and that this could be done by placing criminal liability on the operator but note that changes may be required to the Air Navigation Order 2016 (ANO) to facilitate this. Article 4(1) ANO 2016 provides a definition of operator. Currently Article 23(c) ANO 2016 removes the Open and Specified categories from most of the ANO including application of Article 4(1) ANO 2016. Schedule 1 ANO 2016 defines both what a UAS operator is and what a remote pilot is which distinguishes them from the meaning of operator and pilot in 265(1) ANO 2016. Therefore, it would appear a clear linguistic distinction has been made between Article 4(1) and Schedule 1 ANO 2016. Furthermore, the operator definition in Article 4 is not that which applies to 265A to F UAS operator.

Consultation Question 53

We provisionally consider that the “reasonable care” defence in article 265(3) of the Air Navigation Order 2016 applies adequately for “direct contraventions” under Article 265(5) to (8) involving autonomous operations. Do you agree?

Yes

Consultation Question 54

We seek views on whether for autonomous operations the reasonable care defence should be applicable to the vicarious liability created in article 265(1) of the ANO.

Please share your views below

Yes.

Consultation Question 55

We provisionally propose that a remote pilot of an uncrewed aircraft operating in the certified category should be treated as a pilot-in-command for the purposes of criminal liability pursuant to article 265(1) of the Air Navigation Order 2016. Do you agree?

Yes

Please expand on your answer below

We agree that remote pilots should be integrated into the wider aviation regulatory regime. Schedule 1 ANO 2016 defines both what a UAS operator is and what a remote pilot is which distinguishes them from the meaning of operator and pilot in 265(1) ANO 2016. Therefore, it would appear a clear linguistic distinction has been made between Article 4(1) and Schedule 1 ANO 2016.

Consultation Question 56

We ask for consultees' views on the criminal liability of pilots (or remote pilots) when an aircraft operating autonomously returns control to the pilot or vice-versa. In particular, should a pilot (or remote pilot) only become criminally liable for the piloting of the aircraft at the end of a transition period?

Please share your views below

The pilot in command is responsible for liability under 265(1) ANO as is the operator. In established aviation the pilot-in-command is responsible for every aspect of the flight (legal responsibility). For example, if a student commits an airspace infringement while the instructor is on the ground, the instructor may be prosecuted as the pilot in command. The pilot is ultimately responsible. Another example is in commercial aviation, even if the first officer is doing all the flying the pilot-in-command is responsible. Therefore, to distinguish phases of flight from overarching responsibility of pilot-in-command under 265(1) ANO 2016 it would not only be impossible to enforce but provides a distinction without an aviation difference.

Consultation Question 57

We provisionally propose that the pilot-in-command of aircraft in a multiple simultaneous operation should be criminally liable for breach of operating requirements in the same way as a pilot in command of a single aircraft would be. Do you agree?

Yes

Consultation Question 58

We invite consultees' views on whether the Air Traffic Management and Unmanned Aircraft Act 2021 operates satisfactorily in the case of highly automated and autonomous flight.

Please share your views below

We await with interest the detailed views of respondees in respect of this consultation question.

Consultation Question 59

We invite views on how operator responsibilities for dangerous goods might need to be adapted in light of autonomous operations.

Please share your views below

Transportation of Dangerous Goods should be covered by the Technical Instructions and be subject to the same requirements and oversight as all other modes of transport. However, considering the differences in the type of operations carried out by UAS and the type/s of aircraft involved, there may be circumstances when the full provisions of the Technical Instructions are not appropriate or necessary.

For example in the Specific Category of UAS operations. In such circumstances and when appropriate, the CAA may grant an alleviation in the Operational Authorisation to permit the carriage of DG without all the requirements of the Technical Instructions being fulfilled, provided an equivalent level of safety can be achieved. The applicable conditions will be described in the approval document (Operational Authorisation).

Consultation Question 60

We ask for consultees' views about whether the offence of hijacking in domestic law should be updated to:

1. include the unauthorised seizure or control of autonomous or remotely piloted aircraft by technological means or by persons not on board the aircraft; and
2. expand the period in which hijacking can occur from the period when an autonomous or remotely piloted aircraft is "in flight" to the period when it is "in service".

Please share your views below

The act currently states the person must be onboard an aircraft in flight and makes reference to the use of force or threats. The act should be amended to include the 'hijacking' of autonomous or remotely piloted aircraft, and that this can take place using technical as well as physical methods. Force or threats would still be relevant to remotely piloted aircraft.

The term in-service is correct but we will need to define it so that it includes the "hijack" of an autonomous system whether it is on the ground or in the air operating. It should be considered in connection with The Computer Misuse Act and the Hijacking Act, as we will now have remote threat actors who could be capable of remotely "hijacking" remotely piloted aircraft mid-flight.

It should be noted that the Technical Instruction include requirements for high consequence dangerous goods, which are those which have the potential for misuse in a terrorist event and which may, as a result, produce serious consequences such as mass casualties, mass destruction or, particularly for Class 7, mass socio-economic disruption. These are clearly listed and referenced.

Consultation Question 61

We also ask consultees for views on whether any offences against the aircraft other than hijacking need to be updated to account for increased autonomy in aviation.

Please share your views below

Not at this time. There is the computer misuse act and Aviation Security Act 1982. A drone is considered an aircraft and much legislation covers it adequately.

Impact

Consultation Question 64

We invite consultees to tell us if they believe or have evidence or data to suggest that any of our provisional proposals could result in advantages or disadvantages to certain groups or based on particular characteristics (with particular attention to age, disability, transgender identity, marriage and civil partnership, pregnancy and maternity, race, religion or belief, sex or gender, and sexual orientation).

Please share your views below

We await with interest the detailed views of respondees in respect of this proposal. Before adopting any of these provisional proposals we would carry out further engagement with stakeholders and consider any responses through the prism of our own obligations under the Equality Act 2010. We are conscious of the necessity to have due regard to the Public Sector Equality Duty in respect of all relevant policies and decisions, and of how we are able to use our role as the regulator to effect positive change in this area.

Law Commission Consultation

Aviation Autonomy

CAA Consumer Panel response

Background

The CAA Consumer Panel is a non-statutory critical friend, giving expert advice to the Civil Aviation Authority (CAA) as policy is being developed, to ensure aviation consumer interests are central. We are a group of independent experts, who bring together deep consumer expertise and experience along with strategic thinking, applying these in a practical way to improve the experience for aviation passengers.

Our role is to champion the interests of consumers, with a particular focus on advocating for those in vulnerable circumstances and who have accessibility needs. In particular, we have worked with the CAA to develop a better understanding of the consumer interest in the context of new technologies to ensure it is considered throughout the innovation development process at appropriate stages – particularly in respect of Advanced Air Mobility (VTOLs) and AI. We therefore welcome this opportunity to input to an important future framework that will transform future travel for consumers.

The Law Commission has invited responses to 64 questions around the adequacy of the regulatory framework (including gaps and uncertainties in current provisions) in respect of the areas listed below.

- UAS Regulation (Chapter 3)
- Airworthiness and certification (Chapter 4)
- Rules of the air (Chapter 5)
- VTOLs (Chapter 6)
- Drones (Chapter 7)
- Civil liability and insurance (Chapter 8)
- Criminal liability (Chapter 9)
- Impact (Chapter 10)

This is to ensure future frameworks are prepared for advances in automation and ultimately autonomous flight, and that such advances take place safely, lawfully and with appropriate mechanisms for attributing criminal and civil liability when things go wrong.

The Panel's approach to this consultation

We have approached the consultation through a 'consumer lens' and our role as the CAA's, critical friend¹ focusing on questions that are most relevant and likely to have implications for aviation consumers.

¹ See [Consumer Panel Terms of Reference](#).

Our response is structured as follows:

Part A – Key themes

Summarises the key themes in our response, with a particular focus on gaps and practical considerations to progress alongside the development of a future regulatory framework which will be essential to make autonomy in aviation work in practice for aviation consumers and the public.

Part B – Annex (responses to relevant questions in the consultation)

As noted above, we have approached the consultation through a ‘consumer lens.’ Our main focus is on relevant questions in Chapter 6 (VTOLs) as well as a handful of questions in other chapters.

For the avoidance of doubt, we are not technical safety experts and have not responded to questions outside our remit.

Our response is independent to the CAA’s response to the Law Commission’s consultation. However, we have referenced the CAA’s response to relevant questions for context.

Part A – Key themes

General comments

Overall, we welcome this consultation which is an important future framework that will transform future travel for consumers.

We are pleased that the Law Commission has tried to include a consumer focus in its consultation. In particular, we welcome references² to the [Consumer Principles](#) and [CAP 2539](#) in the consultation, and particularly welcome the inclusion of questions 31–33 on accessibility. We are also pleased that the consultation tries to highlight potential implications for passengers resulting from proposed changes in the current approach to safety regulation in a crewed/uncrewed VTOL context.

In general, we felt the consultation was comprehensive, well thought through and clearly signposted. Perhaps understandably - given the vast and prescriptive nature of aviation legislation, the Law Commission's role and its terms of reference for this project - the consultation is highly technical, theoretical and at times difficult for non-technical experts to follow. This makes it easy to get lost in the detail and difficult to draw out the real, practical 'human impact' these proposals will have on aviation consumers and the public. At the same time, we appreciate that the Law Commission has been asked to recommend how the law should change to adapt to circumstances that don't yet exist, so it is to be expected that the consultation is somewhat theoretical and speculative.

For the next stage of the consultation, we suggest the Law Commission considers whether it can develop different versions adapted for specific audiences and try to draw out in simpler terms (without legalese) what potential options for change might mean for consumers and the public in practice. For example, infographics and questionnaires on proposed changes could help facilitate direct engagement with consumers (including consumer groups) and the public – who should have a greater say in the consultation process as ultimately, *they* will be affected by any changes that are introduced.

This links to a broader theme on the importance of consumer engagement and acceptance as part of the Future Flight Challenge which is discussed below. In this context, we note that the UKRI Future Flight Challenge funded researchers at the University of Birmingham, YouGov and Thinks Insight & Strategy to lead on two studies³ which were published⁴ in July 2024. We feel this research is an important step in building a better understanding of consumer and public perceptions of future flight technologies, and its findings should feed into the Law Commission's work.

Alongside consumer engagement and acceptance, we consider greater weight should be attached to the Consumer Principles and their application to crewed and uncrewed VTOL operations. While some steps have been taken to do this, further work is needed to embed a 'Consumer Principles mindset.' We are also mindful that VTOLs are just one piece of the jigsaw

² See pages 5 and 9 of the Law Commission's [main consultation document](#).

³ (1) a UK public dialogue; and (2) a nationally representative survey to understand public perceptions of future flight technologies.

⁴ See [Framework for Future Flight in the UK \(thinksinsight.com\)](#).

puzzle: we recommend that the Consumer Principles are applied holistically across the end-to-end passenger journey - from door, to vertiport, to VTOL. By doing this, legislators and policymakers are more likely to develop a ‘future-proof’ regulatory framework that supports a seamless, inclusive and accessible mode of transport to all, not just the wealthiest in society.

In summary, we welcome the Law Commission’s consultation to develop a new regulatory framework to prepare the UK for autonomy in aviation. However, if consumers and the public are not engaged in the process; don’t understand the proposals or how they might be affected; and most importantly don’t feel safe, assured and confident in the use of new autonomous technologies – the framework will have limited success.

This is why consumer and public engagement, awareness and education on the Law Commission’s work (as well as the Future Flight Challenge more generally) early on and throughout the process, is crucial in building confidence and trust. This currently feels like an area where more focus is needed.

Key themes

1. Building consumer and public acceptance, confidence and trust through iterative consumer research and engagement

As noted above, this is an important strand of work that should be progressed alongside the development of a new regulatory framework.

To build acceptance, confidence and trust, we need to first measure current perceptions of existing transport services and the use of future flight technologies. As noted above, the Future Flight Challenge funded two studies which were published in July 2024. These studies measured public perceptions around existing transport services and future flight technologies.

We strongly welcome these studies, which should be used to help inform the Law Commission’s work and the Future Flight Challenge more generally, and to help bridge the gap between the development of a regulatory framework for autonomy in aviation and the real-world ‘human impact’ it will have on consumers and the public.

Set out below are some of the key findings from these two studies as well the CAA’s annual Aviation Consumer Survey.

(1) Thinks Insight & Strategy: Principles from a deliberative public dialogue

This research⁵ sought participants’ views on current transport services and their ideal future of future flight services. We note:

- Participants felt that existing services were not available equally across the country and were especially lacking in rural areas. This underpinned their hopes that future flight services could fill gaps in existing transport and improve user experience and sustainability. They also felt that current delivery services were plentiful and convenient but contribute to congestion. This led to a parallel concern about future flight delivery services leading to overly congested skies.

⁵ See [Framework for Future Flight in the UK - Principles from a deliberative Public Dialogue\[76\] \(website-files.com\)](#).

- In the best-case scenario, participants hoped that future flight services would deliver social, environmental and economic opportunities for all. They supported the opportunity for better connectivity across the UK, through affordable and more sustainable journeys. In addition, they saw future flight as an opportunity for more accessible travel, including those with disabilities, health conditions and those experiencing other barriers to access current public transport.

In general, we agree with the 14 principles identified in the research to underpin the roll-out of future flight technologies, and are particularly pleased that many of the principles have captured accessibility needs for those with disabilities, health conditions and wider access barriers, including principle 10 that future flight vehicles and operations must be designed with accessibility in mind from the start:

“Participants saw a significant opportunity for future flight services to improve the accessibility and social inclusion of public transport and wanted the end-to-end journey to be designed with access needs in mind, including the needs of those with non-visible disabilities and neurodivergence. They felt people with expertise and lived experience should be involved in decisions, and that manufacturers and operators should absorb the additional costs.”

(2) The University of Birmingham/You Gov: Future Flight Survey 2024

This survey⁶ explored the current levels of understanding amongst the UK public of future flight technologies, including:

- their general awareness
- their views on potential benefits and drawbacks
- development priorities
- future scenarios for adoption of future flight technologies and services

In particular, the survey found current levels of awareness of future flight technologies is mixed. While the vast majority of the UK public have heard of non-passenger carrying drones, far fewer have heard of Advanced Air Mobility (eVTOLs) or electric/hydrogen regional air mobility.

While overall there is a sense that the benefits of future flight technologies outweigh the drawbacks, the research highlights the nuances of this perception, with the public recognising a number of different pros and cons. The main perceived benefits relate to providing support to emergency services, access to isolated areas and communities, reducing fossil fuel usage and creating new jobs. The top cited drawbacks focus on cyber security, their impact on wildlife, safety concerns, congestion in the sky, privacy and that they may only be accessible to the wealthiest in society.

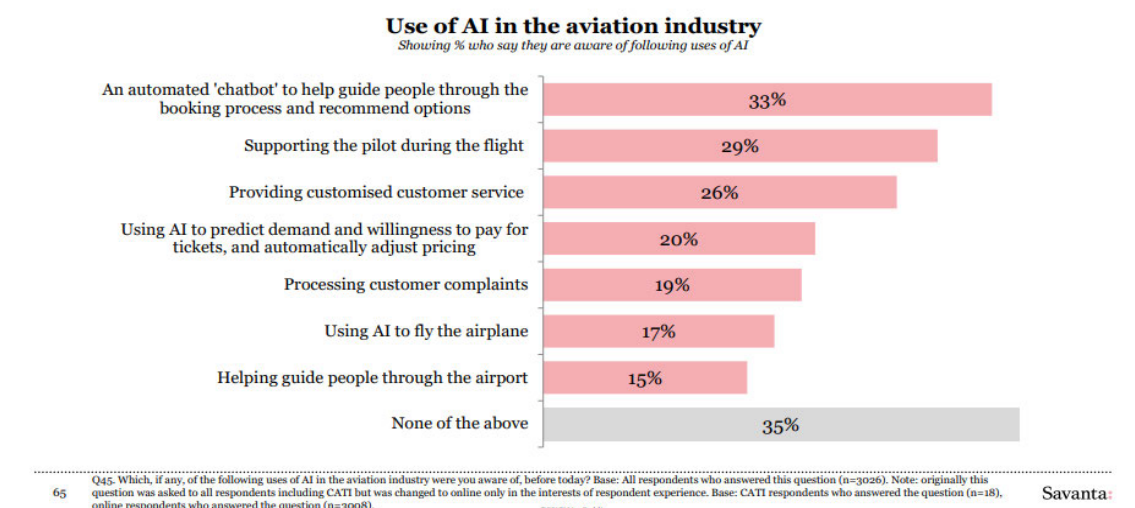
A majority of participants said they would feel comfortable being a passenger in an eVTOL once introduced, though only after they had been operating for a number of years. While women are less comfortable with a variety of aspects of future flight technology development, the finding that people would feel more comfortable riding in an eVTOL after they have been in use for a period of time holds regardless of gender.

⁶ See [Future Flight Survey 2024 Report\[50\] \(ukri.org\)](#).

(3) The CAA's Aviation Consumer Survey

We note that the [latest wave](#) of the CAA's annual Aviation Consumer Survey undertaken by Savanta, found that participants' knowledge of how AI is used in the aviation industry is fairly limited:

Knowledge of how AI is used in the aviation industry is fairly limited with a third being unaware of *any* use in the industry at present



Source: ACS Wave 12

Concluding comments

As noted above, the findings from these studies should be used to help inform the Law Commission's work and the Future Flight Challenge more generally.

In terms of next steps, we consider further research and engagement should be undertaken on an iterative basis to test updated proposals and user cases for future flight technologies with consumers and the public, and to monitor how perceptions are evolving. Taking consumers and the public on the journey towards greater autonomy in aviation, will help build acceptance, confidence and trust.

2. Future-proofing the end-to-end future flight journey

In addition to building consumer confidence and trust, the end-to-end passenger journey should be considered holistically when developing a new regulatory framework – from door, to vertiport, to VTOL. This includes considering:

- how the consumer interest and Consumer Principles feed in and interact at each stage of the passenger journey; and
- the roles and responsibilities of relevant stakeholders, including how they will work together to ensure a seamless journey for passengers.

We feel this is an important way to 'future-proof' new technology and ensure it is fit for purpose. We also agree with the Law Commission that accessibility needs to be considered at multiple

stages: from the design of aircraft, through to its operation and the services provided at airports or vertiports.

While the consultation makes a brief reference to the fact that future legislation and/or guidance will be needed to cover areas including vertiports⁷, we note there didn't seem to be any focus on the role of vertiports in the consultation. While there is CAA guidance/proposals on vertiports⁸, insofar as possible we feel that the future frameworks for VTOLs and vertiports should be progressed in parallel. The journey to the vertiport will also be important to consider as they could be designed in quite different ways from current airports, which could have implications for accessibility, sustainability, affordability and passengers' expectations and understanding of their rights.

This links to a related point on the importance of clearly defined roles and responsibilities of key stakeholders involved in VTOL operations. Chapter 6 focuses heavily on the respective roles of the pilot, pilot in command (PIC), remote pilot, VTOL operator and ground crew/staff, with key roles and responsibilities effectively delegated due to the nature of autonomous operations given that the PiC and cabin crew won't be physically onboard.

Given the enhanced safety-critical role the operator and ground crew/staff are likely to have in VTOL operators, it is crucial that their responsibilities and the interactions between key players are clearly defined - especially when things go wrong. Also, where the PiC delegates responsibilities, robust training will be important as will an appropriate sanctions framework to provide a deterrent effect. There are also likely to be challenges around "maintaining good order" without a physical crew on board which further underlines the importance of clearly defined roles and responsibilities of key players – see Part B for further information. In addition, we feel it is important to have robust contingency and emergency plans in place in the event that there are technical failures.

More generally, to help future-proof VTOL operations, we recommend an end-to-end passenger journey mapping exercise is undertaken by:

- applying the Consumer Principles to identify potential consumer issues that might arise at different stages of the future VTOL passenger journey; and
- comparing this to the current passenger journey.

While this will be speculative, it could be a useful exercise to help identify opportunities, risks and gaps for the future framework to address.

We are pleased the Law Commission references the CAA's consumer protection tools in its consultation including Regulation (EC) No 1107/2006. In our response below, we reference the CAA's airlines accessibility framework⁹ and consider further work is needed to explore how this and other tools could apply in a VTOL context.

⁷ See paragraph 6.4 in [main consultation document](#).

⁸ See [CAP2538 and Vertiport Design Proposal for existing Aerodromes](#) – we note that CAP 2538 references the Consumer Principles.

⁹ See [Airline Accessibility Guidance \(caa.co.uk\)](#).

3. Challenges in regulating AI

The consultation raises significant issues¹⁰ around the use and application of AI in aviation safety certification including: (1) a lack of predictability and explainability; (2) the importance of data sets (including the risk of bias); and (3) adaptability. It also discusses current work being undertaken to certify AI including by EASA.

Given that this is an evolving area where ongoing work is being undertaken to address these significant issues, the regulation of AI does not seem to be a key focus of the consultation. While the Panel is not a technical expert, given that the use of AI technologies is a critical enabler of higher levels of autonomy in aviation, further work is needed in this area.

We note that the CAA is due to publish an AI strategy and has already published a document¹¹ on its AI Principles. We are also pleased that the CAA is currently undertaking a piece of work, based on our feedback, that considers how the AI Principles and Consumer Principles interact. Given that highly autonomous and autonomous flight will rely on AI, it will be important to address the challenges noted above as well as broader concerns around transparency, privacy and ethics, if consumers and the public are to have confidence and trust in future flight technologies.

¹⁰ See paragraphs 4.53 – 4.71 of [main consultation document](#).

¹¹ See <https://www.caa.co.uk/media/e0th5tdy/20240226-ai-principles-paper-v1-2-pdf.pdf>.

Part B – Annex
CAA Consumer Panel response to relevant questions
Law Commission Consultation
Aviation Autonomy

Consultation Question 3

We seek views on whether current regulatory tools to support the development of highly automated and autonomous aviation technologies are adequate.

Please share your views below

Panel response

We agree with the CAA's views below that the current regulatory tools (including the regulatory sandbox) to support the development of new aviation technologies seem to be sufficient. However, in respect of the future development of passenger carrying VTOLs:

- As part of any advice or guidance offered by the CAA to developers, the CAA should ensure developers consider how the Consumer Principles might apply which should be factored into their processes. For example, the CAA should ask developers to consider how VTOLs will have accessible design for passengers with reduced mobility or who are vulnerable – including in respect of access to the aircraft and storage of any specialist equipment, or for passengers who need special assistance onboard. As part of this, we strongly recommend developers engage with specialist consumer representative bodies (such as RIDC¹²) and the disability community as well as those with lived experience during the design and planning process. While safety is the priority, applying the Consumer Principles at an early stage and throughout the development process will help bring consumers on the journey which in turn will help build trust and confidence in the new technology which is critical for the take-up and success of VTOLs.
- We were pleased to see the Law Commission reference the Consumer Principles and work on Advanced Air Mobility (CAP 2539) in its consultation and consider this can be a model which can be adapted more widely for BVLOS and the development of other new technologies. In this regard, the CAA is currently undertaking a piece of work with the Consumer Panel on how the AI Principles and Consumer Principles interact which we welcome.

CAA response

The current regulatory tools available are sufficient to support the development of new aviation technologies. As the Law Commission outlines, these tools include a number

¹² See <https://www.ridc.org.uk/>.

of ways to conduct experimental test flights. It is important to support the development of new aviation technologies whilst maintaining a high standard of safety. Permits to fly, for example, allow flying to enable the testing of an aircraft in support of development, albeit in a more limited capacity. Moreover, operating an aircraft under E Conditions is a way of flying a prototype to test certain concepts without the need to obtain a permit to fly. Both options allow a safe and controlled way to test prototypes and develop technology. In respect of regulatory sandboxes, the evidence collected through the use of this tool can help assuage regulatory uncertainty and thus allow more innovative technologies to reach the market, ultimately leading to major benefits for consumers.

Chapter 5 – Rules of the air

Consultation Question 5

We seek consultee views about what challenges remotely piloting an aircraft in an emergency scenario presents and how these might be addressed.

Please share your views below

Panel response

There could be a number of emergency scenarios that present challenges to a remote pilot. For example, remotely navigating extreme or adverse weather towards a safe landing or a medical emergency on board or disruptive passenger.

We note the CAA's [CAP722](#) and [CAP722A](#) sets guidance and safety requirements for UAS (RPAS) operators to meet, including in respect of emergency scenarios.

Passenger-related emergency scenarios are considered further in response to questions in chapter 6.

CAA response

During precautionary or emergency landings, it would be difficult for the remote pilot to find a suitable landing spot that minimises the ground risk. Technologies and systems could be developed with appropriate performance and assurance that enable adequate detection to mitigate risk

Chapter 6 VTOLs

Consultation Question 8

We provisionally propose that a person overseeing a VTOL flying automatically, who monitors its course and is able to intervene and change its course at any time should continue to be classified as a “remote pilot”. Do you agree?

Yes

Please expand on your answer below

Panel response

We agree with the CAA's response below.

For the avoidance of doubt, a "remote pilot" should have the same definition as set out in "UAS Delegated Regulation: "a natural person responsible for safely conducting the flight of an unmanned aircraft by operating its flight controls, either manually or, when the unmanned aircraft flies automatically, by monitoring its course and remaining able to intervene and change its course at any time."

The text underlined is an important clause to capture, which wasn't included in the posed question.

We note the Law Commission's alternative proposal to create a new legal role of flight "supervisor" instead of "remote pilot." We agree it would be difficult to distinguish between the two (which largely depends on the degree of control of the aircraft) and that it's better to retain consistency with the existing UAS regulatory regime. The term "pilot" is well understood by consumers, and it might give them a greater degree of confidence and assurance around new VTOL technology. We note the Law Commission's point that describing someone who is not consistently operating the flight controls as a pilot may risk misleading members of the public. We recognise this risk, but consider that with proper consumer education and assurance around the role of a "remote pilot" v a typical "pilot in command", this risk can be managed.

CAA response

A certified VTOL being flown remotely, should be flown by a remote pilot. This person will be charged with the safety of passengers, even if not directly manipulating the controls of the aircraft.

Consultation Question 9

We provisionally propose 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. Do you agree?

Yes

Please expand on your answer below

Panel response

As a starting point, we agree that a remote pilot should have the responsibilities of a commander of an operation within the meaning of Regulation 965/2012. In other words, we agree that the law should make clear that a remote pilot is capable of being the commander of a commercial air transport operation. The pilot in command is responsible for:

- The safe operation of the aircraft – including that all hold luggage and cargo is properly loaded and secured.
- The safe conduct of the flight, including the safety of crew and passengers. In particular, the PiC has more specific duties to ensure passengers know what to do to keep themselves safe both during normal flight and emergencies. For example, ensuring passengers are properly seated and secured, and for ensuring passengers are given a demonstration of how to use life jackets, oxygen and other emergency equipment and proceedings. The PiC is also responsible for the good conduct of passengers on board and managing disruptive behaviour. To fulfil these responsibilities the PIC has broad powers to take reasonable measures against people on board aircraft to ensure safety of aircraft and persons and maintain good order. In practice, the completion of these tasks is usually delegated to cabin crew but the PiC has ultimate responsibility.
- Reporting accidents, near accidents and bird strikes.

It is also a criminal offence to act as a PiC if not sober or alert, or if function is impaired due to drink or drugs, injury, fatigue, medication or sickness, which acts as a strong deterrent.

Pilots must be issued licences to operate and most must also have medical certificates. Aero-medical examiners are also certified.

Additional requirements must be met for specific circumstances such as licences wishing to exercise night rating privileges, and after a licence is obtained “recent experience” needs to be demonstrated. For example, a pilot may not operate an aircraft in commercial air transport or carry passengers unless they have carried out a certain number of take-offs, approaches and landings as pilot-in-command or co-pilot in the preceding 90 days.

The regulation of PiC is robust with clearly defined responsibilities which have helped build strong consumer confidence in the safety of commercial aviation over the years, which should apply to remote pilots. However, there are several aspects of the traditional pilot’s role and responsibilities that a remote pilot would find difficult to replicate, which will need to be adapted in the context of VTOLs which are discussed further below in questions 10 – 17.

Consultation Question 10

We provisionally propose 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;

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☒ 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.

Do you agree? (Tick all that you agree with)

Please expand on your answer below

Panel response

As noted in our response to question 9, a number of a traditional pilot responsibilities will need to be adapted in the context of remotely piloted VTOLs.

We agree that a remote pilot should ensure points 1-5 above, but in respect of ensuring “all cabin baggage, hold luggage and cargo is properly loaded and secured” it will be very important to ensure the relationship between the PiC and ground crew and allocated responsibilities are very clearly defined and regulated. It could be argued that ground staff/crew will have an even more important role than today’s groundhandling staff as the PiC will be relying on the ‘eyes on the ground’ to ensure all baggage and specialist equipment is properly loaded with due care and secured. Consideration should be given to more training and assurance methods around the role and responsibilities of ground crew/staff and operator’s responsibilities.

CAA response

Agree with those listed, but propose that the core duties for a remote pilot remain the same as a conventional PiC unless there is something about a VTOL that is clearly not applicable for example, it may not mean the Remote Pilot must physically check all these elements (i.e. cargo is secured properly), this may be achieved with sensors and/or ground handling staff.

Consultation Question 11

We invite views as to whether there are additional operational responsibilities that a remote VTOL pilot should be required to fulfil.

Please share your views below

Panel response

As a general approach, we agree that the operational responsibilities should stay the same (and should at the very least not be diluted). However, we think it’s worth exploring if existing responsibilities in the following areas need to be strengthened or enhanced in a remotely piloted VTOL context:

- The role and responsibilities of ground crew and how they will interact with the PiC as noted above in question 10.
- Pre-flight “specific instruments and equipment” that must be checked including “all necessary safety, medical, evacuation and survival equipment, taking

account of the risks associated to the areas of operation, the routes to be flown, the flight altitude and the duration of the flight.”

We agree with the Law Commission that there are benefits in having one person ultimately responsible for these checks before each flight. Such benefits include consistency with the current approach and less chance of miscommunication or things going wrong. As the CAA notes below, such responsibilities could be delegated with appropriate means for providing assurance to the PiC. In our view any delegation – for example to ground staff - will arguably need to have even more robust assurance and escalation mechanisms in place particularly for safety, medical, evacuation and survival equipment given that the PiC will not be there in person to verify that everything is in order.

Also, given the way that pre-flight checks might be completed for remotely piloted VTOL via a mixture of information provided by the aircraft and checks done by crew based on the ground - and the fact that this information will be compiled from different sources – means there is a higher likelihood that things could go wrong. Clearly defined roles and responsibilities of relevant parties, with clear lines of communication, and contingency plans will be very important.

CAA response

The responsibilities should remain the same - they can be delegated with appropriate means for providing assurance to the PiC. The practicalities of being remote from the operation means that it will be very difficult for the pilot to assume those responsibilities without highly robust systems in place to ensure the safety outcomes we are trying to achieve.

Consultation Question 12

We provisionally propose that the remote pilot-in-command should be responsible for, amongst other things, ensuring passengers are:

1. given a safety briefing; and
2. seated and wear seat belts during take-off and landing

Do you agree?

Yes

Please expand on your answer below

Panel response

We agree that the remote PiC should be responsible for items 1 and 2, but consider there are a number of practical considerations that need to be further considered:

1. Safety briefings

While passenger safety briefs are the responsibility of the PiC, they are usually done by the cabin crew, who also check passengers are seated and wear seatbelts during take-off and landing, and during turbulence. The Law Commission propose that these functions could be fulfilled by a mixture of a remote or pre-recorded briefings and video footage of passengers, and that a remote pilot should remain responsible for these checks.

Even if the remote pilot remains legally responsible for these checks, practically it is not clear how they will be implemented. Based on the assumption that current VTOL business models do not include human cabin crew onboard, the Panel queries whether remote or pre-recorded briefings go far enough. Any 'virtual' safety briefings must at the very least be interactive and allow passengers the ability to ask questions and seek assurance. This is particularly important for passengers with reduced mobility or who have specific medical or accessibility needs, but also for other passenger groups such as the elderly, parents with children or those who are in vulnerable circumstances, such as those who travel with an assistance dog or carer or even for anxious or nervous fliers. Another obvious issue is how a 'virtual safety briefing' will be able to help passengers who need physical help with their seatbelt or other types of special assistance. See the following links for further information/guidance that should be considered in this context [Information for passengers | Civil Aviation Authority \(caa.co.uk\)](https://www.caa.co.uk/passengers-and-public/on-board/cabin-safety/) and <https://www.caa.co.uk/passengers-and-public/on-board/cabin-safety/>

Consideration should also be given to relevant guidance on [fitness to fly](#) and who will be responsible for this.

2. Seated and wear belts during take-off and landing

We note the CAA's point below that it might be the case that seatbelts are worn continuously during short flights, however from a passenger perspective, there might be scenarios where this isn't feasible. Further engagement with accessibility and disability groups is needed to identify situations when this may not be possible.

Overall, we consider the lack of a physical presence or responsible person onboard a VTOL is a significant issue that should be addressed through further engagement with the CAA and developers.

This further underlines the importance of the CAA, Law Commission, UKRI and developers considering the practical application of the Consumer Principles as set out in [CAP 2539](#) in the context of remotely piloted VTOLs.

CAA response

Given the duration of the flights that industry is proposing, it might be the case that seatbelts are continuously worn. There is no toilet or anywhere for the passengers to move around the aircraft in the flight.

Consultation Question 13

We provisionally propose that air operators (rather than the remote pilot-in-command) should be responsible for preventing passengers from boarding:

1. who appear drunk or under the influence of drugs; or
2. whose carriage would, in the view of the operator's employees, endanger the safety of the aircraft or other passengers.

Do you agree?

Yes

Please expand on your answer below

Panel response

1. We agree that there should be a person who is legally responsible for preventing passengers from boarding who appear drunk or under the influence of drugs. We agree that this should be the responsibility of the crew on the ground as we believe there is little a remote PiC could do in practice. This responsibility needs to be clearly defined in the regulations, and we are concerned that at the moment the use of the phrase "operator" is ambiguous and it is not immediately clear who would be responsible in practice.
2. If the ground crew (under delegated authority) is responsible for preventing passengers from boarding who could endanger the safety of aircraft or other passengers then the following issues need to be considered:
 - a) It is likely that staff will need relevant training to deal with disorderly passengers. We are also mindful that some disabled people can be mistaken as drunk or disorderly – specialist training will need to be provided to ensure this does not happen.
 - b) Staff will need to be attuned to the potential risks presented by different passengers, including taking into account the length of the trip and the likelihood of changes in behaviour over that duration.
 - c) An escalation mechanism will be needed to resolve disputes about whether a passenger should or should not be allowed to fly.
 - d) There should be a deterrent in place to reduce the risk of disorderly conduct - <https://www.caa.co.uk/passengers-and-public/on-board/disruptive-passengers/>

CAA response

Agreed. Is 'air operators' the appropriate term for intended purposes, for example, in leasing scenarios when responsibilities are nuanced?

Consultation Question 14

We provisionally propose that the remote pilot-in-command should have the power to take reasonable measures, including restraint of passengers, as set out in section 94 of the Civil Aviation Act 1982. Do you agree?

Yes

Please expand on your answer below

Panel response

Whilst we agree that the power and authority to restrain passengers should remain with the PiC, we have some practical concerns in this area related to how a remote PiC could take reasonable measures:

- a) **Uncrewed VTOLs** - While we agree this responsibility should be given to the remote PiC, and they could authorise passengers to act and provide instructions, the successful outcome of a situation that arises mid-air would be entirely dependent on the ability of the other passengers to resolve it. For an uncrewed VTOL (where there are no crew members physically on board), a range of potentially serious safety concerns could materialise such as terrorism activities, female safety, sexual harassment, an allergic reaction or other medical emergency where CPR is needed. It would not be reasonable to expect other passengers to resolve these situations solely based on the pilot's instructions.

We believe this area needs further exploration and engagement.

- b) **Crewed VTOLs** – the consultation goes onto say if 'crewed' business models are developed the crew should be able to take reasonable measures to protect the safety of aircraft persons or property on board – on behalf of the PiC. We agree this sounds sensible, and any potential crew can be instructed by the remote pilot to fulfil their duties. However, as the Law Commission highlights, if the communications link between the remote pilot and VTOL is lost and the crew cannot receive instructions, this could have serious safety implications and it will be important to ensure crew members are appropriately trained to act on their own accord with the power to exercise their own judgment in these circumstances.
- c) **Passengers taking reasonable steps** The Law Commission discusses whether passengers should be able to take such measures to protect the safety of aircraft or persons/property. As identified above, while this may be possible in some cases, there are some potential problems with passengers taking on this responsibility and we agree with the CAA's view below that the interests of vulnerable passengers will need to be considered in this context.

More generally, consideration should be given to whether there are relevant aspects of the CAA's performance framework for airline accessibility under Regulation (EC) No 1107/2006 which should also be factored in. This sets out a set of standards to hold

airlines to account in upholding the rights of disabled persons and persons with reduced mobility, which might be relevant (or could be applied) in the context of VTOLs. See question 25 below for further information.

CAA response

Although they will not be present on the aircraft, and neither may any cabin crew, so unlikely this will be feasible. If the pilot is going to authorise the restraint of a passenger remotely, it would require briefing of passengers as part of the safety briefing, as current industry plans do not have cabin crew on board to supervise the process. In this instance there needs to be measures to prevent the abuse of this power and to protect vulnerable passengers. This may need to be an operator responsibility as opposed to a PiC.

Consultation Question 15

We provisionally propose that a person on board a VTOL aircraft (other than a crew member) should be able to take reasonable measures to protect the safety of the aircraft or of persons or property on board. Do you agree?

Please expand on your answer below

Panel response

As noted above in question 14, it might be possible for a passenger to take reasonable measures to protect the safety of the aircraft or of persons or property on board in some cases, but this raises a range of issues that need to be considered:

- a) As the CAA notes below, provision will be needed to reflect that passengers are not experts and do not have the relevant training to do this and shouldn't be expected to do this as the norm.
- b) It may well be the case that passengers have to put themselves at the risk of harm in order to do this, and this risk would need to be properly reflected in the support and instructions provided.
- c) If the remote PiC was expected to provide instructions to support passengers, they would need to be able to see the passengers (and the situation onboard) to be able to judge what actions would be appropriate in the circumstances.

CAA response

We can see this is a practical issue that will need considered in the drafting of the legislation. There would need to be some safeguarding in the drafting that recognises the passengers are not 'experts' but recognise that the law must consider some action to be taken by the passenger.

Consultation Question 16

We seek views on whether the powers of crew on board a VTOL aircraft should be broadened to reflect those of the pilot-in-command under the Civil Aviation Act 1982 to:

1. take reasonable measures to protect the safety of the aircraft/persons or property on board;
2. maintain good order and discipline; or
3. enable the crew to disembark or deliver a person.

Please share your views below

Panel response

If crewed VTOL business models are developed in the future, we can see a case for broadening their responsibilities to reflect those of the PiC – as in effect they will be acting on behalf of the PiC and in some serious cases, exercising their own judgement and discretion. A physical crew should be able to fulfil points 1-3 above, although additional training might be needed, and clear lines of communication (including back up communications and contingency plans if there is a technical failure). Robust escalation mechanisms between the crew and remote pilot will also be essential.

However, as set out in question 14 above the more fundamental issue is how this will work for uncrewed VTOLs.

CAA response

The same powers and duties should apply to VTOL crew as are currently in force. If no PIC, we agree that these should be broadened.

Consultation Question 17

We provisionally propose that passengers should be able to contact a member of crew at all times during an operation. Do you agree?

Yes

Please expand on your answer below

Panel response

We agree with the CAA that this is vital, and in the case of uncrewed VTOL absolutely critical. There should also be back up forms of communications and robust contingency plans in case the primary method of communication fails.

The Law Commission also poses the question on whether passengers should be able to communicate directly with the pilot. The consultation proposes that passengers should be able to contact representatives of the operator at all times during an operation, so as not to distract the remote pilot who will need periods of time to focus

on the operation of the aircraft without distractions. Members of crew would then be responsible for relaying messages to the pilot if necessary.

We generally agree with this approach but note that there might be circumstances, such as emergencies, where passengers need to speak directly to the remote pilot and quickly. Further consideration is needed in this area, and careful communications will need to be developed as part of the safety briefing for passengers on how the communications process will work.

CAA response

This is vital for safeguarding. 'Member of crew' does not need to be the PiC. In fact for VTOL with crew onboard, it might be better if the passengers contacted ground crew who would then relay a message, to avoid distraction to the PiC.

Consultation Question 18

We provisionally propose 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. Do you agree?

Yes

Please expand on your answer below

Panel response

We agree with the CAA's view below.

CAA response

We would expect that the same rules for a current commercial pilot should apply. This could also include fatigue, illness or other condition that could impair performance.

Consultation Question 19

We provisionally propose that it should be a criminal offence for a person to act as the remote pilot of a VTOL when the level of alcohol in their blood, breath or urine is over a prescribed limit. Do you agree?

Yes

Please expand on your answer below

Panel response

We agree with this proposal, and consider a strong deterrent is needed to ensure safety.

Consultation Question 20

We provisionally propose that the remote pilot should be subject to the reporting obligations currently applicable to pilots under the Air Operations Regulation. Do you agree?

Yes

Please expand on your answer below

Panel response

We agree with the CAA's view. Consideration should be given to the role and responsibilities of ground staff at vertiports – if they are given an enhanced role with more responsibility this needs to be recognised in the framework, for example through appropriate training. See questions 10 and 11 above.

CAA response

Agree, however, in some of the activities normally carried out by a traditionally crewed pilot will be undertaken by ground staff at the vertiport. This could be extended to any other personnel associated with operating the aircraft.

Consultation Question 21

We provisionally propose that a remotely piloted VTOL should be required to be capable of detecting and recording information relating to accidents and near accidents for the purposes of reporting it. Do you agree?

Yes

Please expand on your answer below

Panel response

We agree with the CAA that further work is needed in this area.

CAA response

The CAA will need to do more technical work to define what the detecting 'criteria' are. It may be different to current operations based on the operating models. The remote pilot may not have the visual and audio queues associated with bird strike, vibration etc and whilst the responsibility sits with the pilot, it is the operator whom must ensure that such events are brought to their attention for reporting.

Consultation Question 22

We provisionally propose that licences should be required for remote VTOL pilots. So far as appropriate, these should follow the classes and ratings adopted for crewed VTOLs. Do you agree?

Yes

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Please expand on your answer below

Panel response

We are not technical experts so are not in a position to comment but practical considerations for passenger carrying VTOLs will need to be factored into remote pilot licences.

CAA response

Remote pilots will be licenced. Whether or not it is appropriate for the crewed pilot classes and ratings to be followed for remote VTOL pilots is not possible to say at this stage.

Consultation Question 23

We provisionally propose that operators of remotely piloted VTOL should be certified. Do you agree?

Yes

Please expand on your answer below

Panel response

We are not technical experts so are not in a position to comment but we agree that with no pilot physically in the aircraft, it will be important to make sure that operators are responsible persons who take the appropriate steps to promote safety via certification, which will need to be adapted to a crewed and non-crewed VTOL context. This will be important to ensure passenger confidence.

CAA response

If in this context, VTOL refers to a certified operation (e.g. pax carrying)

Consultation Question 24

We provisionally propose that operators of remotely piloted VTOLs should continue to be required to:

- ☒ (1) have the means necessary for the scale and scope of operations planned;
- ☒ (2) use only suitably qualified and trained personnel;
- ☒ (3) implement a management system to ensure safety;
- ☒ (4) ensure operations only take place in accordance with the operations manual;

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- ☒ (5) establish procedures to minimise the consequences to safe flight operations of disruptive passenger behaviour;
- ☒ (6) develop and maintain security programmes suitable for the aircraft and type of operation;
- ☒ (7) have a management system to prevent fatigue.
- ☒ (8) ensure the continuing airworthiness of the aircraft; and.
- ☒ (9) establish procedures for any reasonably foreseeable emergency situation.

Do you agree? (tick all that you agree with)

Please expand on your answer below

Panel response

We agree but further consideration is needed on whether the points raised in questions 12,14,15 – 17 on emergencies and disruptive behaviour should be factored into the operator requirements. Accessibility and vulnerability in a crewed/uncrewed VTOL context should also be considered as a potential additional requirement or embedded into existing requirements – particularly for points (2), (5) and (9).

There should be clear definitions on the roles, responsibilities and interactions between the remote PiC, ground crew and operator – especially where some responsibilities are delegated.

CAA response

Yes. In 2, we would suggest "only suitably qualified and 'competent' personnel", instead of 'trained' personnel. Training does not necessarily imply competence; the latter also requires experience.

Consultation Question 25

We seek views as to whether there are additional responsibilities that operators of remotely piloted VTOLs should need to fulfil.

Please share your views below

Panel response

As noted in question 24, accessibility and vulnerability in a crewed/uncrewed VTOL context should be considered as a potential additional requirement or embedded into existing requirements.

The CAA's performance framework for airline accessibility under Regulation (EC) No 1107/2006 should also be considered. This sets out a set of standards to hold airlines

to account in upholding the rights of disabled persons and persons with reduced mobility including:

- Pre- journey: website accessibility and the provision of essential information, requesting assistance and pre-notification, access and medical clearance, accompanying persons
- At the airport – boarding and disembarking
- During the journey – onboard facilities (including storage of manual wheelchairs and the carriage of mobility and medical equipment), assistance dogs
- Training
- Post journey considerations including complaint handling and compensation for lost, delayed and damaged mobility equipment

There might be areas of overlap or adaptations that could be made in the context of VTOLs. See <https://consultations.caa.co.uk/corporate-communications/performance-framework-for-airline-accessibility/>.

CAA response

Additional responsibilities could include but not be limited to:

- Accident reporting
- Whistleblowing procedures
- Having an accountable manager
- Security of Remote Pilot Stations
- Cyber Security Compliance
- Assurance of integrity of C2 Link (could be via C2 CSP)

There are unknowns in this operating environment that will undoubtedly require addressing.

Consultation Question 25

We seek views as to whether there are additional responsibilities that operators of remotely piloted VTOLs should need to fulfil.

Please share your views below

Panel response

The Panel refers to the CAA's response below.

CAA response

Additional responsibilities could include but not be limited to:

- Accident reporting
- Whistleblowing procedures
- Having an accountable manager
- Security of Remote Pilot Stations
- Cyber Security Compliance
- Assurance of integrity of C2 Link (could be via C2 CSP)

There are unknowns in this operating environment that will undoubtedly require addressing.

Consultation question 26

We seek views as to whether the law should permit remote pilots to act as pilot-in-command for more than one VTOL at the same time.

Please share your views below

Panel response

We are not technical experts but note the CAA's response below and agree if MSOs are introduced in the future, robust safeguards would need to be introduced.

Also, if MSOs were introduced, careful thought would need to be given on how to build trust and confidence as consumers are already likely to be apprehensive about a remote pilot for one VTOL.

CAA response

Remote pilots may be authorised to act as the PiC for more than one VTOL at the same time if the operator can demonstrate to the satisfaction of the Regulator that the relevant procedures are in place, including emergency procedures, processes to quickly bring in other PiCs in cases of emergency or complex scenarios, human factor limitations and mitigations, etc. With sufficient mitigation a single emergency situation can be handled without compromising the other operation(s).

The development of the regulatory framework would be dependent on industry demand and capability.

Consultation Question 27

We seek views as to whether there should be an upper limit to the number of VTOLs for which a remote pilot can act as pilot-in-command at the same time.

Please share your views below

Panel response

We are not technical experts and refer to the CAA's response below.

CAA response

The limit to the number of VTOL a single remote PiC can control should be determined by an assessment relevant to the particular operation, and include inter alia, the complexity of the airspace, possible non-normal operational scenarios, accessibility and availability of relief pilots, availability of additional support to the PiC, robustness of the communication etc. This process should be approved by the Regulator.

Consultation Question 28

We seek views as to what additional safeguards should be introduced for remote pilots piloting multiple VTOLs.

Please share your views below

Panel response

The Panel is not a technical expert. We agree with the CAA's response below and agree that stringent testing will be needed of all possible emergency/other scenarios that could materialise from MSOs.

CAA response

There are unknowns in this operating environment that will undoubtedly require addressing. This list is not exhaustive, considerations include:

- Introduction of robust safety cases and operating experience without CAT passengers to prove the extension of operation.
- A method by which the operator can quickly bring in a 'relief' pilot or additional pilot in circumstances which that may cognitively overload the remote pilot.

Additional RP(s) available to allow more capacity for emergency situations so that one RP would then be able to deal with the emergency.

Consultation Question 29

We seek views as to whether there should be a role for a person supervising the flight of an autonomous passenger-carrying VTOL and acting as a point of contact in relation to it. What powers or responsibilities should such a person have?

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Please share your views below

Panel response

We are not technical experts but agree with the CAA that there must be such a role. As set out in our answers to the questions above, to ensure consumer confidence and trust, it will be essential for there to be a responsible person who can be contacted at all times, support passengers remotely during take-off and landing and can assist with any incidents onboard.

CAA response

Yes, there must be such a role, with a set of responsibilities. For a fully autonomous RPA, there will be no remote pilot. The operator is accountable for the safe operation, and responsibility must be delegated to an appropriate person(s) in the organisation. The operator management structure and Nominated Persons associated with it are key here. Ground operations becomes a significant role with many of the pilots' responsibilities in practice devolved at a working level to ground staff.

Duties would include inter alia: passenger liaison and welfare, passenger information (e.g. in cases of emergency what to do); pre-flight safety checks

There are unknowns in this operating environment that will undoubtedly require addressing.

Consultation Questions 31 – 33 – we have considered these questions together

Q31 - We seek views as to whether initial airworthiness standards for uncrewed VTOLs should include accessibility standards for persons with disabilities and reduced mobility.

Q32 - We seek views as to whether the CAA should be able to include accessibility standards within the licences granted to uncrewed VTOL operators.

Q33 - We seek consultees' views on any other issues with the current legal framework as it relates to operations involving remotely piloted and autonomous VTOLs

Please share your views below

Panel response

We are pleased that the Law Commission discusses accessibility in its consultation, which is critical in ensuring VTOLs/urban air mobility is open to all. We are particularly pleased with its recognition that accessibility needs to be considered at multiple stages: from the design of aircraft, through to its operation and the services provided at airports or vertiports. This is a point the Panel has been advocating, which was reflected in guidance to industry - see [CAP 2539 Consumer Principles Guidance for the AAM industry \(caa.co.uk\)](#). While some initial progress has been made in light of

CAP 2539, more work is needed in this area to ensure accessibility is consistently being factored in at multiple stages.

Regarding question 31, insofar as possible we feel accessibility standards for persons with disabilities and reduced mobility should be included within initial airworthiness standards.

Regarding question 32, insofar as possible we feel the CAA should be able to include accessibility standards within the licences granted to uncrewed VTOL operators. Such standards, as the Law Commission notes, could require that a certain proportion of an uncrewed VTOL fleet should be capable of carrying mobility equipment, or an assistance dog. We recommend further engagement with the CAA (and ourselves) on this topic and accessibility more generally, including the application of Regulation (EC) No 1107/2006 and the CAA's accessibility frameworks in a VTOL context.

Regarding question 33, in the Panel's response to the Transport Committee's Call for Evidence on Accessible Transport, we set out our views on the effectiveness of the current accessibility legislative framework and areas which need to be strengthened or which need additional guidance. We also set out a number of gaps or barriers in the current framework that if addressed could improve outcomes for passengers with accessibility needs. This could be applied or adapted in the context of VTOLs, and we are happy to undertake further engagement in this area. See <https://www.caa.co.uk/media/k22gxypf/caa-consumer-panel-transport-committee-inquiry-response.pdf> for further information.

As noted in Part A of our response, to help future-proof VTOL operations, we recommend that an end-to-end VTOL journey mapping exercise (by applying the Consumer Principles at each stage) is undertaken to identify potential consumer issues (including those relating to accessibility) that might arise at different stages of the journey. While this will be speculative, it could be a useful exercise to identify opportunities, risks and gaps for the future regulatory framework to address.

We also agree with the CAA's response below in respect of its Public Sector Equality Duty.

CAA response

Question 31 - We expect organisations that we regulate to comply with their legislative obligations in respect of accessibility for people with disabilities and/or reduced mobility. These include UK Regulation (EU) 1107/2006, as well as any relevant obligation under the Equality Act 2010 and the objectives of the Public Sector Equality Duty to the extent that these apply. We await with interest the detailed views of respondents in respect of this proposal. Before introducing any accessibility standards within special conditions or certification specifications for passenger-only VTOLs, we would carry out further consultation with stakeholders and consider any responses through the prism of our own obligations under the Equality Act 2010. We are conscious of the necessity to have due regard to the Public Sector Equality Duty in respect of all relevant policies and decisions, and of how we are able to use our role as the regulator to effect positive change in this area.

Question 32 - This would be a pragmatic approach as opposed to including it within the type certification. The operator can determine how to accommodate accessibility requirements in line with law and regulation referenced in response to question 31.

Question 33 - The transport of mobility aids in a VTOL must take into account the various types of self-powered mobility aids, namely with regards to electric mobility aids (powered by lithium ion batteries or other types of batteries) with the consideration of safety systems such as fire detection and suppression and certification standards for these systems.

Consultation Question 64

We invite consultees to tell us if they believe or have evidence or data to suggest that any of our provisional proposals could result in advantages or disadvantages to certain groups or based on particular characteristics (with particular attention to age, disability, transgender identity, marriage and civil partnership, pregnancy and maternity, race, religion or belief, sex or gender, and sexual orientation).

Please share your views below

Panel response

As set out in questions 31 – 33, we feel some progress has been made in considering the consumer interest and the Consumer Principles in the context of new technologies. However, more work is needed in this area to ensure the CAA (through the prism of its PSED duty and other regulatory roles) and developers are consistently factoring in the Consumer Principles, to ensure fair and equitable access to future modes of transport for all.

We welcome further engagement with the Law Commission as its proposals develop.

CAA response

We await with interest the detailed views of respondents in respect of this proposal. Before adopting any of these provisional proposals we would carry out further engagement with stakeholders and consider any responses through the prism of our own obligations under the Equality Act 2010. We are conscious of the necessity to have due regard to the Public Sector Equality Duty in respect of all relevant policies and decisions, and of how we are able to use our role as the regulator to effect positive change in this area.

CHRIS DANIELS

Background

This is an individual response from Chris Daniels. Chris is a Director and Chief Commercial Officer of an autonomous drone software company, Flare Bright. He co-chairs the ADS Group's Drone Platform and Counterdrone group and is a Director of ARPAS, the drone industry trade body. He is ARPAS' representative at the Royal Aeronautical Society's Remotely Piloted and Autonomous Aircraft Systems (RPAAS) Specialist Group. As such he contributed to their submission into this report. Note, this response represents Chris Daniels' views and may not necessarily coincide with views from other organisations he is associated with.

Question responses

Consultation Question 1. We seek views on how current airworthiness and certification regulation might need to be adapted or developed in light of highly automated and autonomous aircraft. In particular, should provisions be adopted which allow for: (1) the certification of optionally piloted and uncrewed or unoccupied versions of conventional aircraft (hybrid versions); and (2) the separate certification of command units?

For an unmanned aircraft, the airworthiness issue is around avoiding contact with other aircraft, and ground risk. The former is primarily a function of the ATM system and how it interacts with the UAV; the latter is a combination of how airworthy, and how robust and reliable any Flight Termination System (FTS) is. So it would be entirely feasible to have a perfectly safe aircraft (even if currently deemed un-airworthy) if its ATM interface and FTS was robust. Therefore "airworthiness" as a concept needs to be looked at and legislated for in the round, taking into account these other two concepts. Even with passengers onboard, for eVTOLs, these concepts extrapolate.

The key is understanding the risks, the redundancies and the causal links of any software systems on board (e.g. in what scenarios does a failure in the Flight Control Software lead to a potential failure in FTS or failure in the interaction with ATM systems, or detect and avoid capability). The architecture of the software systems needs defined redundancy and that needs fully understanding in order to be certified. It is less a case of the robustness or failure rate of an individual system, but more the layering of what all the systems do in extreme events. That level of understanding is for a Regulator, rather than something that necessarily needs defining in law.

Consultation Question 2. We welcome views on what changes to the certification system might be necessary to enable higher automation and autonomy in aviation.

Currently, the majority of AI or ML systems use a statistical approach of a large data set. This is the same approach a human expert uses to assess whether a system is safe (to a degree of certainty, say, 10^{-9}). There is a fear about using AI, which in my view is unfounded. It is the same process, but a machine makes the assessment, rather than a human, so it is less prone to error. I believe it would be helpful to assess how accurately the 10^{-9} figure is with humans assessing it (there are plenty of times when it has not hit those marks, even after signing off on it) and comparing when machines assess it. There are many examples of us accepting these results, even if in cases when we haven't fully understood the order of magnitude of potential errors. The solution here, therefore, is having

sufficient redundancy, on systems which are not linked to, nor affected by, the primary system, which can take over in failure modes. It is worth noting Nassim Taleb's many comments on the issue of low probability events and human's failings in assessing the high impact and low probability issues. <https://www.edge.org/conversation/the-fourth-quadrant-a-map-of-the-limits-of-statistics> Given the paucity of data sets of the novel configurations of a lot of VTOLs and drones, any assessment of the likely chance of an event happening is almost certain to be incorrect. Hence layering redundancy of different methods of safety is going to be a key to delivering robust aircraft which will be certifiable.

The real challenge is likely to be when statistical assessments (through ML or any other manner) are made on sparse data sets. This is an area where reliance on simulation is key, and a similar approach to the one described above would be helpful.

Consultation Question 3. We seek views on whether current regulatory tools to support the development of highly automated and autonomous aviation technologies are adequate.

Currently no. It is holding back innovation, and stifling an industry which could be just as safe but by taking very different approaches to those traditionally used in aerospace, as described in the above question.

The other area of cross-over in answering this question, is having geo-fenced dedicated testing areas. With so much innovation, rather than testing in a specific area (which is essentially put out of bounds to other air users), I would recommend having a few dedicated test sites where all innovative, prototype and equivalent testing takes place. This needs to be a testing environment with This would encourage innovation, but more importantly, have an area where a regulator could have access to huge amounts of flight data of novel aircraft, and learn about the regulatory process in a safe and ring-fenced environment.

Consultation Question 4. We seek views on how highly automated and autonomous aircraft should act in emergency scenarios. In particular: (1) should highly automated and autonomous aircraft be given the freedom to operate outside the rules of the air in emergency circumstances; or (2) should a comprehensive set of rules be developed for highly automated and autonomous aircraft in emergency situations.

The autonomy and "brains" of any aircraft will develop over time. The law is unlikely to develop in step with this. Therefore it is imperative to give a legal framework that recognises this – with advanced autonomy an aircraft should be able to decide for itself the safest course of action in an emergency, irrespective of the rule of law or slavish adherence to particular regulations. Having a comprehensive rule set (beyond basic rules of the air) is likely to be counterproductive to innovation and not allow AI to develop to react in the best manner possible in any particular circumstance.

Consultation Question 5. We seek consultee views about what challenges remotely piloting an aircraft in an emergency scenario presents and how these might be addressed.

Any aircraft has a degree of autonomy (even the joystick pressure and its reversion to a neutral point could be deemed some level of autonomy). It is therefore tricky legally to even define remotely piloting, and it is likely that there are autonomous emergency overrides to remote piloting (at Flare Bright we are developing exactly this for defence purposes). In

which case there is a continuum between purely remote piloting and true autonomy, and any particular aircraft could be anywhere on that line, and in different phases of flights (or in emergencies) jump somewhere else on that line. The legal framework needs to be able to address this.

Consultation Question 6. We seek consultees' views on whether the rules of the air relating to communication should be adapted for remotely piloted and autonomous aircraft.

All voice communications can be easily replaced by two-way electronic conspicuity and communications – for example, even things like icing should be recognised in sophisticated autonomous aircraft (this is another area Flare Bright is developing) and the areas where icing occurs can be automatically live-transmitted. The same goes for other meteorological conditions such as wind speed and direction, thus (rather like Google Maps) live data from aircraft is continuously updated to other aircraft, giving real-time granular information. This is technically feasible now, and likely to come on stream more widely in 5-10 years. Even Authority's "Follow Me" instructions can also be replicated electronically and be mandatory preprogrammed in UAVs. The first step is to mandate Electronic Conspicuity to agreed common standards for all air users (both manned and unmanned, and of all sizes and weights).

Consultation Question 7. We ask for consultees' views on how the rules of the air might be adapted or developed for remotely piloted or autonomous flight.

The Consultation has a view that changing the rule set will be a challenge. However, for a working ATM system in Shared Airspace to function, a clear and new set of rules will need to be created digitally (akin to the NASA proposal). I therefore think the issue may be the ATM system chosen will dictate the rules of the air approach.

Consultation Question 8. We provisionally propose that a person overseeing a VTOL flying automatically, who monitors its course and is able to intervene and change its course at any time should continue to be classified as a "remote pilot". Do you agree?

Yes. The analogy is the definitions used in Air Forces for their remote pilots. However, there are probably some roles of authority, which don't involve the flying of the aircraft, but do involve decision making of what the aircraft or its passengers are doing that may need defining.

Consultation Question 9. We provisionally propose 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. Do you agree?

I think rather than stating they "should have", I think there are circumstances where they "must" and circumstances when it may not be appropriate. So my wording would be "could have".

Consultation Question 10. We provisionally propose 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. Do you agree?*

It is highly likely that the Pilot of a VTOL will not be collocated with the VTOL (think RAF Predator UAV), so it would be hard for any Pilot to ensure any of these. It may be that there are individual roles that ensure this, or the Pilot has to somehow ensure procedures are adhered to such that these are done properly – but that feels like a Foreman / Sergeant Major / Supervisor type role, and should be legislated as such. (5) is about the only one I feel can squarely sit with a Remote Pilot.

Consultation Question 11. We seek views as to whether there are additional operational responsibilities that a remote VTOL pilot should be required to fulfil.

The challenges of VTOL flight are as much about the safety assessment of any flight (assuming trunk roads are used, say, for flights in and out of London, it is a quite different risk profile flying these in rush hour as it is at 3am on Sunday morning), as the loading and airworthiness. There are also issues about checking connectivity and that GPS signals are secure throughout a flight, as well as bandwidth is available for the duration of the flight to control the aircraft. These need to be ensured and are more of remote Pilot's role than any of the Question 10 points. The same goes for noise. I also think there is an additional duty of care about passengers, who are likely to be unsupervised onboard – there needs to be a legal method of ensuring they do as they are told and are monitored throughout a flight to see that they are not compromising the safety of the flight in any manner. Emergency landing procedures (due to regular flying over built up areas at low level) are likely to be a unique feature of VTOL, and this may need to be brought into legislation to ensure procedures are safe and optimise the safety of those on the ground, rather than those in the air.

Consultation Question 12. We provisionally propose that the remote pilot-in-command should be responsible for, amongst other things, ensuring passengers are: (1) given a safety briefing; and (2) seated and wear seat belts during take-off and landing. Do you agree?

I'm not sure this is that important in the grand scheme of things. It may be more roller coaster style restraints are more appropriate to uncrewed aircraft, to minimise the risk of passenger disruption (which is not always to do with drinks or drugs – with minimal supervision or other many other strangers on board, anything could happen).

Consultation Question 13. We provisionally propose that air operators (rather than the remote pilot-in-command) should be responsible for preventing passengers from boarding: (1) who appear drunk or under the influence of drugs; or (2) whose carriage would, in the view of the operator's employees, endanger the safety of the aircraft or other passengers. Do you agree?

Given the potential risks, and the amount of behavioural data we can access easily, I think there may be a call for some sort of legal profiling which permits Operators to simply refuse

boarding for a wide range of people, for reasons that they don't necessarily need to share. This should be done at the ticketing stage, rather than the boarding stage. Should there be a "right" to travel by VTOL? – given the small and enclosed nature of this form of transport, with limited supervision, I expect Operators to demand that there shouldn't be. I think it a much wider issues than drink and drugs.

Consultation Question 14. We provisionally propose that the remote pilot-in-command 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. Do you agree?

Fine, but in practice this will be hard to achieve.

Consultation Question 15. We provisionally propose that a person on board a VTOL aircraft (other than a crew member) should be able to take reasonable measures to protect the safety of the aircraft or of persons or property on board. Do you agree?

Yes, but I think this is likely to be covered by other areas of the law in almost all scenarios when a fellow passenger would have to act.

Consultation Question 16. We seek views on whether the powers of crew on board a VTOL aircraft should be broadened to reflect those of the pilot-in-command under the Civil Aviation Act 1982 to: (1) (2) (3) take reasonable measures to protect the safety of the aircraft or persons or property on board; maintain good order and discipline; or enable the crew to disembark or deliver a person.

Yes, but see responses above too in this regard.

Consultation Question 17. We provisionally propose that passengers should be able to contact a member of crew at all times during an operation. Do you agree?

Yes, although is that a matter for law? I would expect people simply to not fly with a Carrier that doesn't offer this as a service – I feel this is something that market forces will dictate, rather than needing a law to cover it.

Consultation Question 18. We provisionally propose 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. Do you agree?

Consultation Question 19. We provisionally propose that it should be a criminal offence for a person to act as the remote pilot of a VTOL when the level of alcohol in their blood, breath or urine is over a prescribed limit. Do you agree?

Yes and yes. This relates to questions later on in the Consultation about it being illegal for anyone to attempt to take over the piloting of a VTOL remotely at any point.

Consultation Question 20. We provisionally propose that the remote pilot should be subject to the reporting obligations currently applicable to pilots under the Air Operations Regulation. Do you agree?

Consultation Question 21. We provisionally propose that a remotely piloted VTOL should be required to be capable of detecting and recording information relating to accidents and near accidents for the purposes of reporting it. Do you agree?

I think this is largely irrelevant. I think it the Operator's role to report all accidents, near misses etc, and this should be automated in all Advanced Air Mobility aircraft, and the Operator have this legal responsibility to report. It is likely that the ATM provider will know this before the Remote Pilot, and perhaps it could even be their legal responsibility. With Electronic Conspicuity as standard, all flights could be recorded and simulations of the flight paths could be easily calculated to show near misses and indeed any deterioration in performance against (pre-programmed) and expected norms.

Consultation Question 22. 6.99 We provisionally propose that licences should be required for remote VTOL pilots. So far as appropriate, these should follow the classes and ratings adopted for crewed VTOLs. Do you agree?

I think this may change as automation increases, so I wouldn't be inclined to be prescriptive about it upfront.

Consultation Question 23. 6.108 We provisionally propose that operators of remotely piloted VTOLs should be certified. Do you agree?

Yes, this is critical – the Pilots will become less relevant to the process (as they will have less influence and power over decisions), so the Operators need to fulfil a lot of the pilots' current roles.

Consultation Question 24. 6.109 We provisionally propose that operators of remotely piloted VTOLs should continue to be required to: (1) have the means necessary for the scale and scope of operations planned; (2) use only suitably qualified and trained personnel; (3) implement a management system to ensure safety; (4) ensure operations only take place in accordance with the operations manual; (5) establish procedures to minimise the consequences to safe flight operations of disruptive passenger behaviour; (6) develop and maintain security programmes suitable for the aircraft and type of operation; (7) have a management system to prevent fatigue; (8) ensure the continuing airworthiness of the aircraft; and (9) establish procedures for any reasonably foreseeable emergency situation. Do you agree?

Yes.

Consultation Question 25. 6.110 We seek views as to whether there are additional responsibilities that operators of remotely piloted VTOLs should need to fulfil.

I think there is a critical component about managing a continuous link to ATM, which Electronic Conspicuity also is part of. With links to privacy concerns, height of overflight of personal property, noise and use of electromagnetic spectrum all raising their profile, I would expect an Operator to also have a legal duty to pay some regard to these areas.

Consultation Question 26. 6.118 We seek views as to whether the law should permit remote pilots to act as pilot-in-command for more than one VTOL at the same time.

Yes, but they shouldn't be defined as pilots in this case. They are supervisors. If we take an analogy of the early days of steam engines, an engineer would have direct responsibility over a single engine due to the complexity and level of intervention needed. Now an Engineer can supervise 100s of engines in a control room, noting that they will have a team

to deal with emergencies – they are not meant to necessarily do the hands on process themselves. I think future VTOL “supervisors” need to be thought of in this regard.

Consultation Question 27. 6.119 We seek views on whether there should be an upper limit to the number of VTOLs for which a remote pilot can act as pilot-in-command at the same time.

No. This is a new area, and we simply don’t know how complex the process will be. At the other end of the spectrum, it shouldn’t be easier to be supervising multiple VTOLs (or drones) as then a natural arbitrage will happen when a second aircraft is flown just for regulatory arbitrage reasons, which inherently is not as safe and also has a negative environmental impact.

Consultation Question 28. 6.120 We seek views as to what additional safeguards should be introduced for remote pilots piloting multiple VTOLs.

This depends on the interaction with and the legal status of other systems.

Consultation Question 29. 6.135 We seek views as to whether there should be a role for a person supervising the flight of an autonomous passenger-carrying VTOL and acting as a point of contact in relation to it. What powers or responsibilities should such a person have

No – I think this is a legacy of an old technology way of thinking. The legal responsibility should be with the Operator, and how they demonstrate safety and checks is up to their operating procedures. This is a normal process in most general sectors of industry.

Consultation Question 30. 6.140 Should the law permit an uncrewed VTOL to transition between remotely piloted and autonomous flight during an operation?

The general view of the autonomy industry is that having a people-led process (as we have now) is likely to be reasonably effective; and having a machine-led process, where they are all following the same processes and procedures is also likely to be safe and effective. Any hybrid system will have challenges as machines don’t think like humans and vice versa, and machine-piloted aircraft can simply fly in different (better) ways than humans – as evidenced by combat “dogfights” between autonomous aircraft and piloted aircraft – autonomy is winning every time now. It is likely that an autonomous system will have clear advantages, once the technology has matured, and therefore the legal framework for that should be autonomous flight as a default, with remote-piloted as an exception (perhaps think of this as equivalent to the difference between powered flight and gliders, and maybe in that way autonomy should give way to remote-piloted).

Consultation Question 31. 6.160 We seek views as to whether initial airworthiness standards for uncrewed VTOLs should include accessibility standards for persons with disabilities and reduced mobility.

There is a rise in the number of people with disabilities, and this is rapidly becoming a commercial question, rather than one that needs enshrining in law; an OEM should see the commercial benefit of designing a VTOL that accommodates a sizeable chunk of the market, and one that will only grow. But following existing laws seems like a sensible approach for now.

Consultation Question 32. 6.161 We seek views as to whether the CAA should be able to include accessibility standards within the licences granted to uncrewed VTOL operators.

As above.

Consultation Question 33. 6.163 We seek consultees' views on any other issues with the current legal framework as it relates to operations involving remotely piloted and autonomous VTOLs.

I wonder whether there should be a legal requirement on the regulator to support and permit the growth of this sector. The almost universal view of industry is that the slowness of regulators is by far the single biggest factor holding back the entire industry, so perhaps there could be a legal method of redressing this?

I also suspect that there will be challenges to VTOL operations in terms of its environmental (carbon) impact, its use of electricity supply in dense urban areas (where the system is already reaching capacity, and questions about who gets priority of use when the system is overloaded), the access to clear views of the sky and the ownership of the air itself – especially at low levels above private property. All of these are likely to lead to legal test cases, so perhaps it is prudent to investigate these areas in advance.

Consultation Question 34. 7.14 We provisionally propose that a remote pilot for drones should continue to be defined as “a natural person responsible for safely conducting the flight of an unmanned aircraft by operating its flight controls, either manually or, when the unmanned aircraft flies automatically, by monitoring its course and remaining able to intervene and change its course at any time”. Do you agree?

This question works currently, where almost all flights are VLOS (and the few cited in the Consultation are within very tight parameters and so far are extremely limited trials). With the Future Flight Industry Group's Future Flight Action Plan (<https://assets.publishing.service.gov.uk/media/661943b7679e9c8d921dfeeb/fof-action-plan.pdf>) timetable of “routine BVLOS” flights by 2027, the legislation needs to change by then. (Noting that plenty of industry commentators believe this to be an unrealistically optimistic timeframe, due to the challenges of regulation and legislation.) The issue is that with autonomous flight, the drone itself should be able to change course itself and based on its awareness of its surroundings, versus human intervention from afar (noting pilot error is a considerable cause of accidents in manned aircraft), my view is that this primacy of human intervention should not be written in law. I also think a computer system is likely to be best placed, and perhaps the only commercially viable option, to monitor BVLOS flights.

Whether this is the right definition or not, depends on what legal conditions are put on a remote pilot, in any case. Defining it in isolation to that is fairly meaningless.

Consultation Question 35. 7.20 We seek views on whether some low risk autonomous drone operations or drone operations conducted beyond visual line of sight might be accommodated in the open category. In particular: (1) whether there are any such use cases which might be suitable for the open category; (2) and if so, what conditions should be attached to these use cases if operated in the open category.

There is a wider point here. At present BVLOS operations are viewed as higher risk, but that is due to not having the infrastructure in place to bring the risk down. For routine BVLOS to

happen, this infrastructure (DAA, Electronic Conspicuity, ATM systems, integration with the GA community and perhaps tightening of rules for that sector, etc) will necessarily need to exist. This should make future BVLOS operations safer than current VLOS drone operations. So the legal issue changes in that case.

In response to the question, currently there are some very safe potential BVLOS operations (over estates in Scotland, or bodies of water with little boat traffic) where designating an open category would be beneficial. There is also a perversity of Operational Safety Cases from the CAA that are based on ease of legislation, not safety per se. For example, we couldn't get permission for some nanodrone (<250gm) novel testing in an empty area of the Highlands of Scotland, but within the confines of an airport we could – the rationale is that the CAA can essentially outsource the OSC to the Airport ATC as they have safety case primacy in that airspace. These arbitrages need clearing up in any case.

BVLOS is a critical aspect of future drone operations, and making it easier for the lower risk category of drone to experiment in this area will have a marked affect on future drone development. With both FPV making them safer and more reliable, and the question of what wider system of control still unanswered, there is a strong legal case to let this happen now, and learn by testing and doing, rather than trying to intellectually think through an unknown answer. The testing and doing can be controlled in dedicated test areas that are low or zero population, with minimal OSC bureaucracy, and all conducted under the open category. The two safety features that would enable the safety of this system is a robust geofencing, and a good Flight Termination System (e.g. parachute).

Consultation Question 36 7.28 We provisionally propose that for autonomous operations in the specific category, a UAS operator should be required to use a UAS which can:) comply with the authorised limitations and conditions; 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; comply with the operational limitations in designated geographical zones or airspace; comply with the operator's procedures; and 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. Do you agree?

All these are the basics and common sense. It's the edge cases that are going to be challenging.

As an example, avoiding any risk of collision with any crewed aircraft can be seen in very different ways by the UAS community and the GA community. With good DAA and ATM capabilities, a drone could fly within centimetres of a crewed aircraft perfectly safely – it is hard to believe a GA pilot will accept this as avoiding risk of a collision. The compromise will need guidance. There needs a definition of “discontinuation” of a flight – is that fly safely elsewhere, or emergency land, or climb out of the way – all of which can feature (normally independently to each other) in different current drone emergency safety procedures.

Consultation Question 37. 7.41 We seek views on what operational requirements should be applied to autonomous drone operations and drones that operate beyond visual line of sight in the specific and certified categories.

Operational requirements typically look at the aircraft, the ATM system and any other redundancy as independent issues. With BVLOS drone operations there is a much more systematic approach and a level of interdependency that needs capturing. So the

operational requirements may revolve around a robust UTM system (noting there are some fundamentally different technological systems in development currently). As mentioned elsewhere in this response, even the drone itself has very different characteristics to most aircraft – it's ability to geofence itself, as an example, and the ability to easily add a Flight Termination System, as well as an ability for drone to drone communication and decision-making ability to be built in. All of these could add to a complete picture of operational requirements and as a suggestion, an FTS and electronic conspicuity are likely minimum requirements for this.

There is an oft-cited view that with multiple propulsors, there is a higher level of redundancy in VTOL and drones (the EASA paper 03/2023 states this). This is not necessarily true and it is worth reading the AAIB report on Vertical Aerospace's crash to see what can happen, even in a case where they have lots of redundancy and have adhered to the highest regulatory standards in components and redundancy. This is a matter for the Regulators and perhaps needs further research.

A final point is that the CAA to date has often tried to avoid directly following EASA regulations and approaches – I have been told directly that this is due to political pressure related to Brexit (whether that is true or not isn't really the issue; the fact that a CAA employee is willing to state that privately suggests this colours their thinking). With a likely new Government, this issue may go away and there may be a keenness to follow EASA process and thinking going forward.

Consultation Question 38. 7.52 We seek views on whether the current concept of a "remote pilot" is compatible with drone MSO. We also seek views on whether the remote pilots of drone MSO should continue to be subject to the same responsibilities as remote pilots for single drone operations.

It is clearly not compatible. But if this is legislated differently, then unintended consequences are likely to follow – namely, that if the legislative or regulatory burden is lower (as it is likely to be), single drone operators will add another drone to their operations to ensure they fall under the swarm regulations, which cannot be a good thing and almost certainly makes operations less safe. It seems reasonable that an approach would be to define what is safe for MSOs, and use that as a framework for all legislation and regulations for all drone users, including single drone operators.

Consultation Question 39. 7.53 We seek views on whether there should be an upper limit to the number of drones for which an individual remote pilot is responsible.

No – why should there be? This is a technological question, not a legal question (i.e. technological advances could make any number of drones operated by a single person, or press of a button as safe, and perhaps even safer due to their ability to communicate and update information with each other, as a single drone is now).

Consultation Question 40. 7.54 We seek views as to what additional safeguards should be introduced for remote pilots responsible for multiple drones.

If the framework and legislation is correct, then there shouldn't need to be any additional safeguards. This question is a good litmus test for whether legislation is likely to be future-proofed and fit for purpose or not. If the wider drone legislative framework addresses all

MSO operations without needing to specifically mention them, then it is probably focused correctly technologically and not overly burdensome.

It may be worth noting here that a large gripe from industry is around the regular (and well meaning) updates to drone regulations issued periodically by the CAA, which Operators often find confusing, sometimes even contradictory and very prescriptive. Permitting a principles-based legislative framework, rather than a rules-based framework is likely to be the best approach and future-proofs the legislation, in what is a very fast-moving technological area.

Consultation Question 41. 7.58 We provisionally propose that use of flight data recorder systems or devices should be mandatory for autonomous drone operations. Do you agree?

The lack of robust drone incident and crash data is problematic for the industry, for insurers and for regulators. Any legislation which improves this is welcomed. Flight Data is readily available now and is typically recorded, but on ground systems (so the smart phones or other controllers that are used to operate drones). There shouldn't be a need for a flight data recorder on the drone, in most cases, and the SWaPC (Size, Weight and Power, and Cost) are likely to make this prohibitive, but having this transmitted to a ground-based controller is likely to be extremely useful. It should be a relatively simple legal process to state this this needs to be kept for a certain period of time (likely 24 hours as a guide / minimum, as any issues with that drone should be reported within that timeframe).

Consultation Question 42. 7.60 Should the law permit a drone to transition between remotely piloted and autonomous flight during an operation?

Yes, but for the reasons stated elsewhere there shouldn't be a transition time associated with this, nor necessarily seen as a different legal status at different points in the transition – it is not a binary switch, but a continuum and it will be virtually impossible to define in the future where any drone is on this continuum at any point in time.

Consultation Question 43. 7.62 We seek stakeholder views on any other issues with the current legal framework as it relates to operations involving autonomous drones.

Automated legislation and safety cases should be developed alongside autonomy – it's the same sort of process, so backlog should not be an issue so long as the regulator is forward thinking. The technology of drones will always outpace legislation, so why not use technology to track and update legislation and safety cases, bearing that in mind?

There is also a likely fundamental issue about whether a UTM/ATM process that controls a drone has primacy, or whether it is the drone itself. This will be a function of what type of ATM system is ultimately used to control the drones in our airspace. Whoever has primacy is likely to flavour the legal and regulatory approach.

Consultation Question 44. 8.20 We provisionally consider that the current law governing air carrier liability for injury or death of passengers in the UK is adequate for the introduction of remotely piloted and autonomous operations. Do you agree?

Broadly yes, but the definition of an Air Carrier is critical here. We must assume that in future there is no clear concept of a Pilot, and there will be an increasingly important role of the Air Traffic Management system, who may have a more primary role than the Carrier in

terms of safety. Finally, due regard should be given to who has the duty of care of ensuring passengers are not a risk to themselves or others in a flight without pilots or cabin crew? If two strangers are put in an uncrewed aircraft together, whose responsibility is it to check whether any of them have risk factors or previous convictions for antisocial behaviour? Could you legitimately ban a male former sex-offender or violent attacker from travelling with a vulnerable female, for example? And should there be a duty of care from the Carrier to check risk factors of its passengers?

Consultation Question 45. We provisionally consider that the current law governing liability for damage to cargo in the UK is adequate for the introduction of remotely piloted and autonomous operations. Do you agree?

Roland Berger has analysed this market more than most (<https://www.rolandberger.com/en/Insights/Publications/Cargo-drones-The-future-of-parcel-delivery.html>) and I agree with the Law Commission's narrative that drone delivery is likely to be high value, low weight articles. But I would think the charging and insurance structure would cover the risks associated with this, rather than through legislation, similarly to different services and tracking of the Post Office and other parcel delivery services. I feel this area is more akin to last mile road delivery legislation, rather than air law.

Consultation Question 46. We provisionally propose that liability for surface damage, in the case of UAS, should transfer to the lessee when the lease: (1) (2) is for more than 14 days; and specifies the aircraft is to be operated under the responsibility of the lessee. Do you agree?

The one area to think through is the relative ease with which anyone can interfere and "take over" any UAS by GPS jamming, spoofing or any sort of electromagnetic interference. This is common in military operations and is likely to be a feature in civilian operations, whether through simple malfeasance or through organised crime or state actors. The liabilities need to be able to be passed through (e.g. if a Carrier is liable, then that Carrier can sue the person who interfered with their UAS if they can identify them). But this leads to the question of how this liability is dealt with in any case, if it isn't necessarily the fault of the Carrier. Does this force the issue of creating sufficiently robust and cyber-secure control that it does de facto become a Carrier's responsibility. And is this feasible?

Consultation Question 47. We provisionally propose 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. Do you agree?

I wonder whether, in practice, this area of law will be covered by local bylaws? Is that likely a more feasible approach, given it is really a local issue and each circumstance on the ground will be quite different. Having said that, Local Authorities have very limited knowledge in this area (ARPAS regularly engage with LA's and even the few ahead of the curve, such as Coventry City Council, have very limited UAS knowledge).

The other point is around some more practical issues. Just the movement all the time – does that cause a nuisance? And what is reasonable? If a next door neighbour flew to work every day by VTOL, or had multiple drone deliveries per day, would that be a nuisance: the factors are not just noise, but also downdraft (and disturbance of items on the ground),

motion, and also potential use of limited electromagnetic bandwidth – seeing something like that can disturb children, animals etc and simply be off-putting.

Quick point on 8.53: Minimum height is also a function of the vertical distance needed to recover from a stall or spin, and that should be focused on with regard to all UAS and VTOL – the flight characteristics can be quite distinct.

Consultation Question 48. We provisionally propose that there should be a review of product liability law (including the Consumer Protection Act 1987) to take account of the challenges of emerging technologies. The review should cover product liability as a whole, rather than be confined to aviation or automated vehicles. Do you agree?

This makes sense, and the narrative brings together some very disparate areas ranging from AI explainability to decision making processes to “standard” aviation liability – unpicking that may be a challenge. One point not particularly covered is around the practicalities of how UAS deal with emergencies. If the civilian market follows the defence market, then it is likely that every UAS (and perhaps uncrewed VTOLs) will have a Flight Termination System (FTS) within it – i.e. a parachute. It is likely that UAS will not need the same level of reliability as other aircraft due to this in-built safety feature. If this is the case, these will be deployed regularly, which then leads to the issue of liability for goods, and when a passer-by picks up a downed UAS, whether they have a duty to protect it, and its cargo, and return it (similar to legislation about not interfering with Royal Mail letters). A lot of normal legislation will cover this (non-delivery covered by consumer protection; picking up the drone and its cargo and not returning it covered by theft) but there may be some additional protections needed for some situations, for example drone delivery of human organs urgently needed.

Consultation Question 49. We seek views as to whether the current law regarding liability for mid-air collisions is satisfactory in the case of collisions involving uncrewed aircraft systems

I think issues will arise when UAS fly in airspace they are not permitted to – that is probably covered by existing ANO legislation. But then if there is a mid-air collision it is likely to be a failure of Detect and Avoid OR a failure of the ATM system, rather than the UAS or its Operator. Any liability is probably covered in existing legislation (e.g. corporate manslaughter), but these should be the focus.

Consultation Question 50. We seek consultees’ views on whether they expect any difficulties applying existing insurance requirements to uncrewed aircraft systems.

I don’t understand the legal differences between model aircraft and UAS. This differential in weight specifications for insurance will create an arbitrage that will be exploited by many. That difference needs explaining or getting rid of.

Consultation Question 51. We provisionally propose that multiple simultaneous operations should be considered as the Government develops proposals for the insurance requirements applicable to uncrewed aircraft. Do you agree?

Regarding swarms (which in civil use, are often used for light show displays and are full of <250 gram drones), there are numerous insurance issues which need looking into. There have been a few incidents (mainly in China) of light show drones falling out of the sky (<https://www.independent.co.uk/tv/lifestyle/china-drone-crash-zoo-show-b2394312.html>) and in one case due to jamming from a rival light show supplier

(<https://www.newsflare.com/video/457082/dozens-of-drones-fall-from-sky-during-light-show-in-china>)

Consultation Question 52. We provisionally consider that the current approach in the Air Navigation Order 2016 placing criminal liability on an operator is adequate for autonomous operations. Do you agree?

There are a few practical issues here. Unless an Operator is professional, commercial Operator, the typical knowledge of the law is very low. Therefore as a preventative mechanism it isn't that useful. This can be solved by communications, awareness and mandatory exams, but it is worth noting this in relation to how much legislation is useful.

The second practical issue is who prosecutes these issues. I've heard NPAS (the National Police Air Service) state it wasn't a police matter to deal with drone incursions in restricted airspace - it was the CAA's issue. But the CAA has limited resource to deal with this.

I suspect that as drones are used for a range of criminal activity, specific legislation will be needed to deal with this. The Prison exclusion zone is a broad brush way of dealing with previously legally permitted drone issues (flying mobile phones into a prison) and it is likely that there are many legal loopholes that will get exploited by criminal gangs, and others in the future.

Consultation Question 53. We provisionally consider that the "reasonable care" defence in article 265(3) of the Air Navigation Order 2016 applies adequately for "direct contraventions" under Article 265(5) to (8) involving autonomous operations. Do you agree?

Consultation Question 54. 9.46 We seek views on whether for autonomous operations the reasonable care defence should be applicable to the vicarious liability created in article 265(1) of the ANO.

With (ATM) systems potentially functioning based on machine learning or AI, even the "reasonable care" argument may be a challenge, but this is a wider legal issue regarding corporate liability for any AI system.

Consultation Question 55. We provisionally propose that a remote pilot of an uncrewed aircraft operating in the certified category should be treated as a pilot-in-command for the purposes of criminal liability pursuant to article 265(1) of the Air Navigation Order 2016. Do you agree?

No, I think this will lead to many complications and contradictions given it is not clear when a pilot is actually in charge as the level of autonomy on any flight is likely to be high and changeable throughout flight.

Consultation Question 56. We ask for consultees' views on the criminal liability of pilots (or remote pilots) when an aircraft operating autonomously returns control to the pilot or vice-versa. In particular, should a pilot (or remote pilot) only become criminally liable for the piloting of the aircraft at the end of a transition period?

I don't agree with a transition period at all. You are either piloting competently or not. If you need a transition period, then that is prior to the actual time you take over. Use military

RPAS (Predator) flight crews who do shifts on their 24+ hour missions – it is very clear who is in charge and piloting at any point in time.

If remotely piloted flights are treated legally differently from autonomous flights, and it appears the autonomous flights hold an individual operator to a lower degree of accountability, then the market will rapidly gravitate to a hybrid of remote pilot / autonomous flight – and claim that all flights are autonomous. This may be an unintended side-effect of having separate legislation.

Consultation Question 57. We provisionally propose that the pilot-in-command of aircraft in a multiple simultaneous operation should be criminally liable for breach of operating requirements in the same way as a pilot-in-command of a single aircraft would be. Do you agree?

I think this implies so much autonomy for the operation, that the pilot-in-command concept isn't relevant here. But as I stated previously, if the legislation is easier if piloting multiple drones, a single drone operator will add an unnecessary second drone in order to benefit from legislative ease.

Consultation Question 58. We invite consultees' views on whether the Air Traffic Management and Unmanned Aircraft Act 2021 operates satisfactorily in the case of highly automated and autonomous flight.

As mentioned previously, there is a practical issue of who prosecutes these issues. I've heard NPAS (the National Police Air Service) state it wasn't a police matter to deal with drone incursions in restricted airspace - it was the CAA's issue. But the CAA has limited resource to deal with this.

I suspect that as drones are used for a range of criminal activity, specific legislation will be needed to deal with this. The Prison exclusion zone is a broad brush way of dealing with previously legally permitted drone issues (flying mobile phones into a prison) and it is likely that there are many legal loopholes that will get exploited by criminal gangs, and others in the future.

Consultation Question 59. We invite views on how operator responsibilities for dangerous goods might need to be adapted in the case of autonomous operations.

A key advantage of drones is that they can carry "dangerous goods" in a manner that other aircraft cannot easily do. So I believe the legislation shouldn't be adapted for drones, rather drones should be exempt provided they adhere to some specified standards. The presumption in the legislation is that aircraft will fly in air corridors, and that a human will be on board. Drones, on the other hand, won't have a human on board, and can fly routes with dangerous cargoes that avoid flying over urban areas, and possibly can be routed over seas and other areas with limited people underneath. So it may be a very sensible and pragmatic way of getting any dangerous goods off roads and rail and into a safer method of transporting it. Thus legislation shouldn't stymie this use-case, which is likely to be compelling and commercially viable. This is particularly pertinent to medical devices and things like blood, organs etc, where speed of delivery is critical, but they could be classed as dangerous goods. It is likely that emergency services and related activity should be carved out as part of this too.

Consultation Question 60. We ask for consultees' views about whether the offence of hijacking in domestic law should be updated to: (1) (2) include the unauthorised seizure or control of autonomous or remotely piloted aircraft by technological means or by persons not on board the aircraft; and expand the period in which hijacking can occur from the period when an autonomous or remotely piloted aircraft is "in flight" to the period when it is "in service".

Yes. Hijacking was a major problem in aviation in the late 1960s and early 1970s when the legislation was created. The first takeover of an autonomous passenger carrying aircraft (by whatever means, and as pointed out in the consultation, most likely on the ground, technologically) will have a similar effect. So worth pre-empting this with legislation ahead of the inevitable event.

Consultation Question 61. We also ask consultees for views on whether any offences against the aircraft other than hijacking need to be updated to account for increased autonomy in aviation.

Any takeover or diversion of an autonomous aircraft (by spoofing, jamming etc) is likely to be hard to trace to those doing it. A criminal gang or state actor is likely to ensure their actions and undiscoverable. There is therefore a likely crime of permitting illegal interactions with any UAS or VTOL, which would cover IT system operators and telecom providers as well as ATM operators – this will force them to put in place security and counter-measures to try and prevent this occurrence, which currently will be easy (as evidenced by military operations achieving this currently).

Consultation Question 62. We invite consultees to tell us if they have views on, or have experience or data to indicate, the likely costs and benefits of our provisional proposals in relation to VTOLs.

Consultation Question 63. We invite consultees to tell us if they have views on, or have experience or data to indicate, the likely costs and benefits of our provisional proposals in relation to drones.

Taking both questions together, there has been much hype about the impact of VTOLs and drones, and there is a vested interest in consultancies and banks (who primarily provide the economic impact reports) to state optimistic numbers. The PWC Report, which is cited heavily in this document, was commissioned by UKRI Future Flight (which was and is trying to persuade the UK government to fund a Phase 4). Go figure. The report states, "Regulation is often cited as the reason for lack of progress..."

Their S-curve methodology for calculating the numbers of adoption of drones is flawed. It doesn't take into account the legal or regulatory challenges, which are the key issues, and the key costs.

This consultation itself will take a number of years to enter into legislation. The question is will an operator take a legal risk in these matters ahead of that? And if a test case goes against the industry, that could easily kill off an Operator, OEM and the wider industry. Already the VTOL market is struggling to get Type Certified and equity investors are pulling out. The war in Ukraine has buoyed up the drone industry, but purely civil business models have struggled as evidenced by a number of high profile drone companies going into

administration. There will be further consolidation as UKRI's Future Flight funding and equity investment dries up.

The specific costs in this proposal are a function of time and uncertainty. If the Consultation does its job properly, and sensible legislation results, then that will accelerate progress and de-risk the industry, as well as unlocking further equity investment. But in the period of limbo before its report is ready, and the legislation that follows is still uncertain, this is likely to exacerbate the situation. Industry already perceived progress by the CAA as slow, and if the CAA uses this Consultation as an excuse to avoid taking critical decisions, that may make matters worse.

It is also worth noting that there are many sensible voices advocating very strict regulations, such as this response to Parliament: <https://committees.parliament.uk/work/2150/domestic-threat-of-drones-inquiry/publications/written-evidence/> and <https://committees.parliament.uk/work/4619/commercial-and-recreational-drone-use-in-the-uk-inquiry/publications/> and this as a useful example: <https://committees.parliament.uk/writtenevidence/100741/html/>

Consultation Question 64. We invite consultees to tell us if they believe or have evidence or data to suggest that any of our provisional proposals could result in advantages or disadvantages to certain groups or based on particular characteristics (with particular attention to age, disability, transgender identity, marriage and civil partnership, pregnancy and maternity, race, religion or belief, sex or gender, and sexual orientation).

My observation is that the VTOL and drone workforce is predominantly male, and largely White or Asian within the UK. It may be beneficial for a trade body (ARPAS or the ADS Group) to conduct a survey to get a benchmark of this.

In terms of users, the potential for this to be helpful to certain characteristics is highlighted by the University of Birmingham's Public Dialogue on Future Flight to understand where the public see the use cases, which focus on rural areas and those who ordinarily struggle to get around: <https://www.ukri.org/news/public-insight-into-future-flight-technologies-revealed/>

RESPONSE TO LAW COMMISSION CONSULTATION ON AVIATION AUTONOMY

(Law Commission Consultation Paper 261)

Please note that this consultation response has been reproduced from information entered on the Citizen Space online portal.

Any personal email addresses and phone numbers have been excluded from this document.

Unanswered questions have been deleted from this document.

About you

What is your name?

Clive Lewis

Rules of the air

Consultation Question 4

We seek views on how highly automated and autonomous aircraft should act in emergency scenarios. In particular:

1. should highly automated and autonomous aircraft be given the freedom to operate outside the rules of the air in emergency circumstances; or
2. should a comprehensive set of rules be developed for highly automated and autonomous aircraft in emergency situations.

Please share your views below

It would seem to be logical to begin with 2 using established rules for safety and to fit with the expectations of other air users. The potential for 1 should be based on the collection of evidence.

Consultation Question 6

We seek consultees' views on whether the rules of the air relating to communication should be adapted for remotely piloted and autonomous aircraft.

Please share your views below

This would be desirable to interface with piloted air users.

VTOLs

Consultation Question 8

We provisionally propose that a person overseeing a VTOL flying automatically, who monitors its course and is able to intervene and change its course at any time should continue to be classified as a “remote pilot”. Do you agree?

Yes

Please expand on your answer below

The pilot needs to have the expertise to act appropriately in an emergency and retain ultimate responsibility.

Consultation Question 10

We provisionally propose 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.

Do you agree? (Tick all that you agree with)

Please expand on your answer below

Not being an expert in this area, I am uncertain about 5 - the best course of action could involve evasive manoeuvres that exceed operating limitations.

Consultation Question 11

We invite views as to whether there are additional operational responsibilities that a remote VTOL pilot should be required to fulfil.

Please share your views below

It may be included in the above but the assurance of adequate data links for monitoring and control.

Consultation Question 12

We provisionally propose that the remote pilot-in-command should be responsible for, amongst other things, ensuring passengers are:

1. given a safety briefing; and
2. seated and wear seat belts during take-off and landing

Do you agree?

Yes

Please expand on your answer below

This could be by remote sensing or delegation.

Consultation Question 14

We provisionally propose that the remote pilot-in-command should have the power to take reasonable measures, including restraint of passengers, as set out in section 94 of the Civil Aviation Act 1982. Do you agree?

No

Please expand on your answer below

This could be with cabin crew.

Consultation Question 16

We seek views on whether the powers of crew on board a VTOL aircraft should be broadened to reflect those of the pilot-in-command under the Civil Aviation Act 1982 to:

1. take reasonable measures to protect the safety of the aircraft or persons or property on board;
2. maintain good order and discipline; or
3. enable the crew to disembark or deliver a person.

Please share your views below

Support this. However, there may be no crew.

Consultation Question 17

We provisionally propose that passengers should be able to contact a member of crew at all times during an operation. Do you agree?

Yes

Please expand on your answer below

Even if that crew member is remote.

Consultation Question 18

We provisionally propose 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. Do you agree?

Yes

Consultation Question 19

We provisionally propose that it should be a criminal offence for a person to act as the remote pilot of a VTOL when the level of alcohol in their blood, breath or urine is over a prescribed limit. Do you agree?

Yes

Consultation Question 20

We provisionally propose that the remote pilot should be subject to the reporting obligations currently applicable to pilots under the Air Operations Regulation. Do you agree?

Yes

Consultation Question 21

We provisionally propose that a remotely piloted VTOL should be required to be capable of detecting and recording information relating to accidents and near accidents for the purposes of reporting it. Do you agree?

Other

Please expand on your answer below

This would depend on aircraft weight. A small vehicle presents a lesser risk and may not be able to support the equipment.

Consultation Question 22

We provisionally propose that licences should be required for remote VTOL pilots. So far as appropriate, these should follow the classes and ratings adopted for crewed VTOLs. Do you agree?

Yes

Consultation Question 23

We provisionally propose that operators of remotely piloted VTOL should be certified. Do you agree?

Other

Please expand on your answer below

Yes for passenger carrying and large VTOL presenting higher risk.

Consultation Question 24

We provisionally propose that operators of remotely piloted VTOLs should continue to be required to:

- ☒ (1) have the means necessary for the scale and scope of operations planned;
- ☒ (2) use only suitably qualified and trained personnel;
- ☒ (3) implement a management system to ensure safety;
- ☒ (4) ensure operations only take place in accordance with the operations manual;
- ☒ (5) establish procedures to minimise the consequences to safe flight operations of disruptive passenger behaviour;
- ☒ (6) develop and maintain security programmes suitable for the aircraft and type of operation;
- ☒ (7) have a management system to prevent fatigue.
- ☒ (8) ensure the continuing airworthiness of the aircraft; and.
- ☒ (9) establish procedures for any reasonably foreseeable emergency situation.

Do you agree? (tick all that you agree with)

Please expand on your answer below

Security programmes should cover the location of the remote pilot.

Consultation Question 25

We seek views as to whether there are additional responsibilities that operators of remotely piloted VTOLs should need to fulfil.

Please share your views below

With reduced workload, this would be appropriate and desirable for business case. The number of VTOL under control permitted would need to be increased gradually as evidence is built.

Consultation Question 26

We seek views as to whether the law should permit remote pilots to act as pilot-in-command for more than one VTOL at the same time.

Please share your views below

With reduced workload, this would be appropriate and desirable for business case. The number of VTOL under control permitted would need to be increased gradually as evidence is built.

Consultation Question 27

We seek views as to whether there should be an upper limit to the number of VTOLs for which a remote pilot can act as pilot-in-command at the same time.

Please share your views below

Yes, evidence based.

Consultation Question 28

We seek views as to what additional safeguards should be introduced for remote pilots piloting multiple VTOLs.

Please share your views below

Specific pilot training and qualifications.

Consultation Question 30

Should the law permit an uncrewed VTOL to transition between remotely piloted and autonomous flight during an operation?

Yes

Please expand on your answer below

Why not?

Consultation Question 31

We seek views as to whether initial airworthiness standards for uncrewed VTOLs should include accessibility standards for persons with disabilities and reduced mobility.

Please share your views below

Yes, to be socially acceptable, VTOLs should not be the preserve of the able bodied. In fact, they could open mobility opportunities.

Consultation Question 32

We seek views as to whether the CAA should be able to include accessibility standards within the licences granted to uncrewed VTOL operators.

Please expand on your answer below

Yes, to be socially acceptable, VTOLs should not be the preserve of the able bodied.

Drones

Consultation Question 34

We provisionally propose that a remote pilot for drones should continue to be defined as “a natural person responsible for safely conducting the flight of an unmanned aircraft by operating its flight controls, either manually or, when the unmanned aircraft flies automatically, by monitoring its course and remaining able to intervene and change its course at any time”. Do you agree?

Yes

Consultation Question 35

We seek views on whether some low risk autonomous drone operations or drone operations conducted beyond visual line of sight might be accommodated in the open category. In particular:

1. whether there are any such use cases which might be suitable for the open category; and

2. if so, what conditions should be attached to these use cases if operated in the open category.

Please share your views below

Absolutely! There are many low-risk operations possible including but not limited to asset inspection, remote monitoring of secure or remote locations, small package (particularly medical) carriage, last mile logistics, data gathering (e.g. mapping, agriculture)

Consultation Question 36

We provisionally propose that for autonomous operations in the specific category, a UAS 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 manned 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.

Do you agree? (tick all that you agree with)

Please expand on your answer below

All seem common sense given the higher risk presented by the specific category.

Consultation Question 39

We seek views on whether there should be an upper limit to the number of drones for which an individual remote pilot is responsible.

Please share your views below

Yes, evidence based.

Consultation Question 41

We provisionally propose that use of flight data recorder systems or devices should be mandatory for autonomous drone operations. Do you agree?

Other

Please expand on your answer below

This could be too burdensome onboard. If it could be remote it might be a good measure in the short-term until sufficient evidence assures safety.

Consultation Question 42

Should the law permit a drone to transition between remotely piloted and autonomous flight during an operation?

Yes

Please expand on your answer below

Why not?

Criminal liability

Consultation Question 55

We provisionally propose that a remote pilot of an uncrewed aircraft operating in the certified category should be treated as a pilot-in-command for the purposes of criminal liability pursuant to article 265(1) of the Air Navigation Order 2016. Do you agree?

Yes

Please expand on your answer below

As long as there is legal provision to account for issues outside of the pilot's control. e.g. fault of design or operation of automatic/autonomous flight control systems

Consultation Question 59

We invite views on how operator responsibilities for dangerous goods might need to be adapted in light of autonomous operations.

Please share your views below

The responsibility still needs to lie with the operator.

Consultation Question 60

We ask for consultees' views about whether the offence of hijacking in domestic law should be updated to:

1. include the unauthorised seizure or control of autonomous or remotely piloted aircraft by technological means or by persons not on board the aircraft; and
2. expand the period in which hijacking can occur from the period when an autonomous or remotely piloted aircraft is "in flight" to the period when it is "in service".

Please share your views below

Yes.

Impact

Consultation Question 62

We invite consultees to tell us if they have views on, or have experience or data to indicate, the likely costs and benefits of our provisional proposals in relation to VTOLs.

Please share your views below

There is much in the public domain on benefits.

Consultation Question 63

We invite consultees to tell us if they have views on, or have experience or data to indicate, the likely costs and benefits of our provisional proposals in relation to drones.

Please share your views below

There is much in the public domain on benefits.

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About you

What is the name of your organisation?

Consortiq Limited

Airworthiness and certification

Consultation Question 1

We seek views on how current airworthiness and certification regulation might need to be adapted or developed in light of highly automated and autonomous aircraft. In particular, should provisions be adopted which allow for:

1. the certification of optionally piloted and uncrewed or unoccupied versions of conventional aircraft (hybrid versions); and
2. the separate certification of command units?

Please share your views below

Yes I believe specific provisions should be adopted for both, the requirements are different for uncrewed vehicles and the regulations need to reflect that.

Enabling separate certification of command units, would be valuable to enable an ecosystem of parts to allow for specific aircraft builds for new applications.

Consultation Question 2

We welcome views on what changes to the certification system might be necessary to enable higher automation and autonomy in aviation.

Please share your views below

The biggest thing is to separate out vehicles that do not have a human on board, they should not be subject to the same certifications as those that do.

If the command unit is certified separately it can even be certified by a dedicated technology certification body that specialises in autonomous vehicle control.

Consultation Question 3

We seek views on whether current regulatory tools to support the development of highly automated and autonomous aviation technologies are adequate.

Please share your views below

No, there is no pathway for fully autonomous flight within the current regulations. You can conduct R&D work in a sandbox but there is no way for that to become a routine operation, without starting the process anew and attempting to acquire an Operating Safety Case.

Rules of the air

Consultation Question 4

We seek views on how highly automated and autonomous aircraft should act in emergency scenarios. In particular:

1. should highly automated and autonomous aircraft be given the freedom to operate outside the rules of the air in emergency circumstances; or
2. should a comprehensive set of rules be developed for highly automated and autonomous aircraft in emergency situations.

Please share your views below

I don't think this is the right question as it operate under an assumption of the status quo. All aircraft should be transponding at all times, autonomous aircraft could then deconflict from other air users at any time so no special provision would be required for emergencies. Similar to TCAS in commercial aviation.

Consultation Question 5

We seek consultee views about what challenges remotely piloting an aircraft in an emergency scenario presents and how these might be addressed

Please share your views below

The challenges are gaining permission from relevant parties to operate, and tactical deconfliction with other airspace users especially media, emergency services or military.

VTOLs

Consultation Question 8

We provisionally propose that a person overseeing a VTOL flying automatically, who monitors its course and is able to intervene and change its course at any time should continue to be classified as a “remote pilot”. Do you agree?

Yes

Please expand on your answer below

Yes if it is a 1:1 ratio of pilot to aircraft. If not, that person is more like an Air Traffic Controller.

Consultation Question 10

We provisionally propose 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.

Do you agree? (Tick all that you agree with)

Please expand on your answer below

I think this falls to the operator, not the remote pilot. The remote pilot should be checking whatever information is available to them to confirm those facts, but they don't ensure it (who is accountable vs responsible).

What are the considerations for if the remote pilot is not located in the geographic vicinity of the aircraft?

Consultation Question 12

We provisionally propose that the remote pilot-in-command should be responsible for, amongst other things, ensuring passengers are:

1. given a safety briefing; and
2. seated and wear seat belts during take-off and landing

Do you agree?

Other

Please expand on your answer below

Same as above.

Consultation Question 13

We provisionally propose that air operators (rather than the remote pilot-in-command) should be responsible for preventing passengers from boarding:

1. who appear drunk or under the influence of drugs; or
2. whose carriage would, in the view of the operator's employees, endanger the safety of the aircraft or other passengers.

Do you agree?

Yes

Consultation Question 14

We provisionally propose that the remote pilot-in-command should have the power to take reasonable measures, including restraint of passengers, as set out in section 94 of the Civil Aviation Act 1982. Do you agree?

Yes

Consultation Question 15

We provisionally propose that a person on board a VTOL aircraft (other than a crew member) should be able to take reasonable measures to protect the safety of the aircraft or of persons or property on board. Do you agree?

Other

Please expand on your answer below

This should be the same as with current airlines.

Consultation Question 18

We provisionally propose 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. Do you agree?

Yes

Consultation Question 19

We provisionally propose that it should be a criminal offence for a person to act as the remote pilot of a VTOL when the level of alcohol in their blood, breath or urine is over a prescribed limit. Do you agree?

Yes

Consultation Question 22

We provisionally propose that licences should be required for remote VTOL pilots. So far as appropriate, these should follow the classes and ratings adopted for crewed VTOLs. Do you agree?

Other

Please expand on your answer below

I agree licences should be required, but I don't think they should match crewed VTOLs. It's a very different operation and aircraft type.

Consultation Question 23

We provisionally propose that operators of remotely piloted VTOL should be certified. Do you agree?

Yes

Consultation Question 24

We provisionally propose that operators of remotely piloted VTOLs should continue to be required to:

- ☒ (1) have the means necessary for the scale and scope of operations planned;
- ☒ (2) use only suitably qualified and trained personnel;
- ☒ (3) implement a management system to ensure safety;
- ☒ (4) ensure operations only take place in accordance with the operations manual;

- ☒ (5) establish procedures to minimise the consequences to safe flight operations of disruptive passenger behaviour;
- ☒ (6) develop and maintain security programmes suitable for the aircraft and type of operation;
- ☒ (7) have a management system to prevent fatigue.
- ☒ (8) ensure the continuing airworthiness of the aircraft; and.
- ☒ (9) establish procedures for any reasonably foreseeable emergency situation.

Do you agree? (tick all that you agree with)

Please expand on your answer below

Totally agree.

Consultation Question 26

We seek views as to whether the law should permit remote pilots to act as pilot-in-command for more than one VTOL at the same time.

Please share your views below

Eventually, yes. However I see this as a long way off, and it has many enabling requirements.

Consultation Question 27

We seek views as to whether there should be an upper limit to the number of VTOLs for which a remote pilot can act as pilot-in-command at the same time.

Please share your views below

Potentially yes, see comments referencing human factors and HMIs elsewhere.

Consultation Question 30

Should the law permit an uncrewed VTOL to transition between remotely piloted and autonomous flight during an operation?

Yes

Please expand on your answer below

A simple transition might be from take-off and landing to in-flight.

Drones

Consultation Question 34

We provisionally propose that a remote pilot for drones should continue to be defined as “a natural person responsible for safely conducting the flight of an unmanned aircraft by operating its flight controls, either manually or, when the unmanned aircraft flies automatically, by monitoring its course and remaining able to intervene and change its course at any time”. Do you agree?

No

Please expand on your answer below

I don't see these people as 'pilots' and to refer to them as such denigrates the 'pilot' title. Currently they are more akin to systems operators, with all the automation onboard a modern drone the operator is in fact doing the equivalent of moving a virtual pointer in the sky and the drone is taking care of how it gets there.

In the future they will be more like air traffic controllers, looking after multiple aircraft at the same time, but in a reverse of the ATC role they will only intervene when it looks like the software isn't doing what it's supposed to.

Consultation Question 35

We seek views on whether some low risk autonomous drone operations or drone operations conducted beyond visual line of sight might be accommodated in the open category. In particular:

- (1) whether there are any such use cases which might be suitable for the open category; and
- (2) if so, what conditions should be attached to these use cases if operated in the open category.

Please share your views below

Technically any operation where the drone goes around a corner, or when you look down / away from the transmitter / controls is BVLOS.

Operations that are conducted using route mapping software should be able to be conducted in the open category. This would include any mapping mission, or any building inspection using automated flight to capture photographic data at predetermined intervals.

True BVLOS should be reserved for aircraft flying further distances, or with larger aircraft.

Consultation Question 36

We provisionally propose that for autonomous operations in the specific category, a UAS 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 manned 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.

Do you agree? (tick all that you agree with)

Please expand on your answer below

I don't agree with most of these as currently I see many functions sitting with the pilot / equipment operator. If we are currently at the 'human in the loop' stage of automation then there will always be one around to intervene.

The worry is that this sets up too many barriers which will prevent the autonomous operations from even getting started. It should be a sliding scale depending on complexity and the operation itself.

Consultation Question 37

We seek views on what operational requirements should be applied to autonomous drone operations and drones that operate beyond visual line of sight in the specific and certified categories.

Please share your views below

It really depends on the operation itself, but broadly I'd expect to see a much higher level of redundancy in the onboard equipment with defined mean time between failures which will enable a system to reach a risk level that is quantifiable.

This would especially apply to C2 links, or command systems, but also should cover propulsion.

Consultation Question 38

We seek views on whether the current concept of a “remote pilot” is compatible with drone MSO. We also seek views on whether the remote pilots of drone MSO should continue to be subject to the same responsibilities as remote pilots for single drone operations.

Please share your views below

As stated elsewhere drone MSO are more akin to air traffic controllers than pilots, when operating a swarm for a light display the equipment operator cannot manually control individual aircraft, therefore the pilot moniker is invalid and that operator should have different responsibilities.

Consultation Question 39

We seek views on whether there should be an upper limit to the number of drones for which an individual remote pilot is responsible.

Please share your views below

It depends on the use case, safety case, human factors and the human machine interface.

Drone light shows contain 1000+ drones due to the software involved and the human input required, I don't believe you need to limit that.

Though for a swarm of police surveillance drones you may want to limit it to a certain number due to the increased complexity of managing those aircraft and the scenario they're in.

Consultation Question 40

We seek views as to what additional safeguards should be introduced for remote pilots responsible for multiple drones.

Please share your views below

Human factors considerations should be paramount, treating them more like Air Traffic Controllers than a system operator.

Consultation Question 41

We provisionally propose that use of flight data recorder systems or devices should be mandatory for autonomous drone operations. Do you agree?

Yes

Please expand on your answer below

Having drones that log specific data is a good idea, but that data shouldn't be in a proprietary format that only the manufacturer can read.

Consultation Question 42

Should the law permit a drone to transition between remotely piloted and autonomous flight during an operation?

Yes

Please expand on your answer below

This could allow for operations in more difficult take-off and landing environments but with less complex operating environment for example, taking off from street level in a busy city to conduct a building survey.

Consultation Question 43

We seek stakeholder views on any other issues with the current legal framework as it relates to operations involving autonomous drones.

Please share our views below

I don't believe there is a current viable framework.

Civil liability and insurance

Consultation Question 47

We provisionally propose 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. Do you agree?

Other

Please expand on your answer below

I think it needs to go further than this, precedent needs to be established as to what control a person has over the airspace above their property and what constitutes

nuisance for a drone.

The terms in the Chicago convention and existing case law do not cover drones, with the reduced heights and different noise profiles of these new vehicles an update is required.

Consultation Question 51

We provisionally propose that multiple simultaneous operations should be considered as the Government develops proposals for the insurance requirements applicable to uncrewed aircraft. Do you agree?

Other

Please expand on your answer below

MSO is already available from insurers, drone light show operators have insurance already.

RESPONSE TO LAW COMMISSION CONSULTATION ON AVIATION AUTONOMY

(Law Commission Consultation Paper 261)

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About you

What is the name of your organisation?

Drone Alliance Europe

Drones

Consultation Question 34

We provisionally propose that a remote pilot for drones should continue to be defined as “a natural person responsible for safely conducting the flight of an unmanned aircraft by operating its flight controls, either manually or, when the unmanned aircraft flies automatically, by monitoring its course and remaining able to intervene and change its course at any time”. Do you agree?

No

Please expand on your answer below

As the technology moves towards greater automation, it may become less feasible or even not sensible for a human to be in the loop. A more appropriate definition, replacing the traditional notion of a remote pilot could, for example, describe an operator or automated management system as “monitoring aircraft and capable of taking appropriate action to address off-nominal events at any time.”

We also urge the Law Commission and other UK bodies to align with ICAO, EASA, the U.S. Federal Aviation Administration (FAA) and other civil aviation authorities, both at national and international levels. Cooperation between the Law Commission and these other actors promise to facilitate harmonization, consistency and interoperability.

Consultation Question 36

We provisionally propose that for autonomous operations in the specific category, a UAS 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 manned 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.

Do you agree? (tick all that you agree with)

Please expand on your answer below

For possible requirements in Question 36 and for other potential areas of law or regulation, we suggest a performance-based approach aligned with international best practices, such as the Joint Authorities for Rulemaking on Unmanned Systems (JARUS) Specific Operations Risk Assessment (SORA) framework, promoting harmonization and facilitating cross-border operations. The current ruleset for the specific category and the certified category allows a risk-based approach for BVLOS operations, and no additional prescriptive rules are needed at the current stage.

We support performance- and risk-based regulations to support the modernization of the regulatory framework. For proposed requirement (2), for example, instead of requiring the UAS to "avoid any risk of collision" and "discontinue a flight when continuing it may pose a risk," we propose that the Law Commission take a more practical, performance- and risk-based approach, instead requiring that the UAS, "take appropriate action to avoid any risk of collision with crewed aircraft."

For proposed requirement (5), instead of a blanket prohibition on flying near emergency response efforts, the Law Commission's goals could be met with alternative language such as, "avoid flying in close proximity to areas where an emergency response effort is ongoing, unless authorized by the regulator or unless operations have been coordinated with the emergency services." Any law or regulation intended to ensure that drones, whether today's automated drones or autonomous drones that do not yet exist, do not interfere with emergency response will require further review.

Consultation Question 37

We seek views on what operational requirements should be applied to autonomous drone operations and drones that operate beyond visual line of sight in the specific and certified categories.

Please share your views below

Operational requirements for autonomous drones that may be eventually developed, and for highly-automated drones and drones that operate beyond visual line of sight (BVLOS) should be risk-based and proportional to the specific operation. A one-size-fits-all approach would stifle innovation and potentially reduce safety. Requirements should consider factors such as the operational environment, population density, airspace complexity, the technology used, safety data, mitigations, and the level of automation.

Operators should be required to demonstrate through a safety case that their systems and procedures adequately mitigate risks. Additionally, the regulatory framework should be flexible and adaptable to accommodate rapidly-evolving technology. SORA methodology is designed to be applicable to all levels of automation under the JARUS guidelines on SORA 2.5. It is important to stress that as automation in uncrewed aircraft operations increases, there should not necessarily be a corresponding rise in applicable operational requirements – on the contrary, the safety and reliability of highly-automated systems, and, in the future, of autonomous systems, should mean that fewer requirements might be necessary. Consequently, we consider that the current regulatory tools are generally sufficient and adequate to support greater automation and scalability of UAS operations in the ‘specific’ category, provided they are implemented in a coherent, proportionate, and flexible manner.

Consultation Question 38

We seek views on whether the current concept of a “remote pilot” is compatible with drone MSO. We also seek views on whether the remote pilots of drone MSO should continue to be subject to the same responsibilities as remote pilots for single drone operations.

Please share your views below

Looking ahead, it will be necessary to move beyond the current role of remote pilots and shift away from focusing solely on the number of drones each pilot manages. As automation in uncrewed aviation advances, operators will be able to safely scale operations more efficiently and effectively by focusing on managing areas of operation rather than individual drones.

Future “pilots” could be better suited to new roles, for example managing operational areas with varying numbers of UAS, enabled by the deployment of highly-automated systems (e.g., UTM) that connect to highly-automated aircraft systems. This shift will render certain requirements that are currently placed upon the remote pilot, such as the monitoring of the course of the UAS implied by its definition, impractical – instead, pilots should focus on the oversight of the status of all UAS in their area of responsibility, as opposed to individual flight paths.

For example, in an emergency situation requiring aircraft to immediately vacate the airspace, the operator would specify the area(s) where all the UAS within would be automatically commanded to land without delay, rather than managing each aircraft

individually. This forward-thinking strategy emphasises area management over individual flight control. As uncrewed aviation increasingly integrates highly-automated technologies, the role of the remote pilot would inevitably evolve unless unnecessarily restricted by backward-looking requirements.

Consultation Question 39

We seek views on whether there should be an upper limit to the number of drones for which an individual remote pilot is responsible.

Please share your views below

Neither law nor regulations should prescribe a rigid limit on the number of drones for which an individual remote pilot is responsible. Instead, operators should be required to demonstrate their capabilities and safety measures through a performance-based and risk-based approach. The operator should prove its ability to safely manage the number of drones for which remote pilot(s) are responsible. Technology changes, different airspace conditions, developments in drone and non-drone aircraft, and safety data that will come from more experience, among many other predictable developments mean that any prescriptive requirement on the number of drones per pilot would be unreasonable and could stifle technological advancements.

A performance-based approach facilitates innovation while upholding safety. By demonstrating their capabilities through operational experience along with, as necessary, testing and evaluation, operators should be able to operate with a higher ratio or number of drones to pilots in command, provided they can prove their proficiency and risk mitigation strategies. This approach encourages continuous improvement and adaptation to emerging technologies while ensuring safety remains the top priority.

Consultation Question 40

We seek views as to what additional safeguards should be introduced for remote pilots responsible for multiple drones.

Please share your views below

The operator must demonstrate safety based on its particular operation regardless of the type of operation and whether the remote pilots are responsible for one or multiple drones. There is no need to prescribe specific requirements arising from whether the pilot operates one or multiple drones and eventual safeguards for remote pilots responsible for multiple drones must be performance based.

As outlined in DAE's response to Q38, it will be necessary to move beyond the current role of remote pilots and shift away from focusing solely on the number of drones each pilot manages and instead transfer more responsibilities to operators and their advanced systems. As automation in uncrewed aviation advances,

operators will be able to scale operations more efficiently and effectively by focusing on, for example, managing areas of operation rather than individual drones.

Consultation Question 41

We provisionally propose that use of flight data recorder systems or devices should be mandatory for autonomous drone operations. Do you agree?

No

Please expand on your answer below

Without fully understanding the justification for the Law Commission's proposal that flight data recorder "systems" or "devices" should be mandatory for autonomous drone operations, especially in the absence of an internationally-agreed definition of "autonomous," we object to the proposition that "autonomous" drone operations must use flight data recorder systems or devices. The case for flight-data recorder systems and appropriate technology are appropriate topics for discussion with the drone community, civil aviation authorities, and other stakeholders. It would be premature at this point to create a blanket requirement that may not be founded in data and that may ultimately be inconsistent with requirements to be developed by other bodies or in other geographies.

Consultation Question 42

Should the law permit a drone to transition between remotely piloted and autonomous flight during an operation?

Despite the rapid progress in these technologies over the past few years, we are likely to see even faster development in the near future. Given this potential for continued technological progress, DAE would consider it arbitrary and potentially limiting for the UK or any other government to develop a bespoke ruleset that addresses these two modes of operation. Doing so could pose an obstacle for innovation, as it would be challenging to ensure that regulation adequately accommodates evolving technology in this sector. DAE recommends using a framework that allows for flexibility to respond to unique operating environments and is based on outcomes and performance.

Consultation Question 43

We seek stakeholder views on any other issues with the current legal framework as it relates to operations involving autonomous drones.

Please share our views below

The UK has an opportunity to become a leader in the regulation of highly-automated uncrewed aircraft flights and also in the regulation of eventual

autonomous flights. We appreciate that realising this potential may require unique regulatory decisions that might not fully align with those of the EU or the United States, or the formulation or refinement of particular rulesets that are still in progress in these regions.

While we support this aspect of regulatory innovation, we believe it is equally crucial to consider the emerging international consensus on the regulation of highly-automated drones, which includes the adoption of globally-recognised standards. It is vital that UAS operators can scale across different markets using their existing data and established proof points, rather than having to start from scratch in the UK or elsewhere. We strongly urge UK regulators and lawmakers to prioritise international alignment when developing frameworks for automation in uncrewed aircraft operations.

RESPONSE TO LAW COMMISSION CONSULTATION ON AVIATION AUTONOMY

(Law Commission Consultation Paper 261)

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Unanswered questions have been deleted from this document.

About you

What is the name of your organisation?

Drone Major Group Limited

Airworthiness and certification

Consultation Question 1

We seek views on how current airworthiness and certification regulation might need to be adapted or developed in light of highly automated and autonomous aircraft. In particular, should provisions be adopted which allow for:

1. the certification of optionally piloted and uncrewed or unoccupied versions of conventional aircraft (hybrid versions); and
2. the separate certification of command units?

Please share your views below

Certification of UAS and optionally piloted systems needs to be managed through the development of appropriate standards. A full suite of certifications exist for manned aircraft but nothing exists beyond a range of acceptable means of compliance safety and quality standards for UAS such as the ISO21384 series.

Drone Major are now working with SAE to develop a new suite of certification standards using existing manned aircraft certification standards, such as the ARP series, as a basis to avoid duplication.

Once developed, certification schemes need to be developed to enable compliance against the appropriate standards.

Consultation Question 2

We welcome views on what changes to the certification system might be necessary to enable higher automation and autonomy in aviation.

Please share your views below

No change needed, only new standards and new certification schemes...the framework should remain the same as that for manned aviation.

Consultation Question 3

We seek views on whether current regulatory tools to support the development of highly automated and autonomous aviation technologies are adequate.

Please share your views below

Current regulatory tools are not adequate to support the development of highly automated and autonomous systems.

There is a complete disparity between the application and terminology used by each regulatory domain (land, maritime and air) - see Drone Delivery Group white paper on this topic at www.Drone-Delivery-Group.org

The current OSC system is way too subjective leaving the ability for assessors to apply vastly varying standards when applying the guidance. The new SORA system will alleviate some of these issues but will introduce new issues as it is highly objective so, where a system is new and innovative, it will immediately fail as the framework will not exist for such operations...and currently, there is no route for highly innovative autonomous systems to gain authority to operate or obtain certification.

Rules of the air

Consultation Question 4

We seek views on how highly automated and autonomous aircraft should act in emergency scenarios. In particular:

1. should highly automated and autonomous aircraft be given the freedom to operate outside the rules of the air in emergency circumstances; or
2. should a comprehensive set of rules be developed for highly automated and autonomous aircraft in emergency situations.

Please share your views below

All aircraft need to prove that, in emergency situations, they will behave in a prescribed manner. There are currently no frameworks to enable developers to do

so. The CAA has a lack of expertise in DO178 certified software and there are no standards available to guide industry.

This problem has been created by a lack of investment by Civil Servants and Government in the development of Standards for this industry.

Most activity is on the international level (such as ISO) with virtually no support from BSI or Government.

Consultation Question 5

We seek consultee views about what challenges remotely piloting an aircraft in an emergency scenario presents and how these might be addressed

Please share your views below

The challenges facing the industry are:

- a complete lack of guidance on the standards required for emergency system behaviours
- a lack of appropriate standards to guide manufacturers (operator guidance is espoused in ISO21384-4)
- a lack of expertise at the CAA level to guide industry or assess possible solution.

Consultation Question 6

We seek consultees' views on whether the rules of the air relating to communication should be adapted for remotely piloted and autonomous aircraft.

Please share your views below

Yes, absolutely...supported by appropriate industry standards NOT more CAA guidance.

Consultation Question 7

We ask for consultees' views on how the rules of the air might be adapted or developed for remotely piloted or autonomous flight

Please share your views below

The current Rules of the Air are already sufficient for UAS operations and suitable safety and quality standards exist to support them (ISO21384-3).

VTOLs

Consultation Question 8

We provisionally propose that a person overseeing a VTOL flying automatically, who monitors its course and is able to intervene and change its course at any time should continue to be classified as a “remote pilot”. Do you agree?

Yes

Please expand on your answer below

Where a VTOL is uncrewed, it is classified as a UAS - in accordance with ISO 21384-4. However, be aware that a new role of Fleet Manager is being espoused in ISO21384-3 to cover the role of someone monitoring and having limited control over an automated UAS. Remote Pilot should only be used where the pilot has full operational control (i.e. is can actually fly the aircraft).

Consultation Question 9

We provisionally propose 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. Do you agree?

Yes

Please expand on your answer below

Please also see ISO21384-3 which is evolving faster than regulation possibly can.

Consultation Question 10

We provisionally propose 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.

Do you agree? (Tick all that you agree with)

Please expand on your answer below

This is very simplistic and it depends on the nature of the VTOL...indeed the very use of this term

Is confusing....a helicopter is VTOL but it is not uncrewed. Furthermore, any aircraft designed for passenger carrying will it be uncrewed for a significant amount of time and will actually be operated in exactly the same way as traditional helicopters so...

We should use the terms:

- eHelicopter (for piloted systems using electric propulsion)
- optionally piloted aircraft (for aircraft which can legitimately transition from piloted to uncrewed)
- UAS (for uncrewed systems)

This will remove the confusion caused by using the term VTOL and more accurately reflect the realities of the industry. VTOL is not a term that should be used beyond describing the action of taking off and landing vertically.

Consultation Question 11

We invite views as to whether there are additional operational responsibilities that a remote VTOL pilot should be required to fulfil.

Please share your views below

Depends on what you mean by VTOL - see previous question.

Consultation Question 12

We provisionally propose that the remote pilot-in-command should be responsible for, amongst other things, ensuring passengers are:

1. given a safety briefing; and
2. seated and wear seat belts during take-off and landing

Do you agree?

Yes

Please expand on your answer below

This should be exactly the same as the responsibilities of a Helicopter pilot as set out in current helicopter guidance and notices. We do not need additional regulations here.

Consultation Question 13

We provisionally propose that air operators (rather than the remote pilot-in-command) should be responsible for preventing passengers from boarding:

1. who appear drunk or under the influence of drugs; or
2. whose carriage would, in the view of the operator's employees, endanger the safety of the aircraft or other passengers.

Do you agree?

Yes

Please expand on your answer below

This should be exactly the same as the responsibilities of a Helicopter Operator as set out in current helicopter guidance and notices. We do not need additional regulations here.

Consultation Question 14

We provisionally propose that the remote pilot-in-command should have the power to take reasonable measures, including restraint of passengers, as set out in section 94 of the Civil Aviation Act 1982. Do you agree?

This should be exactly the same as the responsibilities of a Helicopter pilot as set out in current helicopter guidance and notices. We do not need additional regulations here - please do NOT re-invent the wheel....these aircraft are no different to helicopters in terms of operations.

Consultation Question 15

We provisionally propose that a person on board a VTOL aircraft (other than a crew member) should be able to take reasonable measures to protect the safety of the aircraft or of persons or property on board. Do you agree?

Yes

Please expand on your answer below

See answers to previous 3 questions.

Consultation Question 16

We seek views on whether the powers of crew on board a VTOL aircraft should be broadened to reflect those of the pilot-in-command under the Civil Aviation Act 1982 to:

1. take reasonable measures to protect the safety of the aircraft or persons or property on board;
2. maintain good order and discipline; or
3. enable the crew to disembark or deliver a person.

Please share your views below

No, simply use the powers set out in the regulations, guidance and notices for the operation of helicopters.

Consultation Question 17

We provisionally propose that passengers should be able to contact a member of crew at all times during an operation. Do you agree?

Yes

Please expand on your answer below

As passenger carrying systems are exceedingly unlikely to be certified or permitted to operate without a pilot, this will be the pilot on board for the foreseeable future...beyond that time, then a link to the pilot would be essential (as set out in ISO 21383-3).

Consultation Question 18

We provisionally propose 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. Do you agree?

Yes

Please expand on your answer below

Again, this should no different to manned aviation regulations and already set out in ISO21384-3 for UAS.

Consultation Question 19

We provisionally propose that it should be a criminal offence for a person to act as the remote pilot of a VTOL when the level of alcohol in their blood, breath or urine is over a prescribed limit. Do you agree?

Yes

Please expand on your answer below

Again, this should no different to manned aviation regulations and already set out in ISO21384-3 for UAS.

Consultation Question 20

We provisionally propose that the remote pilot should be subject to the reporting obligations currently applicable to pilots under the Air Operations Regulation. Do you agree?

Yes

Please expand on your answer below

Again, this should no different to manned aviation regulations for piloted aircraft and already set out in ISO21384-3 for UAS.

Consultation Question 21

We provisionally propose that a remotely piloted VTOL should be required to be capable of detecting and recording information relating to accidents and near accidents for the purposes of reporting it. Do you agree?

Yes

Please expand on your answer below

Again, this should no different to manned aviation regulations and already set out in ISO21384-3 for UAS.

Consultation Question 22

We provisionally propose that licences should be required for remote VTOL pilots. So far as appropriate, these should follow the classes and ratings adopted for crewed VTOLs. Do you agree?

Other

Please expand on your answer below

Yes but it depends on what you mean by VTOL - this term is not defined even by ICAO - please use terms which describe the status of the aircraft:

- piloted
- optionally piloted
- uncrewed (where no crew onboard)
- pilotless (where no pilot but a crew onboard) - an example of why the term

'uncrewed' does not work for all
pilotless systems.

Consultation Question 23

We provisionally propose that operators of remotely piloted VTOL should be certified.
Do you agree?

Yes

Please expand on your answer below

Again, this should no different to manned aviation regulations and already set out in ISO21384-3 for UAS.

Consultation Question 24

We provisionally propose that operators of remotely piloted VTOLs should continue to be required to:

- ☒ (1) have the means necessary for the scale and scope of operations planned;
- ☒ (2) use only suitably qualified and trained personnel;
- ☒ (3) implement a management system to ensure safety;
- ☒ (4) ensure operations only take place in accordance with the operations manual;
- ☒ (5) establish procedures to minimise the consequences to safe flight operations of disruptive passenger behaviour;
- ☒ (6) develop and maintain security programmes suitable for the aircraft and type of operation;
- ☒ (7) have a management system to prevent fatigue.
- ☒ (8) ensure the continuing airworthiness of the aircraft; and.
- ☒ (9) establish procedures for any reasonably foreseeable emergency situation.

Do you agree? (tick all that you agree with)

Please expand on your answer below

Again, this should no different to manned aviation regulations and already set out in ISO21384-3 for UAS.

Consultation Question 25

We seek views as to whether there are additional responsibilities that operators of remotely piloted VTOLs should need to fulfil.

Please share your views below

See ISO 21384-3 for pilotless systems and current helicopter regs and guidance for piloted systems.

Consultation Question 26

We seek views as to whether the law should permit remote pilots to act as pilot-in-command for more than one VTOL at the same time.

Please share your views below

Yes but the input of such personnel would need to be restricted - see new definition of Fleet Manager - ISO21384-3 revision 2 (in draft).

Consultation Question 27

We seek views as to whether there should be an upper limit to the number of VTOLs for which a remote pilot can act as pilot-in-command at the same time.

Please share your views below

Depends what you mean by the term VTOL but yes of course but this depends on the level of control of each aircraft - if only terminate, could be many more than if multiple control inputs are allowed.

Consultation Question 28

We seek views as to what additional safeguards should be introduced for remote pilots piloting multiple VTOLs.

Please share your views below

Nothing that does not exist in current helicopter regulations and guidance formulated systems and in ISO 21384-3 for UAS.

Consultation Question 29

We seek views as to whether there should be a role for a person supervising the flight of an autonomous passenger-carrying VTOL and acting as a point of contact in relation to it. What powers or responsibilities should such a person have?

Please share your views below

See ISO21384-3 Revision 2 in draft.

Consultation Question 30

Should the law permit an uncrewed VTOL to transition between remotely piloted and autonomous flight during an operation?

No

Please expand on your answer below

Total Autonomy should never be permitted - there should always be a pilot in the loop.

Consultation Question 31

We seek views as to whether initial airworthiness standards for uncrewed VTOLs should include accessibility standards for persons with disabilities and reduced mobility.

Please share your views below

These should be no different to the accessibility standards which exist for manned aviation - please do not re-invent the wheel.

Consultation Question 32

We seek views as to whether the CAA should be able to include accessibility standards within the licences granted to uncrewed VTOL operators.

Please expand on your answer below

Of course but see answer to previous question.

Consultation Question 33

We seek consultees' views on any other issues with the current legal framework as it relates to operations involving autonomous VTOLs.

Please share your views below

I have covered all of the issues in previous answers but the main one is the use of the term VTOL for something which may penman not have a pilot on board.

- If it has a pilot onboard, it is a manned aircraft (piloted) and should be treated as such

If it is optionally piloted, when the pilot is onboard it should be treated as a manned aircraft and when the pilot is not onboard during operations, it is a UAS...the issue is the gap which exists in the transitional period!

Drones

Consultation Question 34

We provisionally propose that a remote pilot for drones should continue to be defined as "a natural person responsible for safely conducting the flight of an unmanned aircraft by operating its flight controls, either manually or, when the unmanned aircraft flies automatically, by monitoring its course and remaining able to intervene and change its course at any time". Do you agree?

Yes

Please expand on your answer below

Yes but be careful of the use of the term drone. The definition of a drone is 'any unmanned system which is remotely or autonomously controlled' - ISO21384-4

A drone is any unmanned system in any domain (land, maritime and air) so ensure that any recommendations include all domains or be domain specific.

Consultation Question 35

We seek views on whether some low risk autonomous drone operations or drone operations conducted beyond visual line of sight might be accommodated in the open category. In particular:

- (1) whether there are any such use cases which might be suitable for the open category; and
- (2) if so, what conditions should be attached to these use cases if operated in the open category.

Please share your views below

Agreed but the conditions for this to arrive in BVLOS operations will be very few and far between due to the additional risks of BVLOS operations.

Consultation Question 36

We provisionally propose that for autonomous operations in the specific category, a UAS 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 manned 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.

Do you agree? (tick all that you agree with)

Consultation Question 37

We seek views on what operational requirements should be applied to autonomous drone operations and drones that operate beyond visual line of sight in the specific and certified categories.

Please share your views below

See ISO21384-3.

Consultation Question 38

We seek views on whether the current concept of a "remote pilot" is compatible with drone MSO. We also seek views on whether the remote pilots of drone MSO should continue to be subject to the same responsibilities as remote pilots for single drone operations.

Please share your views below

No, see ISO 21384-3 Revision 2 (draft) for definition of Fleet Manager.

Consultation Question 39

We seek views on whether there should be an upper limit to the number of drones for which an individual remote pilot is responsible.

Please share your views below

Yes but depends on level of control given to the Fleet Manager - the higher the control inputs, the lower the number of aircraft under control - espoused in ISO21384-3 Revision 2 (draft).

Consultation Question 40

We seek views as to what additional safeguards should be introduced for remote pilots responsible for multiple drones.

Please share your views below

See ISO21384-3 Revision 2 (draft).

Consultation Question 41

We provisionally propose that use of flight data recorder systems or devices should be mandatory for autonomous drone operations. Do you agree?

Yes

Please expand on your answer below

ISO21384-3 Revision 2 (draft).

Consultation Question 42

Should the law permit a drone to transition between remotely piloted and autonomous flight during an operation?

Yes

Please expand on your answer below

See ISO21384-3 Revision 2 (draft).

Consultation Question 43

We seek stakeholder views on any other issues with the current legal framework as it relates to operations involving autonomous drones.

Please share our views below

Regulations should be thin, supported by industry standards as Acceptable Means of Compliance (AMC) such as the ISO21384 series.

Do not duplicate manned regulations where there is no need or practical advantage to do so

Stop using term VTOL - it describes a flight envelope not an aircraft type.

Civil liability and insurance

Consultation Question 44

We provisionally consider that the current law governing air carrier liability for injury or death of passengers in the UK is adequate for the introduction of remotely piloted and autonomous operations. Do you agree?

Yes

Consultation Question 45

We provisionally consider that the current law governing liability for damage to cargo in the UK is adequate for the introduction of remotely piloted and autonomous operations. Do you agree?

Yes

Consultation Question 46

We provisionally propose that liability for surface damage, in the case of UAS, should transfer to the lessee when the lease:

- (1) is for more than 14 days; and
- (2) specifies the aircraft is to be operated under the responsibility of the lessee.

Do you agree?

Yes

Consultation Question 47

We provisionally propose 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. Do you agree?

Yes

Consultation Question 49

We seek views as to whether the current law regarding liability for mid-air collisions is satisfactory in the case of collisions involving uncrewed aircraft systems.

Please share your views below

Yes, the current law is sufficient - supported by appropriate standards.

Consultation Question 50

We seek consultees' views on whether they expect any difficulties applying existing insurance requirements to uncrewed aircraft systems.

Please share your views below

No - current requirement are sufficient - also espoused in ISO21384-3.

Consultation Question 51

We provisionally propose that multiple simultaneous operations should be considered as the Government develops proposals for the insurance requirements applicable to uncrewed aircraft. Do you agree?

Yes

Criminal liability

Consultation Question 52

We provisionally consider that the current approach in the Air Navigation Order 2016 placing criminal liability on an operator is adequate for autonomous operations.

Do you agree?

Yes

Consultation Question 53

We provisionally consider that the "reasonable care" defence in article 265(3) of the Air Navigation Order 2016 applies adequately for "direct contraventions" under Article 265(5) to (8) involving autonomous operations. Do you agree?

Yes

Consultation Question 54

We seek views on whether for autonomous operations the reasonable care defence should be applicable to the vicarious liability created in article 265(1) of the ANO.

Please share your views below

Yes but appropriate standards would need to have been met in terms of compliance with AMCs.

Consultation Question 55

We provisionally propose that a remote pilot of an uncrewed aircraft operating in the certified category should be treated as a pilot-in-command for the purposes of criminal liability pursuant to article 265(1) of the Air Navigation Order 2016. Do you agree?

Yes

Consultation Question 56

We ask for consultees' views on the criminal liability of pilots (or remote pilots) when an aircraft operating autonomously returns control to the pilot or vice-versa. In particular, should a pilot (or remote pilot) only become criminally liable for the piloting of the aircraft at the end of a transition period?

Please share your views below

Yes - from the point of control transition - where the pilot has any input to control no matter how small.

Consultation Question 57

We provisionally propose that the pilot-in-command of aircraft in a multiple simultaneous operation should be criminally liable for breach of operating requirements in the same way as a pilot in command of a single aircraft would be. Do you agree?

Yes

Consultation Question 58

We invite consultees' views on whether the Air Traffic Management and Unmanned Aircraft Act 2021 operates satisfactorily in the case of highly automated and autonomous flight.

Please share your views below

Agreed.

Consultation Question 59

We invite views on how operator responsibilities for dangerous goods might need to be adapted in light of autonomous operations.

Please share your views below

In the same way as for manned aviation.

Consultation Question 60

We ask for consultees' views about whether the offence of hijacking in domestic law should be updated to:

1. include the unauthorised seizure or control of autonomous or remotely piloted aircraft by technological means or by persons not on board the aircraft; and
2. expand the period in which hijacking can occur from the period when an autonomous or remotely piloted aircraft is "in flight" to the period when it is "in service".

Please share your views below

Yes.

Consultation Question 61

We also ask consultees for views on whether any offences against the aircraft other than hijacking need to be updated to account for increased autonomy in aviation.

Please share your views below

Should be the same as for manned aviation.

RESPONSE TO LAW COMMISSION CONSULTATION ON AVIATION AUTONOMY

(Law Commission Consultation Paper 261)

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About you

What is the name of your organisation?

E-Drone Research Project Consortium

Rules of the air

Consultation Question 4

We seek views on how highly automated and autonomous aircraft should act in emergency scenarios. In particular:

1. should highly automated and autonomous aircraft be given the freedom to operate outside the rules of the air in emergency circumstances; or
2. should a comprehensive set of rules be developed for highly automated and autonomous aircraft in emergency situations.

Please share your views below

"Automated" and "Autonomous" are very different concepts. Automated means it can automatically execute a sequence of actions after input from an operator, since it is not aware of the context. Autonomous means it can both select the appropriate actions AND execute them. As a result, "automated" aircraft can only perform option (2) by definition. "Autonomous" aircraft should, as other emergency aircraft, be given priority over non-emergency aircraft, this could include operating outside of the rules of the air. The ultimate goal should be the reduction of potential risk to humans, for example, if a UAS can only clear an urban area by breaking rules of the air, then this would be preferred over adhering to the rules of the air but crashing in an urban area.

The issue with a prescriptive set of rules to follow is the difficulty with edge cases, whereas if a single metric is chosen, this is considerably simpler both to execute for the aircraft and to understand, to explain to non-experts (for example a jury), and to judge the efficacy. For (generally smaller) aircraft that operate within line of sight, the onus is wholly on the operator. For beyond visual line of sight, the aircraft

should have a basic level of autonomy which is able to minimise the risk posed to humans. This could be achieved through the use of pre-loaded risk maps, as demonstrated in the analysis of risk conducted in the E-Drone research project and reported in: Pilko A, Sóbester A, Scanlan J P and Ferraro M (2023) 'Spatiotemporal Ground Risk Mapping for Uncrewed Aircraft Systems Operations', Journal of Aerospace Information Systems, 20(3), 126-139 (available at: <https://doi.org/10.2514/1.1011113>).

Consultation Question 5

We seek consultee views about what challenges remotely piloting an aircraft in an emergency scenario presents and how these might be addressed

Please share your views below

Above all, the biggest additional challenge would be maintaining the C2 link, on top of all the existing challenges in common with crewed aircraft. This is why some autonomy should be required in such scenarios to enable the aircraft to attempt at best effort actions that would minimise the potential for human casualties. Aircraft could have some ground and air risk maps built in that could be used to navigate away from high risk areas, such as in: Pilko A, Sóbester A, Scanlan J P and Ferraro M (2023) 'Spatiotemporal Ground Risk Mapping for Uncrewed Aircraft Systems Operations', Journal of Aerospace Information Systems, 20(3), 126-139 (available at: <https://doi.org/10.2514/1.1011113>).

Consultation Question 6

We seek consultees' views on whether the rules of the air relating to communication should be adapted for remotely piloted and autonomous aircraft.

Please share your views below

There are two phrases used to identify an emergency situation in aviation. The phrase "Mayday" refers to an immediate life threatening emergency, whereas "Pan-Pan" is an urgency that does not yet pose immediate danger. As UAS, by definition, do not have humans aboard, a "Mayday" would be inappropriate. "Pan-Pan" would be the most appropriate. For example, a "Pan-Pan" passenger aircraft should still be prioritised over a "Mayday" UAS by virtue of the number of human lives that are at stake in both situations. It is intuitive that, despite a less urgent situation, the number of lives that are potentially in peril in the passenger aircraft situation should prioritise it above an uncrewed vehicle. This is additionally complicated by the possibility of autonomous passenger carrying vehicles (that is, without any pilots), although such technologies have seen progress slow, primarily facing regulatory and certification concerns.

Consultation Question 7

We ask for consultees' views on how the rules of the air might be adapted or developed for remotely piloted or autonomous flight

Please share your views below

*The rules of the air need to have new aircraft categories added to the basic priority list. This would likely be below powered aircraft, as they will maintain full control over their trajectory as well as likely be more agile and able to react faster than the average human pilot. This is likely to need extensive stakeholder engagement, such as that conducted during the E-Drone research project and reported in: Grote M, Pilko A, Scanlan J, Cherrett T, Dickinson J, Smith A, Oakey A and Marsden G (2022) 'Sharing airspace with Uncrewed Aerial Vehicles (UAVs): Views of the General Aviation (GA) community', *Journal of Air Transport Management*, 102, 102218 (available at: <https://doi.org/10.1016/j.jairtraman.2022.102218>); and in: Grote M, Pilko A, Scanlan J, Cherrett T, Dickinson J, Smith A, Oakey A and Marsden G (2021) 'Pathways to Unsegregated Sharing of Airspace: Views of the Uncrewed Aerial Vehicle (UAV) Industry', *Drones*, 5(4), 150 (available at: <https://doi.org/10.3390/drones5040150>).*

An additional complicating factor is that of electronic conspicuity (EC); that is, whether (or not) an aircraft is voluntarily participating in cooperative deconfliction by broadcasting its position to other aircraft, rather than relying on the significantly limited see-and-avoid method. It is an open question whether EC equipped aircraft should have priority over those that do not participate in cooperative deconfliction, as they are less likely to identify conflicting traffic as a result. The FAA Aviation Rulemaking Committee (ARC) in the USA has already done this to an extent by proposing that EC equipped UAS should have right of way over non-EC crewed aircraft.

Criminal liability

Consultation Question 59

We invite views on how operator responsibilities for dangerous goods might need to be adapted in light of autonomous operations.

Please share your views below

The regulations governing the transport of Dangerous Goods (DG) by air (known as the 'Technical Instructions' published biennially by the ICAO) have developed exclusively from the perspective of crewed aircraft, in particular the large, fixed-wing, airliner-type aircraft used to transport the vast majority of air freight. Hence, as a novel mode for payload transport, the application of DG regulations to drones is an emerging legislative arena, still under development in different regions around the world. This leads to uncertainty regarding drone operators' responsibilities, and to the need for National Aviation Authorities to issue DG approvals to operators on

a case-specific basis, which is a resource-intensive and time-consuming process for everybody involved.

In general, there is a need for explicit provisions to be included in future versions of the Technical Instructions to clarify how they should be applied to drones and to reduce the uncertainty regarding operators' responsibilities. This point was highlighted by the comprehensive review undertaken as part of the E-Drone research project of how DG regulations apply to drones published in: Grote M, Cherrett T, Oakey A, Royall P G, Whalley S and Dickinson J (2021) 'How Do Dangerous Goods Regulations Apply to Uncrewed Aerial Vehicles Transporting Medical Cargos?', Drones, 5(2), 38 (available at: <https://doi.org/10.3390/drones5020038>).

Impact

Consultation Question 63

We invite consultees to tell us if they have views on, or have experience or data to indicate, the likely costs and benefits of our provisional proposals in relation to drones.

Please share your views below

Regarding Multiple Simultaneous Operations, imposing an upper limit on the number of drones for which an individual remote pilot is responsible at the same time will have an impact on the costs associated with drone operations. Recent (2024) data analysis and modelling work undertaken as part of the E-Drone research project found that the relative costs of drone operations (in particular, drone labour costs) compared to more traditional transport modes (e.g., vans, bicycle couriers) were a barrier to the uptake of drones in mixed-mode logistics (i.e., payload delivery) systems. In other words, due to associated expense, drones did not displace the use of vans and/or bicycle couriers, even when remote pilots were assumed to be capable of monitoring 20 drones simultaneously.

In general, imposing a low limit on the number of drones that can be monitored simultaneously is likely to have a negative impact on the costs of drone logistics. A full description of the analysis and modelling was published in: Grote M, Oakey A, Pilko A, Krol J, Blakesley A, Cherrett T, Scanlan J, Anvari B and Martinez-Sykora A (2024) 'The effects of costs on drone uptake in multi-modal logistics systems within a healthcare setting', Transport Economics and Management, 2, 58-75 (available at: <https://doi.org/10.1016/j.team.2024.03.001>).

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About you

What is the name of your organisation?

U.S. Federal Aviation Administration

Airworthiness and certification

Consultation Question 1

We seek views on how current airworthiness and certification regulation might need to be adapted or developed in light of highly automated and autonomous aircraft. In particular, should provisions be adopted which allow for:

1. the certification of optionally piloted and uncrewed or unoccupied versions of conventional aircraft (hybrid versions); and
2. the separate certification of command units?

Please share your views below

Provisions for optionally piloted and uncrewed or unoccupied versions of conventional aircraft should be developed. This is likely going to be a significant portion of the market moving forward, due to lower adoption costs. Provisions for separate command units may be desired; however, care should be taken that a command unit can sufficiently handle the aircraft it is piloting. In addition, many physical changes (such as actuators) will be needed, and will strongly depend on the aircraft. In this regard, as a command unit would need to be certified for a particular aircraft.

The FAA has published FAA Order 8130.34D providing procedures on issuing special airworthiness certificates for UAS and OPA configurations. For a standard airworthiness certificate, evaluation of these highly automated aircraft must require evaluating the overall aircraft, control station and (command and control) C2 services. Although 14 CFR Part 23 Amendment 23-64 provides performance-based

requirements which is not contingent on the physical location of the pilot, additional policy/guidance would be needed in the following areas:

1. Cybersecurity
2. Human Machine Interaction
3. Data recorder to support accident investigation
4. Detect and Avoid system
5. Command and control system

Consultation Question 2

We welcome views on what changes to the certification system might be necessary to enable higher automation and autonomy in aviation.

Please share your views below

Requirements on data sets will be critical. In particular, it will be crucial to test an Artificial Intelligence (AI) on a comprehensive dataset. This is the AI is tested every environment/situation it could possibly encounter. Predictability of AI/Machine Learning (ML) algorithms outside of their training data sets can be difficult to understand. As such, large bounds are needed on evaluation data sets. In addition, current airspace traffic management relies on centralized systems. Decentralized systems (in limited simulations) have been shown to have potential for dense operations. As such, a certification system may want to account for more fundamental changes in aviation.

The FAA has taken many steps to improve our certification system framework to enable higher automation and autonomy in aviation. In 2017, we published the 14 CFR Part 23 rewrite which moved away from the rigid and prescriptive airworthiness requirements and outlined safety objectives which provides more flexibility needed for higher automation and autonomy. The FAA is continuing to improve and adapt our system to ensure interoperability and consistency with the other foreign civil aviation authorities.

Consultation Question 3

We seek views on whether current regulatory tools to support the development of highly automated and autonomous aviation technologies are adequate.

Please share your views below

The advent of highly automated and autonomous aircraft has significantly challenged the current regulatory tools used for certification. We do not have sufficient validation tools on the use of simulation in lieu of flight test across the various normal and emergency procedures these aircrafts are intended to perform autonomously.

Rules of the air

Consultation Question 4

We seek views on how highly automated and autonomous aircraft should act in emergency scenarios. In particular:

1. should highly automated and autonomous aircraft be given the freedom to operate outside the rules of the air in emergency circumstances; or
2. should a comprehensive set of rules be developed for highly automated and autonomous aircraft in emergency situations.

Please share your views below

Assuming that autonomous systems are thoroughly tested to ensure that they will behave in a safe and predictable manner when interacting with other users of the airspace, it is beneficial to allow them to operate freely in emergency situations. However, it may be more reliable to start with a comprehensive set of rules to establish confidence in the platforms before giving them the freedom to act independently. Furthermore, starting with rules will likely make it easier for other users of the airspace to understand how to engage with autonomous aircraft, should the situation ever arise.

In emergency situations, the safety of people onboard the aircraft, other aircraft, and on the ground need to be given top priority. If operation outside the normal operating rules provides safety enhancement, we may want to consider. But this is not necessarily equivalent to traditional aircraft because loss of the aircraft would not be as critical as the risk to 3rd parties, and therefore wouldn't necessarily involve procedures to land the aircraft in higher risk areas such as roadways.

Behavior of the aircraft in emergency situations may vary depending on the aircraft design, level of autonomy, and operating environment. Emergency actions when conducting agricultural applications may differ significantly from those taken when delivering packages in urban areas.

Consultation Question 5

We seek consultee views about what challenges remotely piloting an aircraft in an emergency scenario presents and how these might be addressed

Please share your views below

Challenges with regards to remotely piloting an aircraft in an emergency scenario include C2 latency (the pilot may not have sufficient time to respond), and poor situational awareness (e.g., poor sensor health, lost data feeds, etc.). C2 latency is typically handled by increasing the NMAC distance, so that the pilot would have to initiate a maneuver earlier. In a remotely piloted situation, all situational awareness is provided by sensors. As such redundancy for all sensors providing situational awareness should be required.

An example of piloting challenges include pilot workload, especially where common-mode failures result in multiple aircraft experiencing emergency situations. Consideration also needs to be given to the effects of a lost or degraded link between the remote pilot and the aircraft. FAA suggests setting high-level requirements based on ensuring a safe outcome, and then giving industry the latitude to provide solutions for how that outcome would be ensured.

Consultation Question 6

We seek consultees' views on whether the rules of the air relating to communication should be adapted for remotely piloted and autonomous aircraft.

Please share your views below

Consider conducting or incorporating workload assessments to evaluate the impact of increased communications expected with the increased traffic.

Consultation Question 7

We ask for consultees' views on how the rules of the air might be adapted or developed for remotely piloted or autonomous flight

Please share your views below

Similar to the UK, The FAA recognizes that the airspace is now at an inflection point where we have grown past the limits of small unmanned aircraft systems' current regulations. In response, the FAA is currently engaged in a rulemaking effort that would dramatically expedite the introduction of BVLOS operations. The FAA sees BVLOS as the next step in incrementally integrating UAS into our national airspace. Using consensus-based standards, this action would establish a regulatory process for issuing a special airworthiness certificate (SAC) for unmanned aircraft up to 1,320 pounds, as well as the acceptance of their associated elements. It would create new operational and design requirements for unmanned aircraft issued a SAC, enabling routine BVLOS operations without waivers or exemptions. Moreover, the rulemaking would prescribe a new BVLOS rating for the remote pilot certificate. It would also build new operating rules for UAS cargo delivery for compensation or hire. Finally, this action would create a defined regulatory approval pathway for third-party services, including UAS Traffic Management (UTM) service suppliers.

Additionally, before adopting any thoroughly vetted flight rules such as NASA's DFR, it is important to understand that the proposed flight rules may not have undergone rigorous testing to understand their limitations or their impact on the safety of existing airspace users.

VTOLs

Consultation Question 8

We provisionally propose that a person overseeing a VTOL flying automatically, who monitors its course and is able to intervene and change its course at any time should continue to be classified as a “remote pilot”. Do you agree?

Other

Please expand on your answer below

The FAA is hesitant to require all aircraft designs to have a person directly monitoring and potentially intervening in the course of the aircraft flight.

In continuing the classification as a Remote pilot classification, consideration should be given to having a pilot-in-command appointment for every operation.

Consultation Question 9

We provisionally propose 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. Do you agree?

Other

Please expand on your answer below

Given the definition, considerations should be given to ability of a pilot in command located away from an aircraft to do things like pre-flight checks.

Consultation Question 12

We provisionally propose that the remote pilot-in-command should be responsible for, amongst other things, ensuring passengers are:

1. given a safety briefing; and
2. seated and wear seat belts during take-off and landing

Do you agree?

Other

Please expand on your answer below

If applicable, passengers must be given a safety briefing. This should include safe behavior during flight. However, requiring a pilot who is not on the aircraft to ensure passengers are seated and wearing seat belts or harnesses may be impractical.

Consultation Question 13

We provisionally propose that air operators (rather than the remote pilot-in-command) should be responsible for preventing passengers from boarding:

1. who appear drunk or under the influence of drugs; or
2. whose carriage would, in the view of the operator's employees, endanger the safety of the aircraft or other passengers.

Do you agree?

Other

Please expand on your answer below

The question implies a model where a passenger-carrying aircraft always has a representative of the operator at the boarding site. This seems to preclude point to point operations that don't use operator-controlled takeoff/landing sites.

Consultation Question 14

We provisionally propose that the remote pilot-in-command should have the power to take reasonable measures, including restraint of passengers, as set out in section 94 of the Civil Aviation Act 1982. Do you agree?

Other

Please expand on your answer below

If feasible, the RPIC should be able to take action to restrain unruly passengers. However, it may be unenforceable if there are no crew onboard the aircraft.

Consultation Question 15

We provisionally propose that a person on board a VTOL aircraft (other than a crew member) should be able to take reasonable measures to protect the safety of the aircraft or of persons or property on board. Do you agree?

No

Please expand on your answer below

Unless it is a flight marshal, only qualified personnel should be instructed to take measure to protect safety of the aircraft or person on board. An untrained individual could further increase the severity of an inflight hazard.

Consultation Question 17

We provisionally propose that passengers should be able to contact a member of crew at all times during an operation. Do you agree?

Other

Please expand on your answer below

For an aircraft without an onboard pilot, contacting will always be an option to mitigate potential safety issues.

Consultation Question 18

We provisionally propose 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. Do you agree?

Other

Please expand on your answer below

The FAA addresses this in 14 CFR Part 91.17.

Consultation Question 19

We provisionally propose that it should be a criminal offence for a person to act as the remote pilot of a VTOL when the level of alcohol in their blood, breath or urine is over a prescribed limit. Do you agree?

Other

Please expand on your answer below

The FAA addresses this in 14 CFR Part 91.17.

Consultation Question 21

We provisionally propose that a remotely piloted VTOL should be required to be capable of detecting and recording information relating to accidents and near accidents for the purposes of reporting it. Do you agree?

Other

Please expand on your answer below

Consider clarifying whether or not this data will be used for legal or other purposes.

Due to the new and novel aspect of a remotely piloted VTOL, data available during an accident investigation will be critical to determining root cause and having industry learn from those failures. Flight and ground data recorder (separate data recorders both onboard the aircraft and at the ground control station) would be needed to evaluate not only the commands understood by the aircraft systems but by the control station and remote pilot, if applicable, as well.

Consultation Question 24

We provisionally propose that operators of remotely piloted VTOLs should continue to be required to:

- ☐ (1) have the means necessary for the scale and scope of operations planned;
- ☐ (2) use only suitably qualified and trained personnel;
- ☐ (3) implement a management system to ensure safety;
- ☐ (4) ensure operations only take place in accordance with the operations manual;
- ☐ (5) establish procedures to minimise the consequences to safe flight operations of disruptive passenger behaviour;
- ☐ (6) develop and maintain security programmes suitable for the aircraft and type of operation;
- ☐ (7) have a management system to prevent fatigue.
- ☐ (8) ensure the continuing airworthiness of the aircraft; and.
- ☐ (9) establish procedures for any reasonably foreseeable emergency situation.

Do you agree? (tick all that you agree with)

Please expand on your answer below

These items should be addressed in an operating manual.

Consultation Question 26

We seek views as to whether the law should permit remote pilots to act as pilot-in-command for more than one VTOL at the same time.

Please share your views below

Depending on the level of automation of the aircraft, one-to-many operations may be reasonable. However, care needs to be taken to evaluate whether a remotely sited operator can reasonably fulfill all the legacy responsibilities of a pilot-in-command.

Consultation Question 27

We seek views as to whether there should be an upper limit to the number of VTOLs for which a remote pilot can act as pilot-in-command at the same time.

Please share your views below

Any cases where one person is responsible for multiple flights at the same time must be demonstrated during formal testing.

Consultation Question 29

We seek views as to whether there should be a role for a person supervising the flight of an autonomous passenger-carrying VTOL and acting as a point of contact in relation to it. What powers or responsibilities should such a person have?

Please share your views below

This role would likely heavily overlap with the role of a pilot-in-command for automated systems.

Consultation Question 30

Should the law permit an uncrewed VTOL to transition between remotely piloted and autonomous flight during an operation?

Other

Please expand on your answer below

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

Consultation Question 31

We seek views as to whether initial airworthiness standards for uncrewed VTOLs should include accessibility standards for persons with disabilities and reduced mobility.

Please share your views below

The FAA supports the consideration to include accessibility standards for both vehicle airworthiness and operator licenses. This ensures that access to the airspace remains equitable.

FAA intends to set the level of safety nearly equivalent to today's part 121 scheduled commercial operations. The initial airworthiness standards would be set independent of the mobility capability of a passenger.

Drones

Consultation Question 34

We provisionally propose that a remote pilot for drones should continue to be defined as "a natural person responsible for safely conducting the flight of an unmanned aircraft by operating its flight controls, either manually or, when the unmanned aircraft flies automatically, by monitoring its course and remaining able to intervene and change its course at any time". Do you agree?

Yes

Please expand on your answer below

Consideration should be given to whether it still applies to cases where a single pilot is operating a large number of aircraft simultaneously.

Consultation Question 35

We seek views on whether some low risk autonomous drone operations or drone operations conducted beyond visual line of sight might be accommodated in the open category. In particular:

- (1) whether there are any such use cases which might be suitable for the open category; and
- (2) if so, what conditions should be attached to these use cases if operated in the open category.

Please share your views below

The FAA supports and agrees with the UK's proportionate risk approach to drone regulations, wherein low-risk drones are permitted subject to conditions, and higher-risk drones and operations must be approved or certified.

Similar to the UK, the FAA has predicated its efforts to integrate drones in the airspace on a safety continuum wherein the level of risk an operation could engender influences the corresponding operational policy. Additionally, the FAA emphasizes the importance of adopting a “crawl, walk, run” approach to drone integration has been paramount to ensuring our airspace is kept safe. This approach has prescribed that lower-risk operations be permitted before operations that could impose a more significant measure of danger. Many aspects of the UK’s provisionally proposed Open Category parallel the FAA’s current rules governing small unmanned aircraft systems under part 107. Part 107 sets forth rules for operating small UAS that do not require FAA airworthiness certification. Under part 107, operations may not occur over persons at night, generally above an altitude of 400 feet above ground level, or beyond visual line-of sight, without a waiver issued by the FAA. The FAA acknowledges that while part 107 is suitable for some types of operations, many other types, such as long-line linear infrastructure inspections, industrial aerial data gathering, small package delivery, and precision agriculture operations, require the benefit of BVLOS flight. The FAA suggests there are many types of low-risk drone operations that could be conducted BVLOS and are still suitable for the Open Category because they have proven the efficacy of their safety mitigations.

Consider that additional data might be needed to safely accommodate autonomous operations in the open category. Suggest clarifying how these operations could be conducted without endangering other airspace users.

Under the JARUS SORA approach, there are cases where BVLOS operations may be conducted in the open category. The primary aspects to consider are aircraft size and operational risk.

Consultation Question 37

We seek views on what operational requirements should be applied to autonomous drone operations and drones that operate beyond visual line of sight in the specific and certified categories.

Please share your views below

To assist with regulatory harmonization of the FAA’s current rules for the small unmanned aircraft systems (part 107) wording, the FAA suggests including language in the UK’s provisionally proposed definition of a remote pilot for drones that expresses the remote pilot is directly responsible for and is the final authority as to the operation of the unmanned aircraft system. However, the FAA cautions that the language and responsibilities apportioned to remote pilots in command for the FAA’s current regulations for small unmanned aircraft systems under part 107 may not be appropriate or reflect the FAA’s future rulemaking efforts for more complex drones. The FAA recognizes that the development of more complex drone operations may necessitate expanding operational requirements to not just include an individual responsible for the tactical oversight of an operation but also an individual accountable for the entire operation as a whole.

There are many areas of consideration, including but not limited to, right of way, collision avoidance, communication with ATC and with other pilots, and actions to be taken in the event of sustained loss of link with GCS. Consider also that the requirements of a certified vehicle and licensed pilot stand to benefit from further development and should be based on a high operational density.

Consultation Question 38

We seek views on whether the current concept of a “remote pilot” is compatible with drone MSO. We also seek views on whether the remote pilots of drone MSO should continue to be subject to the same responsibilities as remote pilots for single drone operations.

Please share your views below

The term ‘pilot’ carries certain operational responsibilities with it. In some cases, this may be appropriate but as autonomy increases, the role of any individual diverges from the traditional role of a pilot. Alternate terms used in various documents include operator, flight manager, and flight coordinator.

Consultation Question 39

We seek views on whether there should be an upper limit to the number of drones for which an individual remote pilot is responsible.

Please share your views below

Consider the addition of an upper limit to the number of drones an individual pilot can be responsible for. This would help to ensure that the pilot can respond to multiple failures should they occur. Otherwise, the drones may create risks for other airspace users.

Upper limits on aircraft:pilot ratio is variable based on a number of factors. Level of autonomy, airspace congestion, and maximum number of aircraft actually flown simultaneously in testing all play a role in setting a limit.

Consultation Question 40

We seek views as to what additional safeguards should be introduced for remote pilots responsible for multiple drones.

Please share your views below

Currently, the FAA does not allow the operation of multiple drones by an individual remote pilot unless the remote pilot has obtained a part 107.35 waiver. However, as the desire for this type of “swarm operation” has increased and remote pilots with

part 107.35 waivers have successfully demonstrated the use of certain risk mitigations, the FAA encourages looking to the work of industry consensus-making bodies to address whether there should be an upper limit to the number of drones for which an individual remote pilot can operate.

The FAA believes that remote pilots can safely operate multiple drones when additional safeguards, such as training and collision avoidance systems, are put in place to minimize risk. Currently, the FAA's part 107.35 rule prohibits the operation of multiple small unmanned aircraft by one person or by automation. However, the FAA recognizes the potential of this type of operation and allows the part 107.35 prohibition to be waived when additional safeguards are employed. As such, the FAA agrees that it is appropriate to introduce additional safeguards for remote pilots responsible for multiple drones.

A key topic that needs to be addressed in multiple operations by a single pilot is abnormal/emergency operations. Can the pilot manage multiple situations at once in the event of a common-mode issue, such as a pop-up storm.

Consultation Question 41

We provisionally propose that use of flight data recorder systems or devices should be mandatory for autonomous drone operations. Do you agree?

Yes

Please expand on your answer below

The FAA believes that remote pilots can safely operate multiple drones when additional safeguards, such as training and collision avoidance systems, are put in place to minimize risk. Currently, the FAA's part 107.35 rule prohibits the operation of multiple small unmanned aircraft by one person or by automation. However, the FAA recognizes the potential of this type of operation and allows the part 107.35 prohibition to be waived when additional safeguards are employed. As such, the FAA agrees that it is appropriate to introduce additional safeguards for remote pilots responsible for multiple drones.

To ensure all applicable data is collected, FAA recommends that there be a primary recorder onboard the aircraft and a secondary recorder at the ground control station.

Consultation Question 42

Should the law permit a drone to transition between remotely piloted and autonomous flight during an operation?

Other

Please expand on your answer below

Depending on the design of the UAS, emergency operations may require additional pilot involvement. However, caution needs to be taken if transition between remotely piloted and autonomous operations will be routine. How is it ensured that the remote pilot won't mistakenly think the aircraft is operating autonomously when it is not?

Consultation Question 43

We seek stakeholder views on any other issues with the current legal framework as it relates to operations involving autonomous drones.

Please share our views below

The FAA agrees with the provisionally proposed requirements mandating operators to use UASs that can (1) comply with their authorized limitations and conditions, (2) comply with the operational limitations, (3) comply with the operator's procedures, (4) unless granted permission, avoid areas where an emergency response effort is ongoing; and, (5) avoid any risk of collision with any manned aircraft and discontinue a flight when continuing it may pose a risk. However, the FAA suggests adding language to this provisionally proposed requirement that clarifies the UK's policy on drone to crewed aircraft right of way.

The legal framework for autonomous operation will be highly dependent on local law. Some areas of concern would include communication with ATC and other aircraft when using shared airspace, as well as operation over controlled sites such as powerplants or prisons.

Civil liability and insurance

Consultation Question 49

We seek views as to whether the current law regarding liability for mid-air collisions is satisfactory in the case of collisions involving uncrewed aircraft systems.

Please share your views below

Any discussion of mid-air collisions needs to account for right-of-way. Are there cases where the UA would have right-of-way? Is there mandatory equipment to broadcast position and heading of the UA?

Criminal liability

Consultation Question 59

We invite views on how operator responsibilities for dangerous goods might need to be adapted in light of autonomous operations.

Please share your views below

Depending on the operating environment, operators may need to apply Safety Management Systems to determine the requirements with the carriage of dangerous goods. This would include marking of hazardous goods.

Consultation Question 60

We ask for consultees' views about whether the offence of hijacking in domestic law should be updated to:

1. include the unauthorised seizure or control of autonomous or remotely piloted aircraft by technological means or by persons not on board the aircraft; and
2. expand the period in which hijacking can occur from the period when an autonomous or remotely piloted aircraft is "in flight" to the period when it is "in service".

Please share your views below

In addition to the legal concerns about hijacking, consideration needs to be taken with regards to cybersecurity, particularly with respect to the command and control link.

Consultation Question 61

We also ask consultees for views on whether any offences against the aircraft other than hijacking need to be updated to account for increased autonomy in aviation.

Please share your views below

Consider for other cybersecurity aspects also, such as data theft, GPS/GNSS spoofing, and jamming.

Impact

Consultation Question 63

We invite consultees to tell us if they have views on, or have experience or data to indicate, the likely costs and benefits of our provisional proposals in relation to drones.

Please share your views below

FAA experience with drone manufacturers and operators is that there is a very rapid pace of design changes. Any proposed rule should consider the practical impact of a design seeing software changes every few weeks.

Consultation Question 64

We invite consultees to tell us if they believe or have evidence or data to suggest that any of our provisional proposals could result in advantages or disadvantages to certain groups or based on particular characteristics (with particular attention to age, disability, transgender identity, marriage and civil partnership, pregnancy and maternity, race, religion or belief, sex or gender, and sexual orientation).

Please share your views below

Accessibility to VTOLs should be considered. FAA-sponsored work suggests that the minimum household income of those being able to afford VTOL services is \$160,000. Assuming that this value is true in the UK, that would suggest that less than 7% of the UK population would be able to access such services. This income threshold would thus exacerbate any existing inequalities/disadvantages. In addition to cost, location of the services and service routes should be monitored to ensure that routes service all demographics well.

Professor George Leloudas

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26 June 2024

Dear All,

Re: AVIATION AUTONOMY CONSULTATION PAPER 261 OF THE LAW COMMISSION - COMMENTS OF PROFESSOR GEORGE LELOUDAS OF THE INSTITUTE OF INTERNATIONAL SHIPPING AND TRADE LAW (IISTL) OF THE HRC SCHOOL OF LAW OF SWANSEA UNIVERSITY

I hope my submission finds you well.

I want to thank you for allowing us to comment on aviation autonomy. As a Professor of Air Law at the Institute of International Shipping and Trade Law (IISTL) of the HRC Law School of Swansea University and the General Editor of *Shawcross and Beaumont on Air Law*, I would like to submit my comments to this timely and valuable consultation. My remarks focus on civil liability and insurance issues. As the Vice-Chair of the Committee of the Air Law Group of the Royal Aeronautical Society (RAeS), I have also contributed to the RAeS submission to this consultation. Yet, my comments herein are written in my Professorial capacity and not as a member of the Air Law Group of the RAeS.

I am always available to provide any clarifications that you might require.

With kind regards,

Professor George Leloudas LL.B (Athens), LL.M(Bristol, McGill), PhD(Cantab)

Preliminary comments

Before providing my views on some of the questions, I want to make some preliminary (and hopefully relevant) comments. The official accident statistics of the Aircraft Accident Investigation Branch (AAIB) reveal that no fatal injuries caused by UAS have been reported yet. Still, a severe injury was reported in October 2015 when a child lost his eye when a recreational Uncrewed Aircraft (UA) cut through it.¹ While no incidents leading to fatal injuries have been reported in the UK, the proximity of Uncrewed Aircraft Systems (UAS) to the ground poses significant risks of third-party damage. Focusing on their size is deceptive as the AAIB estimated that a UAS of “1.4 kg falling from 8 m could cause a fatal injury”² and also that a “blunt object with a mass of 4.97 kg falling from a height of more than

¹ BBC, “Toddler’s eyeball sliced in half by drone propeller” (November 2015) < <https://www.bbc.co.uk/news/uk-england-hereford-worcester-34936739> > (accessed 25 June 2024).

² AAIB, “Annual Safety Review 2021” (June 2022), p. 8 < <https://www.gov.uk/aaib-reports/annual-safety-review-2021> > (accessed 25 June 2024).

about 3 m could result in a fatal injury to someone wearing a hard hat”.³ Furthermore, the ease of operating them and bringing them to proximity to sensitive installations, such as nuclear plants, (air)ports, motorways and other critical infrastructures, magnifies their catastrophic potential, mainly if used by terrorists who can attempt to override geofencing restrictions and no-fly zones.

Arguably, the absence of fatal or severe personal injuries and significant property damage is, to a great extent, to be attributed to the current regulations governing the operation of UAS, with their insistence on keeping heavy UAS away from people and buildings, requiring a detailed safety case for close-to-people-and-buildings operations, and the UK Civil Aviation Authority's (CAA) commendable reluctance to permit regular BVLOS and autonomous operations in non-segregated airspace until the relevant technologies mature.

Regularly using novel aircraft and technologies (of which UAS is only one type) requires evidence that the technological advances have reached maturity to reduce the risks to passengers and third parties to acceptable levels. It also requires changes to the regulatory system that will ensure that (i) the development process of these aircraft and technologies learns from the long process of errors and fatal accidents experienced with conventional aircraft but does not repeat it, and (ii) provides sufficient space for innovation and profitable commercial uses. At the same time, with the forecasted increase in the number of novel aircraft operating in UK airspace, it is expected that the pressure on the current civil liability and insurance systems will increase, and the review of them at this stage is undoubtedly forthcoming.

Consultation questions and comments

1. Question 14

We provisionally propose that the remote pilot-in-command 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. Do you agree?

We agree. While the definitions of “commander” and “pilots in command” in section 94(7) of the Civil Aviation Act 1982 are broad enough to include remote pilots-in-command, clarifying their legal position in the Act would be beneficial in terms of certainty. It is also recommended that the Act provides new roles, such as “supervisors” of MSO and other roles that might be required to operate Remote Control Centres (RCCs).

2. Question 15

We provisionally propose that a person on board a VTOL aircraft (other than a crew member) should be able to take reasonable measures to protect the safety of the aircraft or of persons or property on board. Do you agree?

We agree. With uncrewed VTOLs and without an onboard commander and crew, the passenger might be the only one capable of taking such physical measures. However, it might be worth providing more detailed guidance/training concerning the restraining measures that

³ AAIB, “AAIB Bulletin 1/2020” (January 2020) p 25
https://assets.publishing.service.gov.uk/media/5f69d6548fa8f507646e1ea8/AAIB_Bulletin_1-2020_Hi_Res.pdf (accessed 25 June 2024).

a passenger is expected to take and also on how a passenger (under the authority of the commander) would disembark or deliver the unruly passenger under section 94(5) of the Civil Aviation Act 1982. The current system is built on the commander “supervising” or participating in the whole process and arranging for the physical delivery of the unruly passenger to the authorities of the landing State, tasks that might be outside the comfort zone of the average passenger. This system is based on the 1963 Tokyo Convention on Offences and Certain Other Acts Committed on Board Aircraft (the UK had ratified it), and with the UK likely to ratify the 2014 Protocol to Amend the Convention on Offences and Certain Other Acts Committed on Board Aircraft (that amends the 1963 Tokyo Convention), any changes to the powers of a passenger need to be checked against the international obligations of the UK.

3. Question 16

We seek views on whether the powers of crew on board a VTOL aircraft should be broadened to reflect those of the pilot-in-command under the Civil Aviation Act 1982 to:

- (1) take reasonable measures to protect the safety of the aircraft or persons or property on board;
- (2) maintain good order and discipline; or
- (3) enable the crew to disembark or deliver a person.

We agree that the crew's powers on board a VTOL aircraft should be broadened when the remote pilot-in-command cannot monitor the VTOL's operation/loses communications with or control of it, and subsequently cannot remotely require or authorise the crew's assistance. In that case, issues of compliance with international law (mentioned in Q15) might arise.

4. Question 26

We seek views as to whether the law should permit remote pilots to act as pilot-in-command for more than one VTOL at the same time.

This is an essential requirement of operating remote control centres (RCCs) commercially. The regulations will need to specify i. the qualifications and training for RCC personnel (of any type), ii. how the coordination between different VTOLs will be achieved, iii. the role and function of each operator within the RCCs – with new roles may be required, such as “supervisors”, iv. what technical requirements and designs an RCC should have to ensure safe operations, and v. the safety management system that needs to be implemented. These arrangements are essential not only for the safe operation of flights but also for attributing civil and criminal liability to various parties; see also Q44.

5. Question 28

We seek views as to what additional safeguards should be introduced for remote pilots piloting multiple VTOLs.

See comment to Q26.

6. Question 30

Should the law permit an uncrewed VTOL to transition between remotely piloted and autonomous flight during an operation?

Yes, provided the strict civil liability regime applies to both modes of operation; this way, claimants would not have to use/balance two different legal regimes depending on the VTOL's mode of operation and absorb the risk of accidents during the transition period.

7. Question 32

We seek views as to whether initial airworthiness standards for uncrewed VTOLs should include accessibility standards for persons with disabilities and reduced mobility.

This question is crucial for VTOLs as they promise to make transporting the elderly and persons with disabilities/reduced mobility more manageable and accessible, especially in urban environments. As such, initial airworthiness standards should include accessibility standards for such persons. Having said that, the Civil Aviation (Access to Air Travel for Disabled Persons and Persons with Reduced Mobility) Regulations 2007 will require amendments to reflect the new reality of carrying passengers with disabilities or reduced mobility in novel aircraft designed with them in mind.

8. Question 34

We provisionally propose that a remote pilot for drones should continue to be defined as “a natural person responsible for safely conducting the flight of an unmanned aircraft by operating its flight controls, either manually or, when the unmanned aircraft flies automatically, by monitoring its course and remaining able to intervene and change its course at any time”. Do you agree?

Yes, we agree. Yet, provision should be made for fully or highly autonomous operations that do not require a remote pilot and provide for a self-contained technological ecosystem capable of responding to the challenges posed by its operational environment (including communication with ATC) without (or with limited) human interference. Levels 4 (High Automation) and 5 (Full Automation) of the CAA classification seem to fall into this concept. At both Levels, the system is responsible for the operations, monitoring and control of the UAS, with the human element playing a secondary role.⁴

9. Question 41

We provisionally propose that the use of flight data recorder systems or devices should be mandatory for autonomous drone operations. Do you agree?

Yes, absolutely. With autonomous drone operations, systems that facilitate the post-incident understanding of the autonomous system's decisions, such as flight data recorder systems,

⁴ CAA, “CAP 722: Unmanned Aircraft System Operations in UK Airspace – Guidance” (April 2024) [4.5.4.3] < <https://www.caa.co.uk/our-work/publications/documents/content/cap-722/> > (accessed 25 June 2024).

are essential. Such systems are also mandatory for highly automated/autonomous cars, so it is imperative to have such systems installed on drones to improve safety.

10. Question 42

Should the law permit a drone to transition between remotely piloted and autonomous flight during an operation?

Yes, absolutely, despite the safety concerns that the transition raises (as to the reaction time of remote pilots), which have also been highlighted by car insurers in the context of automated/autonomous cars. It is suggested that remote drone pilots undergo comprehensive, recurring safety training, including on transition issues, which puts them in a significantly better position regarding safety than the average car driver.

11. Question 44

We provisionally consider that the current law governing air carrier liability for injury or death of passengers in the UK is adequate for the introduction of remotely piloted and autonomous operations. Do you agree?

Overall, we agree that the strict liability system of the current law (Montreal Convention 1999 as domesticated) is fit for purpose. Still, novel aircraft and technologies raise some issues for discussion:

- i. Clarification is required in Article 1 that such novel aircraft are part of the Convention's cover. This is also important for Articles 36 and 39 to 48 of the Convention to ensure that the provisions on successive carriage or subcontracting apply to new ways of cooperation that might be created between traditional air carriers and novel ventures.
- ii. Clarifying the role of RCC operators in the context of the Montreal Convention 1999 (and its domestic equivalent) is essential. In English law, RCCs are likely considered independent contractors, and their acts of negligence do not make the operator/owner of the transport mode liable. Yet, case law under the Montreal Convention 1999 (and its predecessors) suggests that agents within the scope of the Convention are those performing services in furtherance of the contract of carriage that includes, for example, contractors performing airport security services or ground handling which the carrier is obliged by law to perform or contractors engaged by an air carrier to marshal passengers from the aircraft to the terminal in the performance of a function required of the carrier under the contract of carriage. We believe that the English law approach is problematic (and needs reform in the context of RCCs in general), and the case law under the Montreal Convention 1999 is to be preferred in the context of RCCs, in essence making the aircraft operator responsible for the actions of the RCCs and subjecting the RCCs to the Montreal Convention 1999.
- iii. We don't recommend changes to the core provisions governing passenger liability, especially Article 17, as their drafting resulted from a sensitive balance of interests between passengers and airlines and is flexible enough to accommodate new types of accidents/situations into their scope.
- iv. Using the defences of Article 21 (2) (namely that "such damage was not due to the negligence or other wrongful act or omission of the carrier or its servants or agents; or (b) such damage was solely due to the negligence or other wrongful act or omission of a third party") might become more costly for carriers if they are to prove what went wrong with machine learning applications or to prove interference with such applications from third parties (e.g. terrorists); the role of product liability reform in this context is essential – see Question 48 – as is the issue with independent contractors (see above under para ii).

- v. While the question focuses on the UK, it is essential to mention that an international approach is to be preferred (as in the case of conventional aircraft) as it is expected that the boundaries between domestic and international carriage on novel aircraft might soon be blurred and raise issues of application of the Convention. An author has recently provided one example of this blurring as a result of novel booking practices:⁵

A husband and wife, Canadian citizens, purchase roundtrip travel on 'ABC Airlines' to Miami, Florida, USA, from Toronto, Canada. (ABC Airlines is headquartered in Tel Aviv, Israel.) After a busy day of meetings in Miami, the husband retrieves his mobile phone and opens up the 'app' for an 'air taxi', also operated by ABC Airlines. In less than a minute he has scheduled and paid for intracity travel (e.g., within Miami, Florida, USA). Just a few moments thence, an 'on-demand' 'flying taxi' manufactured by a German company arrives. The electric vertical takeoff and landing ('eVTOL') system, which is automated and uncrewed, flies the passenger from the rooftop of one tall building to a 'vertiport' on the roof of another tall building where the passenger would meet his wife. They would then together hail a different eVTOL for intercity travel (e.g., from Miami to Disney World in Orlando, Florida, a distance of approximately 378 kilometres (235 miles)) using an 'app' operated by a second carrier, 'XYZ Airlines', pursuant to a code-sharing arrangement it has with ABC Airlines. Tragically, however, an algorithm that controlled the autopilot system on the first eVTOL (manufactured by a Chinese company and operated from a remote facility) failed, causing a fatal crash on the intracity Miami leg of the journey. The decedent's spouse sues.....

...Article 1 of the Montreal Convention 1999 establishes that it 'applies to all international carriage ... performed by aircraft for reward' where 'international carriage' means 'the place of departure and the place of destination', a locus that includes operations 'performed entirely within the territory of the same State'. As such, the Montreal Convention 1999 almost certainly would be invoked because ... the element of 'international carriage' is likely satisfied (the place of departure and the place of destination was Toronto, Canada via Miami, Florida, USA, even if a portion of the carriage by air occurred totally within the city limits of Miami)

12. Question 45

We provisionally consider that the current law governing liability for damage to cargo in the UK is adequate for the introduction of remotely piloted and autonomous operations. Do you agree?

Yes, we agree. However, a couple of cargo-specific issues (in addition to those discussed in Q44) might need to be addressed:

- i. The use of remotely piloted and autonomous aircraft to carry cargo has already opened new ways of carrying cargo (for example, from ports to vessels, from vessels to oil rigs, during industrial inspections, etc.)

⁵ Timothy Ravich, "Article 1" in G Leloudas, P Dempsey, L Chassot (eds) *The Montreal Convention. A Commentary* (Elgar 2024) paras 1.07, 1.10.

and is expected to trigger non-conventional ways of moving cargo for commercial and humanitarian purposes (apart from consumer deliveries). As the Montreal Convention 1999 does not define the term “cargo”, it is recommended to clarify that such non-traditional carriages fall into the scope of this legal regime; such clarification will neutralise the tendency of some courts to require the issuance of an AWB for an item to qualify as cargo, a practice that, familiar as it is with conventional airlines, is not necessarily common (and should not be necessary) in carrying cargo by UAS.

- ii. One related issue is classifying (unaccompanied or otherwise) animals as cargo, baggage, or passengers for liability purposes. While a strong line of cases has rightly treated unaccompanied animals as cargo under the Conventions (and likely to treat carry-on animals as baggage), rejecting the argument that they shall be treated as passengers, the author is aware of a case pending before the Court of Justice of the European Union where this issue is under consideration. This is an essential issue in the context of this consultation, as several of these new types of aircraft will be used as air taxis in urban environments and are expected to transport a good number of domesticated animals.
- iii. Also, moving cargo via UAS or VTOL aircraft might require a reconsideration of Articles 18(3) and 18(4) of the Montreal Convention 1999 (and its domesticated regime), which define carriage by air, provide for the geographical boundaries of application of the Convention, and also make provision for instances of unlocalised damage of cargo and the unauthorised substitution of carriage by air with other modes of transport. Such provisions are designed with the traditional airport-to-airport (or warehouse-to-warehouse) cargo carriages in mind and might need reconsideration when cargo is routinely carried by novel aircraft.

13. Question 46

We provisionally propose that liability for surface damage, in the case of UAS, should transfer to the lessee when the lease:

(1) is for more than 14 days, and

(2) specifies the aircraft is to be operated under the lessee's responsibility.

Do you agree?

Some preliminary thoughts

English law does not have a dedicated liability system for UAS/VTOL operations. It applies the rules for property damage and personal injuries caused on the ground by aircraft operations. At the same time, we have yet to see any civil cases dealing with such damage from UAS.

States feel little urgency to ratify or update Conventions dealing with surface damage.⁶ Any such accidents will continue to be treated as domestic incidents in the foreseeable future. When regular cross-border UAS services are established, it would be interesting to see the States' reaction, whether they will re-ignite the interest in the third-party liability conventions or continue treating third-party accidents as domestic ones. A well-publicised terrorist event involving aircraft or UAS will certainly re-ignite interest in the two 2009 Montreal Conventions

⁶ Only 52 States have ratified the 1952 Rome Convention on Damage Caused by Foreign Aircraft to Third Parties on the Surface, Signed at Rome, and 12 States have ratified the 1978 Montreal Protocol to Amend the Convention on Damage Caused by Foreign Aircraft to Third Parties on The Surface Protocol. The UK has not ratified either of them. Furthermore, the 2009 Montreal Convention on Compensation for Damage Caused by Aircraft to Third Parties, which was drafted to replace the 1952 Rome Convention and the 1978 Montreal Protocol, and the 2009 Montreal Convention on Compensation for Damage to Third Parties, Resulting from Acts of Unlawful Interference Involving Aircraft, that was drafted to cater for another 9/11, have not come into force yet, 15 years after their drafting.

(see footnote 6). Until then, the UK third-party liability system will play a pivotal role in managing third-party liability claims arising from the operation of UAS.

The endurance of the UK liability system for surface damage is explained by its simplicity. We agree that the main pillars of this system shall remain unamended; no provision for special defences, such as acts of terrorism, hijackings, cyber interference, or artificial limitations of liability shall be made. As such, we believe that victims on the ground shall benefit from an almost absolute liability system that facilitates speedy recovery in cases of surface damage.

Comments

Some amendments are suggested:

- i. Liability under section 76(2) attaches to the registered owner of the UAS, which creates a discrepancy with the mandatory registration requirement that is imposed on the operator of the UAS, namely the entity that manages the UAS and is responsible for its maintenance, operation and ensuring that the remote pilot has the permissions to fly it. In that respect, companies that operate their own UAS would be required to register, while in the case of outsourcing the operation of UAS, the responsibility to register lies with the outsourced operator of the UAS. Currently, this legislative discrepancy does not seem to cause issues as commercial UAS are usually operated by their owners, even in cases where they are leased out. Such leases are generally arranged on a “wet” basis, namely that the owner leases the UAS with the pilot and potential observers. As such, liability under section 76(2) falls on the operator of the UAS. Operating practices will likely change (as in the aviation industry), with owners of UASs leasing them out on a “dry” basis, namely by providing the UA with the lessee operating the UA by using its pilots and observers. In this situation, the arrangement of s 76(2) can potentially cause unfair results as it allocates the liability risk to the owner, who does not have navigational control over the UAS.
- ii. Section 76(4) partly mitigates this issue as it makes the lessee liable in cases where the UAS has been leased out for more than 14 days without the provision of any “pilot, commander, navigator or operative member of the crew of the aircraft”. This is a reasonable arrangement as it allocates the liability risk to the person who operates the UAS. However, this still leaves the following two problematic issues:
 - A. It does not cater for situations where the owner of the UAS provides visual observers or technical assistants, but not the remote pilot, to the lessee. Can a visual observer qualify as a navigator disrupting the allocation of liability risks to the lessee? It is likely, although by no means certain, that they might qualify as such, considering that observers advise the remote pilot about the position of the UAS and any potential collision hazards. Much will depend on whether the remote pilot retains overall responsibility for the navigation of the UAS, which seems likely to be the case. The provision of a technical assistant is unlikely to change the allocation of risk achieved as they will not, under normal circumstances, have a say over the navigation of the UAS. This also seems to be the reading of insurers; for example, in a UAS policy, the term “UAS operator” excludes the “employed observers of the insured” from its definition, focusing on the person that “directly manipulates the flight controls of the UAS”, referring to the remote pilot and “exercises direct authority over the initiation, continuation, diversion or termination of the UAS flight”, referring to the person with the navigational control of the UAS.
 - B. The owner of the UAS remains liable for any third-party damage caused by the UAS during the first fourteen days of the dry lease. The Rome

Convention 1952 also imposes a similar requirement on aircraft owners.⁷ With the mandatory registration of UAS operators, this is an unreasonable provision as it makes the owner/lessor potentially liable for a period without operational control over the UAS. The Rome Convention 1952 mitigates the impact of this arrangement by making the owner/lessor and the operator/lessee of an aircraft jointly and severally liable during this period, essentially enhancing the victim's protection, who has the unilateral right to bring claims against both or either of them. However, the 1982 Act does not follow the same path. Instead, it gives the owner/lessor a right of indemnity against the lessee for any third-party claims that were required to be satisfied because of the operation of a dry-leased UAS. A literal reading of s 76(3) seems to absolve the operator/lessee from direct liability for the first 14 days, giving lesser protection to victims on the ground than the Rome Convention 1952. Despite the wording, we believe that the reasonable interpretation of s 76(3) and (4) is that both the owner and the lessee remain potentially liable for the first 14 days of the dry lease. The owner is given the right to bring an indemnity action against the lessee in cases where they have satisfied claims arising from the operation of the UAS by the lessee. But maybe clarification to that effect is required.

14. Question 48

We provisionally propose that there should be a review of product liability law (including the Consumer Protection Act 1987) to take account of the challenges of emerging technologies. The review should cover product liability as a whole rather than be confined to aviation or automated vehicles. Do you agree?

Yes, we agree that reviewing the entire product liability regime is essential. The absence of reform to reflect emerging technologies disadvantages victims and aircraft operators vis-à-vis manufacturers.

It disadvantages victims as there is doubt i) if and to what extent such new technologies fall into the strict liability regime of the CPA 1987, with the alternative being to bring an action under the law of negligence and having to prove that the product was negligently manufactured - a costly endeavour considering the novelty and difficulty in explaining the decision-making procedure of some of these technologies, such as machine learning, and ii) whether the CPA 1987 would cover RCCs that are established abroad but remotely operate novel aircraft in the UK.

It also disadvantages aircraft operators as i) they are subject to the negligence regime and will face similar issues of proving negligence with some of these new technologies, and ii) software and AI manufacturers tend to take a stricter approach to indemnity provisions and hold-harmless clauses than traditional product manufacturers, which might leave aircraft operators and their insurers with no (or negligible) rights of recourse against them if left unchecked.

As a final comment, we would like to note that any review of the product liability laws will also need to consider its potential effect on innovation and ideally would need to balance the interests of the products' users and manufacturers. With the European Union having taken the step to reform its product liability laws, we believe it is time for a review in the UK.

⁷ Article 3

15. Question 50

We seek consultees' views on whether they expect any difficulties applying existing insurance requirements to uncrewed aircraft systems.

Some preliminary thoughts

Overall, the UAS insurance market seems to be moving away from overreliance on the insurance wordings of the aviation market (airlines and general aviation) to tailor-made wordings and types of cover. It can cover BVLOS operations, delivery operations, and other niche commercial activities. Furthermore, it is becoming increasingly common for UAS insurance policies to include coverage for invasions of privacy, hacker damage, breach of the Data Protection Act, etc.⁸

After several years of operation, the UAS insurance market seems to have accumulated historical data to provide insurance ratings confidently in the traditional manner. More data is becoming available through more accurate reporting of accidents and incidents to the regulators and insurers, enabling more insurers to be involved in the UAS insurance market. Some issues that affect premium rating in UAS operations are familiar to aircraft insurers, such as the risk management ones dealing with the type of UAS to be used, the geographical location of operations, the pilots' experience and qualifications, the UAS usage and the insured's loss history. However, risks related to BVLOS operations, swarm flights and other specialist operations are unique to the UAS insurance market and also risks such as theft, flood, and other natural catastrophes, water, and transportation are more prevalent in the UAS market, considering the size of UAS, their storage places, their sensitivity to weather conditions and their potential uses in emergencies and urban environments. At the same time, passenger and baggage liability is not yet a concern for UAS insurers, although this will change once VTOL operations are authorised.

As a result, a positive outlook has finally emerged for the UAS insurance market in the words of a leading UAS insurer:⁹

Generally...established drone insurers, such as Moonrock Drone Insurance, have now entered a period where they have much better access to historical information and new data and can more accurately identify risks and price policies fairly and transparently. For example, larger drones, such as those over 25 kg, used to require individual pricing. However, many users can now be provided an insurance policy quote online as insurers have better understood the risks, boundaries and parameters of drone use, which can be insured. Similarly, insurers have an improved understanding of beyond visual line of sight (BVLOS) operations and their growth trajectory over the next five years. By utilising an insured's data at the

⁸ For a review of several policies, see G Leloudas, "The Insurability of Third-Party Liability Risks arising from the Use of Civilian Uncrewed Aircraft Systems (UAS) in the UK" in B Soyer and O Gurses (eds) *The Insurability of Emerging Risks. Law, Theory and Practice* (Bloomsbury Publishing 2025 forthcoming).

⁹ Maurice Thompson, Anthony Tarr, Julie-Anne Tarr and Simon Ritterband, "Unmanned Aerial Vehicles Liability and Insurance" in Dino Wilkinson, Anthony Tarr, Julie-Anne Tarr and Maurice Thompson (eds), *The Global Insurance Market and Change* (Taylor & Francis 2023) p 218.

end of a policy, insurers can also price the same insured's subsequent policy with improved accuracy.

Overall, the commercial UAS insurance market seems to flourish courtesy of a large enough pool of insureds and improved availability of accident and operational data. Its capacity to provide adequate coverage has yet to be tested (at least in the UK setting) by multi-casualty events, whether safety- or terrorism-related. The relatively easy access to UAS and their operation without many authorisations, their ability to operate in urban environments, their use in swarm shows and their ability to carry significant weights of payload create a risk profile that can be attractive to terrorists for its catastrophic potential: for example, using light UASs to disseminate chemical substances over a large area of a city might not be too implausible a scenario; or targeting critical energy infrastructures, turning off the geofencing restrictions, might also not be too far off as a scenario. Such issues inevitably are relevant to this question.

Comments

Under assimilated Regulation 785/2006 on insurance requirements for air carriers and aircraft operators (as amended), commercial UAS operators must have third-party liability insurance to cover safety and war-related risks. The Regulation also requires operators to have passenger, baggage, and cargo liability insurance. These are not relevant for UAS operators yet but will be applicable once VTOLs start carrying passengers or we have regular cargo deliveries/flights by UAS.

Overall, we believe the Regulation does not require significant amendments to accommodate the use of novel aircraft, but some adjustments might be needed:

- i. As the Law Commission points out, the Regulation applies, in principle, to UAS (clarification to that effect is forthcoming). Still, it has a significant exception as it does not apply to UAS of less than 20 kg exclusively used for sports or recreational purposes. The exception is estimated to be so broad that most non-commercial UAS operating in the UK are not required to have insurance. Still, the Regulation covers the operation of commercial UAS. This is a nonsensical arrangement, considering that the impact of a UAS crash on third parties is the same irrespective of its use. One might even argue that insurance is more critical for the recreational operations of UAS as remote pilots might have less experience in operating UAS, considering that there is no minimum age for being a remote pilot of a UAS in the Open category. The studies of the AAIB indicating that a 1.4 kg UAS falling from 8m height can cause fatal injuries (see Preliminary comments in p 2) strengthen the argument that insurance for recreational UAS users should become mandatory and not be left to the user's discretion. While operations in the Open category, where most recreational UAS fall into, impose restrictions on their areas of operation and their

weight, it is plausible that a recreational UAS operating in the A3 category, due to a technical fault or human mistake, would crash on a moving car causing its driver to lose control and resulting in property damage and physical injuries. The remote pilot could be liable for causing such an accident. Yet, the absence of insurance would limit the recovery prospects of the car's insurers or any civil claim the injured third parties bring against the remote pilot of the UAS. Or a recreational UAS might be "hijacked" by a terrorist that intends to use it to cause damage to critical urban infrastructures: the absence of war risk insurance will delay the recovery of

damages. Considering the expected increase in UAS operating in UK airspace, these scenarios are not unique or implausible. While a compulsory insurance requirement might increase the cost of operating a recreational UAS, it would ensure a financial net to cover damages caused by such uses. As such, we believe that third-party insurance requirements (to include war and non-war risks) to cover all UAS need to be introduced, arguably at lower levels than the current lowest one of the Regulation, namely 750,000SDRs per flight. Such levels can be determined not only by reference to the weight of the UAS but by reference to “the overall risk of the flight operation, and take into account the level of injury or damage an aircraft could do, the size and maximum take-off mass of the aircraft, the flight path and complexity of the operation” as it was announced in the “Future of Transport Regulatory Review: Future of Flight Government Response”.¹⁰

- ii. Regulation 785/2006 requires that third-party liability cover be provided per occurrence. Yet, it permits cover against third-party war risks to be provided on an aggregate basis. This exception is because the aviation insurance market cannot cover such risks on a per-accident basis following the 9/11 attacks. The practice of the airline insurance market is linked to the catastrophic potential of commercial aircraft, as witnessed by the 9/11 attacks. To avoid the recurrence of the insurance crisis that followed 9/11, third-party war risk coverage for commercial airlines is provided using several layers of excess insurance, and it is only available on an aggregate basis. Considering that access to UAS is considerably more straightforward than that of aircraft, it is arguable that they can cause catastrophic third-party damages against which the war risks insurance market requires protection via the aggregate limits. We believe that a review of whether war-risk insurance for novel aircraft must still be provided on “an aggregate” basis (following conventional aviation insurance practices) or be required on a “per event” basis should be undertaken due to the unique characteristics of their operations explained herein.
- iii. An amendment of the term “flight” to accommodate rotary-wing UASs would improve the Regulation, as it would leave no doubt that it applies to them. When cargo and passenger flights become a reality, amendments will be required. Yet, there is no current, urgent need to overhaul it.

16. Question 59

We invite views on how operator responsibilities for dangerous goods might need to be adapted in the case of autonomous operations.

We believe it is vital to disclose to the ATS and relevant services that the autonomous aircraft carries dangerous goods to safeguard operations’ safety (and security) in non-segregated airspace and urban centres before the flight. At the same time, we believe that any requirements shall not stifle innovation as there are substantial safety and commercial reasons to carry dangerous goods via autonomous aircraft (rather than crewed aircraft) (see for examples the safety case studies in terms of using UAS for inspecting oil rigs, vessels, or carrying dangerous goods).¹¹

¹⁰ Department for Transport (DfT), “Future of Transport Regulatory Review: Future of Flight - Government Response” (September 2023) p. 22.

¹¹ For a review of the benefits of using UAS in the shipping industry, see G Leloudas and M Chatzipanagiotis, “Use of Unmanned Aircraft Systems in a Maritime Context: Operational, Regulatory and Legal Issues” in B Soyer and A Tettenborn (eds), *Disruptive Technologies, Climate Change and Shipping* (Informa Law 2022).

17. Question 60

We ask for consultees' views about whether the offence of hijacking in domestic law should be updated to:

(1) include the unauthorised seizure or control of autonomous or remotely piloted aircraft by technological means or by persons not on board the aircraft; and

(2) expand the period in which hijacking can occur from the period when an autonomous or remotely piloted aircraft is "in flight" to the period when it is "in service".

We fully agree as it is likely that control of an autonomous or remotely piloted aircraft might be interfered with by external means and actors (see, for example, the increased incidents of spoofing attacks against aircraft and vessels). While the 1970 Hague Convention for the Suppression of Unlawful Seizure of Aircraft (the UK has ratified it) requires that the hijacker is on board the aircraft for committing the offence, the 2010 Beijing Protocol Supplementary to the Convention for the Suppression of Unlawful Seizure of Aircraft (that amends the 1963 Tokyo Convention) suggests in Article 1 that no such presence is required. If the UK decides not to ratify the 2010 Beijing Protocol, any such change needs to be checked against the international commitments of the UK under the 1970 Hague Convention. Also, an equivalent offence must be created for taking control or attempting to take control of an RCC.

We also agree to expand the period when hijacking occurs to when an autonomous or remotely piloted aircraft is "in service" as per Article 3 of the 2010 Beijing Protocol (but see previous comment re the international obligations of the UK). This is important as control of an aircraft might be taken while it is on the ground and used for unlawful purposes. Still, the definition of "in-flight" might require adjustment to reflect new types of aircraft that do not have external doors.

18. Question 61

We also ask consultees for views on whether any offences against the aircraft other than hijacking need to be updated to account for increased autonomy in aviation.

We agree and note that such offences must include any unlawful interference with the aircraft's communications, monitoring, and control systems, including the RCC. At the same time, it might be worth considering offences related to manipulating the decision-making process of autonomous aircraft.

END OF SUBMISSION



IUA Response – Law Commission of England and Wales

Consultation Paper: Aviation Autonomy

Response submitted by email: aviationautonomy@lawcommission.gov.uk

The IUA welcomes the work of the Law Commission of England and Wales in respect of Advanced Air Mobility (AAM).

The IUA is the representative body for companies in London providing international and wholesale insurance and reinsurance coverage. Its mission statement is to secure an optimal trading environment for London (re)insurance companies. The IUA's London Company Market Statistics Report shows that overall premium income for the company market in 2022 was £44.071bn. Gross premium written in London totalled £37.626bn while a further £6.444bn was identified as written in other locations but overseen by London operations. The wider London Market generated premium of £90.771bn in 2022 (calculated by combining the IUA total of £44.071bn with £46.7bn declared by Lloyd's in its annual report).

We are working closely with our member (re)insurers who will be expected to support the roll-out of this new technology. We support the introduction of a proportionate, balanced regulatory framework which prioritises safety of AAM users, existing airspace users, people and property. It is our view that such a framework will be imperative to facilitate the successful uptake of AAM.

We do not have specific comments in respect of many of the questions posed but set out some key considerations which we have been discussing with our members. We would be very pleased to work with the Law Commission as this project evolves.

Role of insurance

We appreciate the acknowledgement that (re)insurers will have an important role to play in supporting the safe roll-out of AAM. The London Market is key to supporting the global commercial aviation fleet, insuring the world's largest airlines, manufacturers and airports, as well as the general aviation sector. Insurers have a strong history of supporting the uptake of new technology and have already embraced the growing use of Unmanned Aerial Vehicles (UAVs). We envisage that insurers will be asked to support AAM trials and their gradual production and uptake.

However, to provide this support, (re)insurers require confidence in AAM operations which can be assisted with two key actions. Firstly, the introduction of a regulatory framework with a robust certification process. This framework must prioritise safety throughout the design, build, certification, maintenance and use of an AAM. (Re)Insurers must be afforded a more certain position to develop products that cover risks arising from the regulated use of AAM; doing so would likely involve adapting existing policy wordings or developing new wordings for AAMs. Regulation can facilitate this work by providing certainty over terms relating to the individual or, more likely, system in control of the operation of an AAM, whether they be considered 'operators' or 'pilots'. Secondly, insurers will require data related to the use of AAMs to adequately quantify the risk posed by their operation and to price insurance policies. Data relating to the circumstances of an accident will be fundamental to apportion liability in the event of a claim, discussed further below.

Focusing on safety is fundamental to ensure the integrity and longevity of the AAM market. There is a substantial risk that early accidents could deter insurers from engaging in the market and risk denting public confidence in the technology.

Access to data for insurers

AAM is still in the early stages of development, therefore there is a lack of historical data for actuarial analysis to be conducted to inform underwriting and pricing. At its core, insurance is a data-driven process. Insurers work to ensure that the premiums of the many pay for the losses of the few. As such, it is key to set appropriate premium levels in line with the risk that an individual activity is bringing to the overall risk pool. Insurers' knowledge will grow over time and would be supported by data sharing on activities wherever possible.

The Law Commission must establish how it can be ensured that insurers have access to data to determine liability if an accident were to occur. This point was also raised during discussions on legislation to support the roll-out of Automated Vehicles. The Automated Vehicles Act (AV Act) has a provision for sharing information stored by 'licensed no-user-in-charge operators' and 'authorised self-driving entities' with insurers, with further details on how this information will be shared to follow in secondary legislation. Access to flight data recorder systems or similar devices could help with determining the circumstances of an accident and assigning liability, as well as any sensors or cameras used by aircraft. Without such data being made available, more disputes relating to liability will inevitably arise.

Product Liability and Artificial Intelligence

We agree that a review of product liability law will be required to sufficiently account for the challenges associated with emerging technologies. While the current law is well established and is applicable to a variety of products, the law must be updated to ensure the rights of consumers and of manufacturers are evenly maintained as emerging technologies continues to develop.

Considerations for how artificial intelligence (AI) will be used to facilitate greater levels of automation for AAM will have some parallels to ongoing discussions around the implementation of AI in other industries, such as the automotive industry. The AV Act came into law in May 2024, and sets a framework for the use of Automated Vehicles in the UK. New legal actors have been introduced to determine liability for driving offenses and accidents under specific conditions related to the degree of self-driving functions being used. Similar considerations are necessary related to how to attribute liability for aircraft being controlled remotely by a pilot. A manufacturer of software used to automate aircraft functions could be liable for an incident that would have previously been the responsibility of a traditional pilot. Product liability law will need to account for the increasing role of AI-assisted technology in the operation and maintenance of aircraft, as well as the potential uses of AI for air traffic management, weather prediction, route planning, navigation and aircraft design and maintenance.

This consultation paper briefly touches on the recent revisions made to the EU Product Liability Directive (EU PLD), which expands the definition of a product to include software, and the proposed AI Act which would facilitate the claims process for AI-related incidents. This legislation intends to fairly distribute the burden of proof between manufacturers and injured parties, easing the burden of proof for claimants, by:

- 1) expanding the concept of 'defect'; and
- 2) establishing rebuttable presumptions of causation.

It is necessary to consider the extent to which proposed regulation may either enable or hinder innovation, which is a key consideration that was highlighted in our response to the Department for Science, Innovation and Technology (DSIT) policy paper ‘A pro-innovation approach to AI regulation’ (Appendix 1 below). Providing rebuttable presumptions of causation to ease or reverse the burden of proof for claimants, as the EU has done in the revised EU PLD, would not be reasonable at present due to there being minimal case law or data to illustrate problems with the present legal regime. An unbalanced burden of proof between parties involved in product liability claims could also disincentivise parties involved in creating new technologies, hindering innovation. Another measure that the EU has proposed is placing disclosure requirements on the parties involved in a product liability claim. Stringent disclosure requirements for manufacturers would ensure that claimants are not at a disadvantage due to the significant amount of information that technology, particularly artificial intelligence, can provide. Within UK legislation, a comprehensive system of disclosure already exists, but we would support the enhancement of existing disclosure requirements for manufacturers to aid claimants.

Knowledge of battery technology

We strongly encourage the Law Commission to engage with battery manufacturers supplying their products for AAMs to ensure that the risks associated with these products are understood by both users and (re)insurers. An important consideration when evaluating the risks associated with AAMs is the use of lithium-ion batteries, and any future transitions to alternative battery technology, such as solid-state batteries. It is essential that the risks posed by lithium-ion batteries are considered during the underwriting process when providing cover for AAMs, both for the batteries within the aircraft itself and the batteries inside products carried by aircraft. For these risks to be sufficiently considered, a better understanding of battery technology is needed. Specific challenges exist in respect of thermal runaway and the risk of fire, which would be of substantial concern both for an aircraft in flight and when on the ground (for example, on a helipad based on a property). These risks must be appropriately assessed and managed. We anticipate that rules will be necessary surrounding battery life and thought should also be given to the safe disposal of batteries.

Cyber Security and Systemic Risk

We acknowledge that with any new technology consideration must be given to cybersecurity risk. This is particularly pertinent where the technology is connected and / or relies on external technology to operate, such as 5G networks. The IUA expressed concerns related to the potential increased systemic risk that may be posed by the uptake of Automated Vehicles. We envisage that similar concerns would exist in respect of AAMs. Specifically, if by malicious means or by some non-malicious technological failure, multiple aircraft could simultaneously fail leading to bodily injury and / or property damage. We expect that extensive testing of AAMs will take place to ensure their safety from a cybersecurity perspective. This testing should extend to any technology that AAMs will rely on to operate. We envisage that there would be fail-safes introduced in order that the AAM would safely land in the event of a system failure.

In the broader commercial and general aviation context, GPS interference and spoofing is becoming of increasing concern. Consideration should be given to the potential for these risks to impact AAMs.

Congested Airspace

We understand that work is ongoing to establish how AAMs will safely share airspace with existing aircraft types. This is welcomed by (re)insurers and we encourage ongoing collaboration between regulators, air traffic controllers and airspace users to establish and mitigate potential risks. We expect that many features of airspace control will be automated but envisage that staffing issues could arise with the anticipated continual expansion in airspace use. We also note the substantial impact of the August 2023 National Air Traffic Services (NATS) network disruption and support the ongoing work to reduce the likelihood and impact of future events.

Work may also be required to explore the impact of AAM on existing nuisance and privacy rights, given that AAMs are likely to operate in closer proximity to people and property than traditional aircraft. This point is particularly pertinent in respect of smaller UAVs utilising camera / recording equipment.

If you have any questions or would like to discuss the above further, please do not hesitate to contact Ela Metalia ([REDACTED]) and Tom Hughes ([REDACTED])

June 2024

IUA Response – Department for Science, Innovation and Technology (DSIT)

Policy paper: A pro-innovation approach to AI regulation.

Response submitted by email: [REDACTED]

Background

The IUA appreciates the opportunity to contribute to this white paper and provide feedback on behalf of our members.

By way of background, the IUA is the representative body for companies in London providing international and wholesale insurance and reinsurance coverage. Its mission statement is to secure an optimal trading environment for London (re)insurance companies.

The IUA's London Company Market Statistics Report shows that overall premium income for the company market in 2021 was £35.654bn. Gross premium written in London totalled £30.114bn while a further £5.540bn was identified as written in other locations but overseen by London operations. The wider London Market generated premium of £74.970bn in 2021 (calculated by combining the IUA total of £35.654bn with £39.216bn declared by Lloyd's in its annual report).

Introductory Comments

Our members have two distinct interests in AI. Firstly, insurers will continue using AI systems as part of their business operations, whether that be to interface with customers, to analyse and model insurance risks or to support the claims handling process. Secondly, they will continue to provide insurance products covering the risks posed by AI systems used across a multitude of businesses and sectors.

Our members support the government's drive to position the UK as a global AI hub and welcome the 5 foundational principles of the framework as an essential ingredient to responsible AI use. It is imperative that a balance be struck between the key aims of the government's AI principles to mitigate harm, but to also facilitate innovation. It is important that attention is drawn to both the opportunities and risks of AI.

Further clarification to all stakeholders on the practicalities of the proposed regulatory regime will be necessary to best achieve the government's aims. In particular, how businesses engage with the proposed AI sandbox and what it will entail; the risk register and its level of disclosure; and greater detail on what regulation would look like in the future. We look forward to seeing the progress of this initiative as it evolves and the continued collaboration with industry through trade associations like the IUA.

To achieve the stated goals, it is imperative for the government to ensure that it is actively engaged at the forefront of thinking around AI, with sufficient expertise to be a global leader and facilitate and support innovation within the UK. It is also paramount to facilitate and actively encourage training for businesses and government using AI, particularly those using AI that is considered high-risk.

Further consideration on AI system security is essential as we move forward, as is the distribution of more information on how the government plans to assist and facilitate this security. It is imperative that AI systems remain secure so that threat actors are unable to access and change their operation. Security concerns are particularly prevalent for AI systems that deal with physical processes and

could have the potential to cause physical damage; in particular, when involved in the operation of critical national infrastructure. Stakeholders need to understand the relative ease with which AI systems could be impacted by cyber-attacks, but also be subject to errors, faults or failures.

The role of insurance

Insurance is a vital risk management tool for the implementation of various new technologies across all sectors of the economy. It can provide developers, distributors, and users of AI systems protections against AI-related harms and has the potential to incentivise responsible AI practices. This protection can provide stakeholders with confidence that encourages innovation, making it a valuable tool to support the uptake of AI.

When considering the role of insurance as part of AI governance, it is essential to acknowledge that good regulatory intentions alone cannot guarantee zero-failure outcomes. Therefore, governments should also focus on establishing routes for redress in cases where AI may cause harm to individuals or property. Insurance can serve as a mechanism to handle such failures, ensuring that affected parties receive appropriate compensation. However, for this approach to be successful, there needs to be a clear legal framework that defines liability and accountability for AI systems. In the future, specialised AI dispute resolution mechanisms may be required to support the insurance process effectively.

Continued collaboration among insurance providers, technology experts, AI users, and regulators is necessary to develop robust risk assessment methodologies and ensure the successful implementation of the principles governing AI. By fostering collaboration with the insurance industry, solutions could be developed that would further promote the responsible use of AI.

Understanding

Government efforts on AI should prioritise understanding algorithmic biases and guarding against overreliance on seemingly infallible machines. Education and training on AI-associated biases are vital in mitigating harm, since these biases often stem from inaccurate and unfair data that reflects real-world prejudices. There is a danger that AI systems trained on biased historical data could perpetuate and amplify systematic human biases. It is paramount to recognize that biases could arise from structural inequalities in the real-world where data used by AI is captured. Data may be perceived as objective and neutral. However, it is important to remember that data itself could be subject to human biases. Human expertise and intervention, particularly in "human in the loop" solutions, play a crucial role by increasing accountability and improving oversight of autonomous systems. Governments and businesses should promote transparency in decision-making to identify and resolve any inherent biases in AI models.

Education on biases is imperative for businesses and governments. Government must consider whether it is appropriate for AI systems to be held to higher moral standards than the humans involved in their life cycle. System bias is often a reflection of the biases found in the world where the data is captured. A vital focus of government regulation and support should be to educate AI practitioners on their own cognitive and social biases rather than just the AI system itself and its outcomes. In addition, fostering awareness through education about cognitive biases, such as automation bias, can help mitigate potential harm. Automation bias occurs when there is an excessive dependence on automated instructions, overlooking alternative sources of information. It can also lead to omission errors, where problems are disregarded because the system fails to recognize them as such. Awareness reminds practitioners and users of AI to not solely rely on an AI systems directives.

Regulators will also require ongoing training, education, access to AI subject matter experts and specialised knowledge to effectively govern AI technologies and address associated risks. It is our view that collaboration with industry stakeholders and insurance providers is necessary to develop robust risk assessment methodologies.

The suggestion of a proposed AI risk register is welcomed and further clarity is sought on its practical implications, including how it would be maintained as a live document and the disclosure threshold.

Instead of focusing solely on negative risk factors, a balanced approach should also be taken to assess both risks and opportunities. Objective risks should be monitored, and AI and cyber security experts should be involved to challenge AI systems and drive improvements within the risk register and regulatory sandbox. It is our view that establishing a central database to track developments and connect stakeholders would enhance understanding and oversight of AI systems.

Transparency

Transparency is a vital and necessary component of consumer trust. Transparent AI would facilitate the adoption and realisation of AI and the value it can add to stakeholders, consumers and wider society.

Transparency throughout the AI lifecycle and a systems value chain is imperative. For insurers, it relates directly to their regulatory obligations in protecting their customers. Insurers must clearly understand the nature of an AI system, its use cases, the risks that it may pose and the impact upon the end customer. Furthermore, it would support a clearer pathway to establishing liability if a system resulted in harm. Independent audits and validation mechanisms could help promote transparency and compliance with ethical and regulatory standards.

To support general learning around AI, there would be benefit in organisations making available some information about their AI systems, data sources, and algorithms. It is essential to define transparency clearly, particularly in the sandbox phase, as our members have expressed concern over disclosing proprietary information which could lead to stakeholders refraining from sandbox participation. While constructive disclosure is important, proprietary information should be protected. To maximize the benefit of the regulatory sandboxes to AI innovators, the government should provide clear guidelines on sandbox participation and could offer access to expert advice and resources in order to foster collaboration between participants and regulators.

Requiring organisations to clarify when they are using AI could contribute to transparency, but it may not be sufficient on its own. Insurance could play a role in ensuring transparency by providing coverage for AI-related risks and, where appropriate, gathering information about AI systems and processes as part of the underwriting process.

Additional transparency measures could include independent audits of AI systems to verify their compliance with ethical and regulatory standards, and public accessibility to high-level descriptions of AI models without disclosing proprietary information.

Explainability

The IUA agrees with the government with regards to the importance for relevant parties to hold the ability to access, interpret, and comprehend the decision-making processes of an AI system. However, there is a need for further clarification on what the acceptable threshold of explainability would be. It should be noted that as AI systems become more advanced, the implementation of explainable AI (XAI) techniques becomes increasingly arduous, costly, and at times practically

unfeasible. For instance, an AI system with millions of parameters is significantly easier to explain than one with trillions of parameters. While explainability holds significance, it is important for the government to consider the practical implications associated with more sophisticated AI systems. If explainability becomes a rigid requirement, it may hinder innovation in comparison to jurisdictions with less stringent explainability standards. Requiring full explainability of a system could result in less sophisticated AI, particularly as AI evolves and learning techniques become more advanced or new altogether. In addition, it could act as a barrier for smaller businesses to access more sophisticated AI systems.

Foundational models/Generative AI

When considering foundational models such as Large Language Models (LLMs), we agree with the government's position that these technologies require detailed consideration due to their unique challenges. We believe that further regulatory attention is needed as foundational models being used by multiple parties could aggregate harm and potentially complicate liability matters. In addition, Generative AI, particularly speech, text and image generation, represents a pivotal instance where machines could effectively, naturally, and independently communicate with humans. It is imperative for consumers to discern between interactions with artificial and biological (Human) intelligence as these breakthroughs have opened the door to fully artificial customer service experiences. Ensuring consumers are aware when they are engaging with AI is paramount and should be a mandatory requirement. This becomes especially critical when AI systems recommend, suggest products or attempt to persuade individuals and these suggestions, or behavioural nudges, are delivered or created by generative AI.

It should be acknowledged that companies hold the ability to employ sophisticated techniques to extract and commodify vast amounts of behavioural data from consumers which could be used for targeted advertising, personalised recommendations, and more. The role of regulatory bodies like the ICO (Information Commissioner's Office) in safeguarding consumer privacy and ensuring responsible data practices and protection will be fundamental in the context of evolving AI.

Conclusion

It is important to strike a balance between safety, innovation, and flexibility, while addressing the unique challenges posed by AI technologies. Overall, continued communication and collaboration with all stakeholders involved in the take-up of AI, including insurers, is crucial. Further clarification is needed on the practicalities of the proposed regulatory sandboxes and risk register to maximise their own benefit and to foster participation and innovation. In addition, continued engagement is required ensuring the protection of consumers and stakeholders as technology and regulations evolve. Specific attention should be given to generative AI, particularly in areas such as text and speech technology, where the interaction between technology and consumers is prominent., our members seek clear guidance, in addition to responsive, and consistent application of any rules and regulation. We agree with the government that regulation should be proportionate to the particular risk of an AI system. We hope our comments are useful to DSIT in respect of the UK's pro innovative approach to AI regulation. We would be pleased to expand or clarify on any of the points made.

Christopher Jones



Director of Legal and Market Services

T: [REDACTED]

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RESPONSE TO LAW COMMISSION CONSULTATION ON AVIATION AUTONOMY

(Law Commission Consultation Paper 261)

Please note that this consultation response has been reproduced from information entered on the Citizen Space online portal.

Any personal email addresses and phone numbers have been excluded from this document.

Unanswered questions have been deleted from this document.

About you

What is the name of your organisation?

Joby Aviation

Airworthiness and certification

Consultation Question 1

We seek views on how current airworthiness and certification regulation might need to be adapted or developed in light of highly automated and autonomous aircraft. In particular, should provisions be adopted which allow for:

1. the certification of optionally piloted and uncrewed or unoccupied versions of conventional aircraft (hybrid versions); and
2. the separate certification of command units?

Please share your views below

The technologies supporting autonomy have to be assessed for their role in the functional architecture and impact on the safety assessment. Where gaps exist in recognised practice for assurance at those interfaces, we must establish and then respond to the demonstration burden to show resulting system behaviour - consistent with the safety intent of the regulations.

Overall, the safety gains garnered from increased automation in place of existing reliance on human responses must be factored into any assessment of what should be facilitated. This is illustrated when one considers the considerable role of human factors in current accidents and incidents.

The approach to approving command units (also known as command monitoring units, CMUs, and ground control stations, GCSs) should be tailored to the role that said unit and the person utilising them plays in the overall operation of the aircraft system. We support the approach presented in EASA Opinion 03/2023 which acknowledges that varying extents of on-aircraft autonomy require differing

approaches to the approval of CMUs and tailors the extent of and mechanism for oversight of the CMU appropriately.

Consultation Question 2

We welcome views on what changes to the certification system might be necessary to enable higher automation and autonomy in aviation.

Please share your views below

Existing certification frameworks may be largely appropriate overall. For specific projects with higher automation and autonomy, the onus will be on applicants to demonstrate that highly automated/autonomous systems are able to meet safety thresholds.

The use of 'autonomy' or even artificial intelligence and machine learning (AI/ML) should not result in an assumption that existing certification systems or tools are not appropriate for a given application. The approach to certification should be performance-based and allow means of compliance to be leveraged for systems and aircraft that employ automation and autonomy.

Consultation Question 3

We seek views on whether current regulatory tools to support the development of highly automated and autonomous aviation technologies are adequate.

Please share your views below

To promote continued growth and efficiently, scalable and tailored regulation are needed. Specifically, tools to support the certification within the existing regulatory landscape, such as means of compliance and accepted verification and validation techniques, must be developed and accepted.

However, there is no need to fundamentally change the regulatory landscape or core processes to accommodate highly automated and autonomous aviation technologies.

Rules of the air

Consultation Question 4

We seek views on how highly automated and autonomous aircraft should act in emergency scenarios. In particular:

1. should highly automated and autonomous aircraft be given the freedom to operate outside the rules of the air in emergency circumstances; or

2. should a comprehensive set of rules be developed for highly automated and autonomous aircraft in emergency situations.

Please share your views below

The same principles for handling an emergency should remain. If an aircraft system has the capability to mitigate an off-nominal or emergency situation, it should be allowed to do so, particularly in the event of a pre-approved flight plan with contingencies or pre-programmed failure response management. If an aircraft does not have the capability to automatically mitigate a given set of situations, then operational limitations should be able to be imposed to allow the safe operation of that aircraft by avoiding said situations (e.g., by staying out of airspace types or traffic densities). Any requirement for automated emergency handling should not be universally applied without the opportunity for hazard analyses to show whether or not it is necessary.

Both manned and autonomous system designers may benefit from the expansion and clarification of priorities for emergency response. For example, 1st regaining or maintaining control of the aircraft, 2nd protecting human life, and 3rd avoiding damage to property.

Even with autonomous systems, multiple individuals are involved in deciding (often in advance) what the system response will be, from software engineers to dispatchers to those approving a given flight plan. Having a clear set of priorities would align these decisions; stating what is an acceptable approach with which to approach anticipatory emergency planning would be beneficial.

Consultation Question 5

We seek consultee views about what challenges remotely piloting an aircraft in an emergency scenario presents and how these might be addressed

Please share your views below

All expected emergency scenarios should be addressed. Conventional aircraft are required to have emergency procedures in the Pilot's Operating Handbook (POH) / aircraft flight manual (AFM). These procedures need to be automated by on-board systems and/or the remote pilot needs to be able to perform the procedures at an assurance level equivalent to an on-board pilot. In addition, identification of appropriate alternative landing locations and ditching locations (as needed) need to be identified and validated by the Pilot-In-Command (PIC) for the proposed route to be flown.

Consultation Question 6

We seek consultees' views on whether the rules of the air relating to communication should be adapted for remotely piloted and autonomous aircraft.

Please share your views below

The current rules for the need of two way communication and for the loss of communication are sufficient for remotely piloted and remotely monitored operations. Any revisions of such rules should apply to conventionally manned, remote and automated aircraft operations. The need for two way communications and the rules to follow when a communications failure occurs need to be the same for all aircraft to ensure safety.

Consultation Question 7

We ask for consultees' views on how the rules of the air might be adapted or developed for remotely piloted or autonomous flight

Please share your views below

In general, the rule structure works for all types of operations, but further emphasis on ensuring performance- based rules is important to ensure the regulations can keep pace with technological development.

The rules of the air should be updated to reference the performance requirement/standard required when a sensor(s) is used, as opposed to human vision.

Also, as traffic congestion increases in a specific area, increasing the areas that require two-way communications, specifically permission to enter the airspace and expansion of cruising altitude requirements may be needed.

VTOLs

Consultation Question 8

We provisionally propose that a person overseeing a VTOL flying automatically, who monitors its course and is able to intervene and change its course at any time should continue to be classified as a "remote pilot". Do you agree?

Yes

Please expand on your answer below

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

Consultation Question 9

We provisionally propose 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. Do you agree?

Yes

Please expand on your answer below

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

Consultation Question 10

We provisionally propose 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.

Do you agree? (Tick all that you agree with)

Please expand on your answer below

When operations are conducted within an approved air carrier operation, the remote PIC should be able to utilise the assistance of other trained and approved air carrier personnel who are physically co-located with the aircraft to conduct pre-flight inspections, load of the aircraft, performing weight and balance calculations, fuel the aircraft, filing flight plans etc. This is just as conventional pilots within an air carrier currently rely on these additional personnel to assist in ensuring the aircraft is in a condition for safe operation for the flight to be conducted. The remote pilot should be required to ensure that these functions have been completed before initiating flight.

Consultation Question 11

We invite views as to whether there are additional operational responsibilities that a remote VTOL pilot should be required to fulfil.

Please share your views below

Joby has not identified additional responsibilities that are not already covered by the current set of regulations and guidance for PIC responsibilities.

Consultation Question 12

We provisionally propose that the remote pilot-in-command should be responsible for, amongst other things, ensuring passengers are:

1. given a safety briefing; and
2. seated and wear seat belts during take-off and landing

Do you agree?

Yes

Please expand on your answer below

Yes, with the understanding that the remote PIC can continue to utilise tools, currently used by certificated air carriers, such as pre-recorded safety briefings, utilise other crew (ground or air) to validate passengers are seated and wearing seat belts, and/or use remote cameras and sensors to validate appropriate conditions for safe operation.

Consultation Question 13

We provisionally propose that air operators (rather than the remote pilot-in-command) should be responsible for preventing passengers from boarding:

1. who appear drunk or under the influence of drugs; or
2. whose carriage would, in the view of the operator's employees, endanger the safety of the aircraft or other passengers.

Do you agree?

Yes

Please expand on your answer below

Yes. It is still the PIC's responsibility to ensure that screening occurs, but just as is done today in conventional operations actual person to person validation can be conducted by/delegated to other crew, ground or air, and reported to the PIC.

Confirming these functions have been completed before initiating flight should remain the responsibility of the PIC.

Consultation Question 14

We provisionally propose that the remote pilot-in-command should have the power to take reasonable measures, including restraint of passengers, as set out in section 94 of the Civil Aviation Act 1982. Do you agree?

Yes

Please expand on your answer below

Yes, just as can be done today via a PIC located in a secure cockpit and communicated to a crew member or passenger via an intercom, a remote pilot would have the same ability and authority.

Consultation Question 15

We provisionally propose that a person on board a VTOL aircraft (other than a crew member) should be able to take reasonable measures to protect the safety of the aircraft or of persons or property on board. Do you agree?

Yes

Consultation Question 16

We seek views on whether the powers of crew on board a VTOL aircraft should be broadened to reflect those of the pilot-in-command under the Civil Aviation Act 1982 to:

1. take reasonable measures to protect the safety of the aircraft or persons or property on board;
2. maintain good order and discipline; or
3. enable the crew to disembark or deliver a person.

Please share your views below

Yes.

Consultation Question 17

We provisionally propose that passengers should be able to contact a member of crew at all times during an operation. Do you agree?

Yes

Consultation Question 18

We provisionally propose 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. Do you agree?

Yes, the location of the PIC ground or air should not make a difference; as long as a remote pilot is designated as a PIC there does not seem to be a need to revise any regulations.

Consultation Question 19

We provisionally propose that it should be a criminal offence for a person to act as the remote pilot of a VTOL when the level of alcohol in their blood, breath or urine is over a prescribed limit. Do you agree?

Yes

Please expand on your answer below

Yes, as above - the location of the PIC ground or air should not make a difference and as long as a remote pilot is designated as a PIC there does not seem to be a need to revise any regulations.

Consultation Question 20

We provisionally propose that the remote pilot should be subject to the reporting obligations currently applicable to pilots under the Air Operations Regulation. Do you agree?

Yes

Please expand on your answer below

Yes, as above - the location of the PIC ground or air should not make a difference and as long as a remote pilot is designated as a PIC there does not seem to be a need to revise any regulations.

Consultation Question 21

We provisionally propose that a remotely piloted VTOL should be required to be capable of detecting and recording information relating to accidents and near accidents for the purposes of reporting it. Do you agree?

Yes

Please expand on your answer below

Yes, as above - the location of the PIC ground or air should not make a difference and as long as a remote pilot is designated as a PIC there does not seem to be a need to revise any regulations.

Consultation Question 22

We provisionally propose that licences should be required for remote VTOL pilots. So far as appropriate, these should follow the classes and ratings adopted for crewed VTOLs. Do you agree?

Yes

Please expand on your answer below

Yes, the location of the PIC ground or air should not make a difference as long as a remote pilot is designated as a PIC.

Consultation Question 23

We provisionally propose that operators of remotely piloted VTOL should be certified. Do you agree?

Yes

Please expand on your answer below

Yes, the location of the PIC ground or air should not make a difference as long as a remote pilot is designated as a PIC.

Consultation Question 24

We provisionally propose that operators of remotely piloted VTOLs should continue to be required to:

- ☒ (1) have the means necessary for the scale and scope of operations planned;
- ☒ (2) use only suitably qualified and trained personnel;
- ☒ (3) implement a management system to ensure safety;
- ☒ (4) ensure operations only take place in accordance with the operations manual;
- ☒ (5) establish procedures to minimise the consequences to safe flight operations of disruptive passenger behaviour;

☒ (6) develop and maintain security programmes suitable for the aircraft and type of operation;

☒ (7) have a management system to prevent fatigue.

☒ (8) ensure the continuing airworthiness of the aircraft; and.

☒ (9) establish procedures for any reasonably foreseeable emergency situation.

Do you agree? (tick all that you agree with)

Please expand on your answer below

Yes, the location of the PIC ground or air should not make a difference as long as a remote pilot is designated as a PIC.

Consultation Question 25

We seek views as to whether there are additional responsibilities that operators of remotely piloted VTOLs should need to fulfil.

Please share your views below

At this time, we do not see a need for additional responsibilities requiring a change of the PIC regulations. There may be unique features/procedures similar to the differences identified in type rating training, but the basic responsibilities remain the same as any other PIC.

Consultation Question 26

We seek views as to whether the law should permit remote pilots to act as pilot-in-command for more than one VTOL at the same time.

Please share your views below

Yes, this should be allowed. From a responsibility standpoint this is similar to that of a formation flight, where the lead pilot takes responsibility for the navigation and communication for the entire flight. Approval should be based on demonstrated ability to the authority.

Consultation Question 27

We seek views as to whether there should be an upper limit to the number of VTOLs for which a remote pilot can act as pilot-in-command at the same time.

Please share your views below

To keep pace with developments, it is recommended that the regulation for this area be performance-based. Instead of setting a specific upper limit in regulation, the applicant should be required to demonstrate they can maintain 'operational control' under all reasonably expected conditions, including emergencies.

Consultation Question 28

We seek views as to what additional safeguards should be introduced for remote pilots piloting multiple VTOLs.

Please share your views below

When managing aircraft remotely - regardless if it is one or multiple - an appropriate plan needs to be in place to manage emergencies with the pilot, the ground based equipment and the aircraft being supervised. There is currently a wide range of automation being used to support operations and it is necessary to conduct a risk assessment of the specific aircraft within the proposed concept of operation (conops). This type of review is currently facilitated well within the procedures for approving an air carrier's procedures, training and personnel. What needs to be developed is new guidance on the oversight of air carriers to assist the inspector/regulator who is overseeing air carriers. Also for single operators a new regulatory structure needs to be created to require and support the review and oversight of appropriate procedures for individual operators not operating under an air carrier certificate.

Consultation Question 29

We seek views as to whether there should be a role for a person supervising the flight of an autonomous passenger-carrying VTOL and acting as a point of contact in relation to it. What powers or responsibilities should such a person have?

Please share your views below

Yes, this role should be defined, including their powers and responsibilities, including to account for future operations in which the traditional concept of a pilot in command may no longer be accurate or appropriate.

Consultation Question 30

Should the law permit an uncrewed VTOL to transition between remotely piloted and autonomous flight during an operation?

Yes

Please expand on your answer below

Yes, for example this may be appropriate and or necessary in emergencies and failures in ground control communications.

Consultation Question 31

We seek views as to whether initial airworthiness standards for uncrewed VTOLs should include accessibility standards for persons with disabilities and reduced mobility.

Please share your views below

Regarding airworthiness standards addressing persons with disabilities and reduced mobility any requirements should be the same for all similarly situated (e.g., number of pax seats, and certification regime such as normal vs transport) aircraft and not unique to VTOLs.

Consultation Question 32

We seek views as to whether the CAA should be able to include accessibility standards within the licences granted to uncrewed VTOL operators.

Please expand on your answer below

Accessibility standards, separate from the aircraft (ref question 31) should be addressed as they currently are under law; there is no need for specific VTOL standards.

Drones

Consultation Question 34

We provisionally propose that a remote pilot for drones should continue to be defined as “a natural person responsible for safely conducting the flight of an unmanned aircraft by operating its flight controls, either manually or, when the unmanned aircraft flies automatically, by monitoring its course and remaining able to intervene and change its course at any time”. Do you agree?

Other

Please expand on your answer below

Although we agree that the general premise is correct, provisions, within established design standards, need to be made to address cyber security and hijacking situations. Remote aircraft should be allowed/required to be designed in such a way that it is extremely unlikely for the aircraft course to be redirected from the ground to intentionally fly into restricted airspace, buildings, or other aircraft.

Consultation Question 36

We provisionally propose that for autonomous operations in the specific category, a UAS 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 manned 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.

Do you agree? (tick all that you agree with)

Consultation Question 37

We seek views on what operational requirements should be applied to autonomous drone operations and drones that operate beyond visual line of sight in the specific and certified categories.

Please share your views below

Yes, we generally agree with the requirements as proposed but would request that a performance- and risk-based approach be applied that is in alignment with international precedents and the existing regulatory framework. Specifically, the requirement to discontinue a flight may be excessively prescriptive for highly automated flights which may be able to offer other mitigations.

Consultation Question 38

We seek views on whether the current concept of a "remote pilot" is compatible with drone MSO. We also seek views on whether the remote pilots of drone MSO should continue to be subject to the same responsibilities as remote pilots for single drone operations.

Please share your views below

Yes, because it is important to retain the concept that a human is in control and taking responsibility for the flight(s). The requirements for the PIC should be tailored to the type of operation such as "aerial demonstrations."

Consultation Question 39

We seek views on whether there should be an upper limit to the number of drones for which an individual remote pilot is responsible.

Please share your views below

In order to stand the test of time it is recommended that the regulation for this area be performance based. Instead of a specific upper limit, the applicant should be required to demonstrate they can maintain operational control, under all reasonably expected conditions, including emergencies.

Consultation Question 40

We seek views as to what additional safeguards should be introduced for remote pilots responsible for multiple drones.

Please share your views below

Requirements should be consistent for other areas of remotely piloted aviation. When managing aircraft remotely - regardless if one or multiple - an appropriate plan needs to be in place to manage emergencies with the pilot, the ground based equipment and the aircraft being supervised. There is currently a wide range of automation being used to support operations and it is necessary to conduct a risk assessment of the specific aircraft within the proposed concept of operation (conops). This type of review is currently facilitated well within the procedures for approving an air carrier's procedures, training and personnel. What needs to be developed is new guidance on the oversight of air carriers to assist the inspector/regulator who is overseeing air carriers. Also, for single operators a new regulatory structure needs to be created to require and support the review and oversight of appropriate procedures for individual operators not operating under an air carrier certificate.

Consultation Question 41

We provisionally propose that use of flight data recorder systems or devices should be mandatory for autonomous drone operations. Do you agree?

Yes

Please expand on your answer below

Yes, however provisions should be made for the data to be transmitted and retained on the ground, as an alternative to an installed flight data recorder. For example, there should not be a requirement to harden the data to the same extent as

transport category aircraft, or for an unreasonably long period of recording time if data is also nominally recorded off aircraft.

Consultation Question 42

Should the law permit a drone to transition between remotely piloted and autonomous flight during an operation?

Yes

Please expand on your answer below

Yes and requirements should be consistent for other areas of remotely piloted aviation. This ability is particularly necessary in emergencies and failures in ground control communications.

Civil liability and insurance

Consultation Question 44

We provisionally consider that the current law governing air carrier liability for injury or death of passengers in the UK is adequate for the introduction of remotely piloted and autonomous operations. Do you agree?

Yes

Consultation Question 45

We provisionally consider that the current law governing liability for damage to cargo in the UK is adequate for the introduction of remotely piloted and autonomous operations. Do you agree?

Yes

Consultation Question 46

We provisionally propose that liability for surface damage, in the case of UAS, should transfer to the lessee when the lease:

1. is for more than 14 days; and
2. specifies the aircraft is to be operated under the responsibility of the lessee.

Do you agree?

Other

Please expand on your answer below

Yes, notwithstanding negotiated lease terms regarding liability.

Consultation Question 47

We provisionally propose 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. Do you agree?

Other

Please expand on your answer below

Yes, provided any modifications do not undermine or create confusion regarding the CAA's fundamental responsibility for regulating safe flight.

Consultation Question 48

We provisionally propose that there should be a review product liability law (including the Consumer Protection Act 1987) to take account of the challenges of emerging technologies. The review should cover product liability as a whole, rather than be confined to aviation or automated vehicles. Do you agree?

Yes

Criminal liability

Consultation Question 52

We provisionally consider that the current approach in the Air Navigation Order 2016 placing criminal liability on an operator is adequate for autonomous operations.

Do you agree?

Yes

Please expand on your answer below

Yes, the current aviation legal framework can apply to autonomous or remote operations. Broadly speaking, it is important to consider the impact that criminal liability frameworks may have on just culture, the sharing of information and safety investigations - all of which form the backbone of a robust, continuously improving safety culture.

Consultation Question 53

We provisionally consider that the “reasonable care” defence in article 265(3) of the Air Navigation Order 2016 applies adequately for “direct contraventions” under Article 265(5) to (8) involving autonomous operations. Do you agree?

Yes

Consultation Question 55

We provisionally propose that a remote pilot of an uncrewed aircraft operating in the certified category should be treated as a pilot-in-command for the purposes of criminal liability pursuant to article 265(1) of the Air Navigation Order 2016. Do you agree?

Yes

Consultation Question 57

We provisionally propose that the pilot-in-command of aircraft in a multiple simultaneous operation should be criminally liable for breach of operating requirements in the same way as a pilot in command of a single aircraft would be. Do you agree?

Yes

Consultation Question 59

We invite views on how operator responsibilities for dangerous goods might need to be adapted in light of autonomous operations.

Please share your views below

We would encourage the Law Commission to consider current European and US provisions concerning dangerous goods responsibilities.

By way of example, the following text from the FAA Reauthorization Act of 2024 provides helpful context:

SEC. 933. SPECIAL AUTHORITY FOR TRANSPORT OF HAZARDOUS MATERIALS BY COMMERCIAL PACKAGE DELIVERY UNMANNED AIRCRAFT SYSTEMS.

(a) In General.--Notwithstanding any other Federal requirement or restriction related to the transportation of hazardous materials on aircraft, the Secretary shall, beginning not later than 180 days after enactment of this section, use a risk-based approach to establish the operational requirements, standards, or special permits necessary to approve or authorize an air carrier to transport hazardous materials by unmanned aircraft systems providing common carriage under part 135 of title 14, Code of Federal Regulations, or under successor authorities, as applicable, based on the weight, amount, and type of hazardous material

being transported and the characteristics of the operations subject to such requirements, standards, or special purposes.

(b) Requirements.--In carrying out subsection (a), the Secretary shall consider, at a minimum--

- (1) the safety of the public and users of the national airspace system;
- (2) efficiencies of allowing the safe transportation of hazardous materials by unmanned aircraft systems and whether such transportation complies with the hazardous materials regulations under subchapter C of chapter I of title 49, Code of Federal Regulations, including any changes to such regulations issued pursuant to this section;
- (3) the risk profile of the transportation of hazardous materials by unmanned aircraft systems, taking into consideration the risk associated with differing weights, quantities, and packing group classifications of hazardous materials;
- (4) mitigations to the risk of the hazardous materials being transported, based on the weight, amount, and type of materials being transported and the characteristics of the operation, including operational and aircraft-based mitigations; and
- (5) the altitude at which unmanned aircraft operations are conducted.

(c) Safety Risk Assessments.--The Secretary may require unmanned aircraft systems operators to submit a safety risk assessment acceptable to the Administrator, as part of the operator certification process, in order for such operators to perform the carriage of hazardous materials as authorized under this section.

(d) Conformity of Hazardous Materials Regulations.--The Secretary shall make such changes as are necessary to conform the hazardous materials regulations under parts 173 and 175 of title 49, Code of Federal Regulations, to this section. Such changes shall be made concurrently with the activities described in subsection (a).

(e) Stakeholder Input on Changes to the Hazardous Materials Regulations.--

- (1) Implementation.--Not later than 180 days of the date of enactment of this Act, the Secretary shall hold a public meeting to obtain input on changes necessary to implement this section.
- (2) Periodic updates.--The Secretary shall--
 - (A) periodically review, as necessary, amounts of hazardous materials allowed to be carried by unmanned aircraft systems pursuant to this section; and
 - (B) determine whether such amounts should be revised, based on operational and safety data, without negatively impacting overall aviation safety.

(f) Savings Clause.--Nothing in this section shall be

construed to--

(1) limit the authority of the Secretary, the Administrator, or the Administrator of the Pipeline and Hazardous Materials Safety Administration from implementing requirements to ensure the safe carriage of hazardous materials by aircraft; and

(2) confer upon the Administrator the authorities of the Administrator of the Pipeline and Hazardous Materials Safety Administration under part 175 of title 49, Code of Federal Regulations, and chapter 51 of title 49, United States Code.

(g) Definition of Hazardous Materials.--In this section, the term ``hazardous materials" has the meaning given such term in section 5102 of title 49, United States Code.

RESPONSE TO LAW COMMISSION CONSULTATION ON AVIATION AUTONOMY

(Law Commission Consultation Paper 261)

Please note that this consultation response has been reproduced from information entered on the Citizen Space online portal.

Any personal email addresses and phone numbers have been excluded from this document.

Unanswered questions have been deleted from this document.

About you

What is your name?

John Milner

Airworthiness and certification

Consultation Question 1

We seek views on how current airworthiness and certification regulation might need to be adapted or developed in light of highly automated and autonomous aircraft. In particular, should provisions be adopted which allow for:

1. the certification of optionally piloted and uncrewed or unoccupied versions of conventional aircraft (hybrid versions); and
2. the separate certification of command units?

Please share your views below

As far as airframes are concerned the model in use in General Aviation could probably be adapted. The LAA oversees some private light aircraft with Permit to Fly but anything with commercial potential for training or transport needs to have CAA certification.

Consultation Question 2

We welcome views on what changes to the certification system might be necessary to enable higher automation and autonomy in aviation.

Please share your views below

The key here is the manufacturer's development and testing processes and many likely manufacturers will already be properly certified as the technologies are already in use in some light aircraft. eg Cirrus and development is ongoing.

The more complex issue is to ensure that those installing and maintaining such equipment are properly trained and equipped with proper work practices and documentation. There is a chronic shortage of skilled engineers across the industry.

Consultation Question 3

We seek views on whether current regulatory tools to support the development of highly automated and autonomous aviation technologies are adequate.

Please share your views below

See above, the core infrastructure is in place, but it will need to be adapted and the lack of skilled resources addressed.

Rules of the air

Consultation Question 4

We seek views on how highly automated and autonomous aircraft should act in emergency scenarios. In particular:

1. should highly automated and autonomous aircraft be given the freedom to operate outside the rules of the air in emergency circumstances; or
2. should a comprehensive set of rules be developed for highly automated and autonomous aircraft in emergency situations.

Please share your views below

1. Creates a wholly unpredictable and ill-defined set of scenarios and is therefore to be treated with scepticism

2. Makes sense provided a default scenario can be safely predicted. If such craft are allowed into densely populated urban areas this becomes extremely difficult.

Consultation Question 5

We seek consultee views about what challenges remotely piloting an aircraft in an emergency scenario presents and how these might be addressed

Please share your views below

The critical issues are not greatly different to on board scenarios except that the pilot has "no skin in the game" and the psychological implications of that need to be carefully considered.

The pilot will need a level of situational awareness of the craft and its location and how that can be effectively achieved is currently far from clear.

Consultation Question 6

We seek consultees' views on whether the rules of the air relating to communication should be adapted for remotely piloted and autonomous aircraft.

Please share your views below

There is very little air to air communication and so the issue is about see and avoid in class G and the relationship with air traffic control within Class F upwards. I think the only realistic way forward on communications is to undertake some formal scenario planning with experienced ATCOs who are used to dealing with General Aviation traffic and then create rules based on the outcome.

Consultation Question 7

We ask for consultees' views on how the rules of the air might be adapted or developed for remotely piloted or autonomous flight

Please share your views below

See above answer to question 6.

VTOLs

Consultation Question 8

We provisionally propose that a person overseeing a VTOL flying automatically, who monitors its course and is able to intervene and change its course at any time should continue to be classified as a "remote pilot". Do you agree?

Yes

Please expand on your answer below

This not hugely different to flying light aircraft with 3 axis autopilot. The pilot is in effect monitoring the track and performance of the aircraft and can adjust the autopilot or take control as circumstances dictate.

One problem is that most autopilots have limits in terms of the turbulence they can cope with and will automatically disconnect in extreme conditions leaving control to

the pilot.

Some work on how such potential scenarios would be dealt with is going to be needed.

Consultation Question 9

We provisionally propose 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. Do you agree?

Yes

Please expand on your answer below

It is clearly not going to be acceptable to have people on board such a craft without a safety fall back capability and that necessarily implies that a remote pilot would carry similar responsibilities to an aircraft captain. Not a job I would seek and will be interesting to see who is willing to take on the role.

Consultation Question 10

We provisionally propose 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.

Do you agree? (Tick all that you agree with)

Please expand on your answer below

In practice many of these responsibilities are delegated to properly trained staff in manned CAT operations item 2 would need the ability to test systems remotely.

Consultation Question 11

We invite views as to whether there are additional operational responsibilities that a remote VTOL pilot should be required to fulfil.

Please share your views below

A key issue is to be able to ascertain that take off and landing can be managed safely and that is not feasible unless proper dedicated places are used. The obvious answer is to use existing GA airfields which have both space and infrastructure to be adapted to support these operations and then the VTOL commander can use them and operate safely.

Consultation Question 12

We provisionally propose that the remote pilot-in-command should be responsible for, amongst other things, ensuring passengers are:

1. given a safety briefing; and
2. seated and wear seat belts during take-off and landing

Do you agree?

Yes

Please expand on your answer below

While any pilot would be keen to do this the surveillance infrastructure and communication facilities and ground staff requirements need some careful thought. Passengers are notoriously helpless and stupid and systems are needed to cope with that unpalatable fact.

Consultation Question 13

We provisionally propose that air operators (rather than the remote pilot-in-command) should be responsible for preventing passengers from boarding:

1. who appear drunk or under the influence of drugs; or
2. whose carriage would, in the view of the operator's employees, endanger the safety of the aircraft or other passengers.

Do you agree?

Yes

Please expand on your answer below

Yes but PIC should still have the right to overrule ground crew.

Consultation Question 14

We provisionally propose that the remote pilot-in-command should have the power to take reasonable measures, including restraint of passengers, as set out in section 94 of the Civil Aviation Act 1982. Do you agree?

Yes

Please expand on your answer below

But the elephant in the room is how??? Are we expecting remote piloted aircraft to have cabin crew??

Consultation Question 15

We provisionally propose that a person on board a VTOL aircraft (other than a crew member) should be able to take reasonable measures to protect the safety of the aircraft or of persons or property on board. Do you agree?

Yes

Please expand on your answer below

No-one should have to hesitate in doing the right thing because of a perceived risk of liability....

Consultation Question 16

We seek views on whether the powers of crew on board a VTOL aircraft should be broadened to reflect those of the pilot-in-command under the Civil Aviation Act 1982 to:

1. take reasonable measures to protect the safety of the aircraft or persons or property on board;
2. maintain good order and discipline; or
3. enable the crew to disembark or deliver a person.

Please share your views below

Well clearly yes, why VTOL aircraft be any different from other aircraft in this respect.

The practicalities will be a whole different discussion and again there is a clear need

for some serious scenario planning if sensible practical ways of doing things are to be found.

Consultation Question 17

We provisionally propose that passengers should be able to contact a member of crew at all times during an operation. Do you agree?

Other

Please expand on your answer below

Nothing should be happening during take off and landing. There is then the question of why a passenger would need to contact crew and if we have cabin crew but no pilot that is frankly a bit bonkers.

So the assumption is that remote conversation is needed so communication kit will be needed on board how that is configured and used needs a great deal of thought....

Consultation Question 18

We provisionally propose 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. Do you agree?

Yes

Please expand on your answer below

There is little difference between a pilot and a remote pilot other than physical location....

Consultation Question 19

We provisionally propose that it should be a criminal offence for a person to act as the remote pilot of a VTOL when the level of alcohol in their blood, breath or urine is over a prescribed limit. Do you agree?

Yes

Please expand on your answer below

See question 18.

Consultation Question 20

We provisionally propose that the remote pilot should be subject to the reporting obligations currently applicable to pilots under the Air Operations Regulation. Do you agree?

Yes

Please expand on your answer below

See question 18.

Consultation Question 21

We provisionally propose that a remotely piloted VTOL should be required to be capable of detecting and recording information relating to accidents and near accidents for the purposes of reporting it. Do you agree?

Other

Please expand on your answer below

I see no reason to differentiate between VTOL and other aircraft in this respect, flight recording is evolving and VTOL should simply be part of that.

Consultation Question 22

We provisionally propose that licences should be required for remote VTOL pilots. So far as appropriate, these should follow the classes and ratings adopted for crewed VTOLs. Do you agree?

No

Please expand on your answer below

The operational procedures for remote pilots and pilots on board are significantly different and so while remote VTOL pilots must be properly trained and licenced a specific licencing and rating regime will be needed.

Consultation Question 23

We provisionally propose that operators of remotely piloted VTOL should be certified. Do you agree?

Yes

Consultation Question 24

We provisionally propose that operators of remotely piloted VTOLs should continue to be required to:

- ☒ (1) have the means necessary for the scale and scope of operations planned;
- ☒ (2) use only suitably qualified and trained personnel;
- ☒ (3) implement a management system to ensure safety;
- ☒ (4) ensure operations only take place in accordance with the operations manual;
- ☒ (5) establish procedures to minimise the consequences to safe flight operations of disruptive passenger behaviour;
- ☒ (6) develop and maintain security programmes suitable for the aircraft and type of operation;
- ☒ (7) have a management system to prevent fatigue.
- ☒ (8) ensure the continuing airworthiness of the aircraft; and.
- ☒ (9) establish procedures for any reasonably foreseeable emergency situation.

Do you agree? (tick all that you agree with)

Please expand on your answer below

This is all basic aviation operation and any aircraft operation needs to follow it. However some VTOL, especially unmanned VTOL, will be significantly different from what we have seen in other contexts. Once again I recommend some serious scenario planning to address that and achieve a sensible outcome.

Consultation Question 25

We seek views as to whether there are additional responsibilities that operators of remotely piloted VTOLs should need to fulfil.

Please share your views below

Operators must take responsibility for integrating with existing aviation operations and in particular how take off and approach and landing are to be managed remains largely unknown and doesn't appear to be considered in this consultation either.

Consultation Question 26

We seek views as to whether the law should permit remote pilots to act as pilot-in-command for more than one VTOL at the same time.

Please share your views below

Not unless some serious testing including exception and emergency management scenarios has been undertaken in remote military danger areas.

Consultation Question 27

We seek views as to whether there should be an upper limit to the number of VTOLs for which a remote pilot can act as pilot-in-command at the same time.

Please share your views below

One unless proper procedures are developed and tested and show otherwise...

Consultation Question 28

We seek views as to what additional safeguards should be introduced for remote pilots piloting multiple VTOLs.

Please share your views below

Not a question I can answer without knowledge of procedures and their testing.

Consultation Question 29

We seek views as to whether there should be a role for a person supervising the flight of an autonomous passenger-carrying VTOL and acting as a point of contact in relation to it. What powers or responsibilities should such a person have?

Please share your views below

The same as the captain of a manned aircraft as a minimum.

Consultation Question 30

Should the law permit an uncrewed VTOL to transition between remotely piloted and autonomous flight during an operation?

Other

Please expand on your answer below

Possibly! It may be practical to take a different approach to the various phases of a flight, take off, climb, cruise, approach, landing, but scenario planning and real world testing would be needed to make it possible.

Consultation Question 31

We seek views as to whether initial airworthiness standards for uncrewed VTOLs should include accessibility standards for persons with disabilities and reduced mobility.

Please share your views below

Optional standards would make sense, so that those developing machines have standards to work to. But they'll only be usable if there is ground crew available to assist in boarding and disembarkation, otherwise it's hard to see how it could work.

Consultation Question 32

We seek views as to whether the CAA should be able to include accessibility standards within the licences granted to uncrewed VTOL operators.

Please expand on your answer below

No that ought to be a commercial decision and it's by no means clear that all VTOL aircraft could be designed and built with accessible facilities.

Consultation Question 33

We seek consultees' views on any other issues with the current legal framework as it relates to operations involving autonomous VTOLs.

Please share your views below

It is noticeable that the consultation doesn't address some basic issues like where these craft will take off and land, how they will integrate with existing aviation traffic. While some knowledge can be transferred from helicopter operations the expectation is that VTOL will be different, but how different is by no means clear. I strongly recommend some professional scenario planning work is undertaken before this goes much further.

Civil liability and insurance

Consultation Question 44

We provisionally consider that the current law governing air carrier liability for injury or death of passengers in the UK is adequate for the introduction of remotely piloted and autonomous operations. Do you agree?

Yes

Please expand on your answer below

It's the overall operation not the craft or the location of its pilot that matters.

Consultation Question 45

We provisionally consider that the current law governing liability for damage to cargo in the UK is adequate for the introduction of remotely piloted and autonomous operations. Do you agree?

Yes

Consultation Question 46

We provisionally propose that liability for surface damage, in the case of UAS, should transfer to the lessee when the lease:

1. is for more than 14 days; and
2. specifies the aircraft is to be operated under the responsibility of the lessee.

Do you agree?

Yes

Consultation Question 47

We provisionally propose 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. Do you agree?

Yes

Consultation Question 49

We seek views as to whether the current law regarding liability for mid-air collisions is satisfactory in the case of collisions involving uncrewed aircraft systems.

Please share your views below

No-one knows the answer to this and some proper scenario planning is needed.

Consultation Question 50

We seek consultees' views on whether they expect any difficulties applying existing insurance requirements to uncrewed aircraft systems.

Please share your views below

I have no idea I think this is a question for underwriters surely??

Criminal liability

Consultation Question 52

We provisionally consider that the current approach in the Air Navigation Order 2016 placing criminal liability on an operator is adequate for autonomous operations.

Do you agree?

Yes

Consultation Question 53

We provisionally consider that the "reasonable care" defence in article 265(3) of the Air Navigation Order 2016 applies adequately for "direct contraventions" under Article 265(5) to (8) involving autonomous operations. Do you agree?

No

Please expand on your answer below

What constitutes reasonable care in the context of autonomous operations is very different from manned operations. Did the manufacturer do a proper job of designing and building the software? Did the operator follow procedures properly? it needs more work to look at the differences in context.

Consultation Question 55

We provisionally propose that a remote pilot of an uncrewed aircraft operating in the certified category should be treated as a pilot-in-command for the purposes of criminal liability pursuant to article 265(1) of the Air Navigation Order 2016. Do you agree?

Yes

Consultation Question 56

We ask for consultees' views on the criminal liability of pilots (or remote pilots) when an aircraft operating autonomously returns control to the pilot or vice-versa. In

particular, should a pilot (or remote pilot) only become criminally liable for the piloting of the aircraft at the end of a transition period?

Please share your views below

The answer is possibly, but more work is need to determine the context. How different is it from an autopilot switching off and handing control to the pilot or vice versa???

Consultation Question 57

We provisionally propose that the pilot-in-command of aircraft in a multiple simultaneous operation should be criminally liable for breach of operating requirements in the same way as a pilot in command of a single aircraft would be. Do you agree?

Other

Please expand on your answer below

This can't be answered until the practicality of remote piloting multiple machines has been addressed

16 May 2024

Many thanks for drawing my attention to your consultation paper 'Aviation Autonomy'. Before I share my comments and thoughts, may I take a moment to acknowledge an excellent piece of work. The autonomous aviation team successfully wrangled a broad swathe of material into a coherent and important whole.

As will become clear, I do not propose to answer each of the questions you have posed. That is partly a consequence of the way in which I think about things in general, but also of the concerns that I have long had about an overly prescriptive and inflexible legislative framework. The more prescriptive the legislative texts, the greater the premium placed on those texts, on those who write and scrutinise them (government departments and Parliament) and on those who apply and administer them (industry, consumers and regulators) keeping pace with or running ahead of technological and business technologies. Experience demonstrates this will not or is highly unlikely to happen. To my mind, we should do more to both *enable* regulatory activity by designing better mechanisms (for example identify, promulgate, implement, review and update standards when it is possible to do so but *without the need for specific legislation*), and to *articulate expectations* we have of those carrying out aviation activities.

Underlying approach to risk

The framework now in place reflects and captures decades of experience. It is important to remember that fact and to recognise that we need intentionally to allow new experience to feed through into the framework.

The framework calls for levels of safety that are higher than ever before. That is both a good thing and, potentially, problematic. Not only will the majority of citizens expect that those high standards are retained, but their retention may also encourage and stimulate the development of creative solutions. On the downside, however, too rigid an approach may crowd out opportunities to experiment.

I recall that in the recreational aviation sector the CAA developed the concept of 'safety standards acknowledgement and consent' in order to strike a particular balance of risk in certain cases: [SSAC](#). By the same token, the approach to risks attendant on space-related activity is different again. To my mind, it is worth considering whether a variegated approach would be suitable for different types of operation and to ensure that the framework caters for that without the need for primary or secondary legislation. Moreover, a focus on the operation as a whole, as opposed to a specific aircraft, equipment or flight, may better reflect the way in which technologies develop.

What are we regulating?

As I read it, the thrust of the consultation is at flight level – i.e. a given aircraft may (or may not) proceed with degrees of autonomous operation, provided it has been certified and is

operated safely. Is it not case, though, that no flight will be autonomous in the sense that a person (whether legal or human) will always decide that a flight is necessary or desirable? One might argue that an aircraft is always a means to an end and that the end is pursued at a point in time, by a particular organisation or person.

There may be, therefore, a different way of looking at the framework (or elements of it), such that its focus is further upstream. Can the 'operator' explain how its 'system' will operate and predict its operations to a sufficiently high standard? Can an 'operator' identify the input data upon which decisions will be based and the steps taken to assure its accuracy and availability? What programme(s) are in place to capture experience and inform future flights using that system? Is it possible to interrogate the data post hoc and interpolate the steps that led to a decision being taken to act (or not act) in a particular way? Might there be a case for fixing the 'operator' with all responsibilities and requiring the 'operator' to generate and maintain a statement of how their system is intended, expected to and does operate?

In respect of cyber security, the CAA developed the [ASSURE](#) model as a way of catering for the unique IT and security configurations used by a wide range of aviation companies and the difficulties of keeping up to date with industry and technology. Might a similar model, where the regulator works with approved organisations to generate as complete a picture as possible of an operator and its operations, be worth exploring in respect of increasingly automated and, potentially, autonomous flights? In the aviation safety arena some inspiration that can be taken from the existence of bodies such as the Light Aircraft Association ([LAA](#)) which carry out quasi-regulatory tasks alongside the CAA.

Over time, as has happened with 'traditional' aviation, it may be possible to distil knowledge into clear and specific sector-wide standards. Attempting to distil and specify sector-wide too soon may be counter-productive, however. I wonder whether we need to be comfortable with an approach that is tailor made to the operation and operator before we can move to an off the peg system. If so, it would be necessary to oblige the regulator to establish principles and ways of working that offer fairness to all sector participants and to re-set expectations more broadly. In place of regulatory transactions, we would need to focus on regulatory relationships and identify means of demonstrating trustworthiness.

AI offers opportunities and presents challenges in many areas and looking horizontally may yield insights of value in the aviation context. The ICO is already active in this area ([Regulating AI](#)) and there is merit in drawing on inputs and insight from other sectors too.

Other points that have occurred to me

- I always have in mind the following question: why does legislation need to be detailed? Too much detail and specificity may limit choices about how to deliver an outcome, which may in turn be less effective in securing those outcomes and less efficient in their delivery. Too much detail also makes it more difficult to keep the framework up to date.
- The questions in 5.59 are both legal propositions and design parameters.
 - If parameters can be identified in advance and programmed that is a 'good thing'. (I would question whether they also need to be legal rules.) A 'better thing' would be to permit an aircraft to take what is considered to be the safer/safest course of action in the specific circumstances, even if what it does is considered extraordinary.

- It might be possible to identify a range of control/design inputs or commands (such as, for example, 'never fly below 6ft') and for their legal equivalent to be a provision that is expressed at a much more general level, such as the 'endangering' provision in art 240 of the ANO 2016.
- The point above emphasises the difficulty of seeking to arrive at a new framework in one leap; if we allow for waves of development and differentiated regulatory decisions, we may get to a tidy end point eventually and that point may resemble the point we currently have. To do that, however, we need a number of different routes and need different mechanisms to get there.
- As regards communication, its purpose is to enable the exchange of salient information. That will be the case even without a pilot on board. Again, the design parameter/legal requirements duality (see comment above) is to the fore. Self-evidently we need the ability to communicate, but do we need to specify in law that it must be with a human on the aircraft as opposed to a human outside it, or the AI interface?
- If we are drawing up a 'rule set' for autonomous aircraft, it would be helpful to drill down into the reasons underlying the provision that governs crewed flight and then express that at a higher level of generality, such that it becomes a design principle to be achieved by an operator.
- In an autonomous or remote future, it could be helpful to separate an activity from the individual who currently performs it. It may be possible to unbundle processes so that they are performed by a team of individuals with different, bounded responsibilities. The question may, therefore, be about more than one person. To replace one in situ pilot with another remote pilot may crowd out opportunity. Conceivably, taking an approach that focuses on entity rather than individual person, flight or task may enable swifter development in the short-term and be a foundation for a comprehensive code in the longer term.
- An accountable person style regime may be a means by which to secure good performance both at operation and flight level. To the extent that an individual misbehaves intentionally or by being grossly negligent they would 'endanger' others and could be exposed to criminal liability. To the extent that the 'system' is flawed by creating circumstances that allow the individual to do so then the entity would be in the frame for some form of regulatory response.
- Instead of using legislation to prescribe the limits etc (e.g. upper limit on the number of VTOLs) it would be preferable to use legislation to create the *mechanism* by which a limit may be proposed, be subject to consultation and appropriate accountability, and then specified by the regulator, whether for a specific case or more generally.
- It is not clear to me why it is thought necessary to require a human being to be responsible for being a pilot, whether remote or otherwise. This goes to the purpose of the rule: is it a risk allocation mechanism or is it considered that the mere existence of the rule has an impact on an individual and so drives behaviour. If the latter, how is that achieved? Or, to put it another way, if the only reason there is a pilot is because the law says so, the presence of the pilot is not determinative of the safety of the flight.

- It might be easier to cater for a transition from one type of flight to another ('traditional' to autonomous) if you locate the regulatory point of focus away from the individual and individual flight to the entity organising the flight.
- On the question of PRMs and accessibility, an approach worth considering is a version of 'comply or explain'. In place of prescriptive standards that assume future demand will mimic current demand we could require manufacturers and operators to explain the design/configuration choices they make, thus allowing investors to choose whether to invest in a product or service that may not have a mass market appeal, and which may, in the longer term, have less value in an ageing and less mobile society.
- On the broader question of liabilities (e.g. product liability) we need to consider what policies the law is intended to enable or deliver. With the benefit of hindsight perhaps, different policy settlements are evident in the various passenger liability conventions. Striking a balance between innovation on the one hand and protection for third parties and uninformed users on the other argues for channelling liability in some way.
- As regards collisions, the key thing is to enable data to be interrogated for conclusions to be drawn. Liability can be determined only on that basis and, provided there is some degree of channelling to ease the burden on consumers or third parties, it is not clear that specific provision is required.
- As regards dangerous goods, on the assumption that no aircraft will take off entirely without the involvement of a human entity, it makes sense to place the obligation on the entity deploying the autonomous vehicle to notify agencies.

Thank you again for having produced such a significant and thoughtful consultation paper. If there is anything else I can do to assist you please let me know.

Yours sincerely

Kate Staples



Kennedys response: Law Commission consultation on aviation autonomy

July 2024

About Kennedys

Kennedys is a global law firm with expertise in dispute resolution and advisory services. With over 2,750 people and 75 offices around the world, we are a fresh-thinking firm willing to bring new ideas to the table beyond the traditional realm of legal services.

Our global team of market leading aviation specialists have experience of operations, aero engine issues, reservation and IT systems, ensuring they are well equipped to understand the commercial aims and challenges facing the industry.

Executive summary

We welcome the Law Commission’s detailed consultation on automation in aviation. Review and adaptation of the legislative and regulatory framework is fundamental to the safe deployment of autonomous aviation systems.

Key areas to be included in the updated regulatory framework include:

- Mandatory use of flight data recorder systems or devices for all autonomous drone operations.
- Provisions to allow the sharing of anonymised data collected from flight data recording systems with authorised, registered stakeholders.
- We remain of the view that there should be a review of the CPA to take account of the challenges of emerging technologies, but we do not consider that such a review should be confined to aviation or automated vehicles.

Please note that we have limited our response to the following questions: 37; 41; 44; 45; 48; 50; & 51.

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What is your telephone number?

[REDACTED]

If you want the information that you provide in response to this consultation to be treated as confidential, please explain to us why you regard the information as confidential. As explained in our privacy notice, we will take full account of your explanation but cannot give an assurance that confidentiality can be maintained in all circumstances.

N/A

Questions and responses

Consultation Question 37.

11.37 We seek views on what operational requirements should be applied to autonomous drone operations and drones that operate beyond visual line of sight in the specific and certified categories.

Answer

At present, drones in the ‘certified category’ cover operations that present an equivalent risk to that of manned aviation. As a result, operators of drones in the ‘certified category’ are restricted by the requirement to comply with the same regulatory regimes as operators of manned aircraft. These operational requirements include the certification of the Uncrewed Aircraft Systems (UAS) and the operator and, where applicable, the licensing of the remote pilot.

Operations fall into this certified category if they involve an aircraft of over 3m in size, or if they carry people or high-risk dangerous goods. In order to ensure the current requirements are proportionate, clear definitions will be required around what cargo is considered as “dangerous goods” in the context of drone transport. Consideration should be given to the nature of the item, its weight, and whether the planned BVLOS route could give rise to additional risk.

Consultation Question 41.

11.41 We provisionally propose that use of flight data recorder systems or devices should be mandatory for autonomous drone operations.

Do you agree?

Answer

Yes. We agree with the mandatory use of flight data recorder systems for autonomous drone operations, and we are strongly of the opinion that the data collected is available to authorised, registered stakeholders.

As set out in our response to the Civil Aviation Authority’s consultation in January 2024, there are many benefits of sharing anonymised Flight Information and Notification System (FINS) data. This will greatly assist the monitoring and responding to the needs of UAS users intending to fly BVLOS. We consider this should be introduced in conjunction with the implementation of mandatory insurance for such routine flights.

The risk of potential claims - whether third party claims or hull claims - are likely to increase significantly with routine UAS BVLOS flights. The data captured by the FINS technology will be of the upmost importance to insurers pricing these evolving risks. This data will also help inform the government and the CAA when reviewing and updating existing legislation and regulations.

While we are strongly in favour of anonymised data being widely available and mandatory as proposed, the use of flight data recorder system devices for autonomous drone operations should be implemented in such a way that there is minimum burden on commercial operators operating BVLOS. For example, by making it mandatory for UAS intended to operate BVLOS to have inbuilt tracking systems that record the flight path (including position, altitude and direction of travel) of the UAS, which has a memory feature to download data when required.

Consultation Question 44.

11.44 We provisionally consider that the current law governing air carrier liability for injury or death of passengers in the UK is adequate for the introduction of remotely piloted and autonomous operations.

Do you agree?

Answer

In the case of drones carrying passengers, we consider that the application of Article 17 of the Montreal Convention 1999 would be adequate to govern liability for injury and death.

However, the definition of a carrier under the Montreal Convention would need to extend to include the remote pilots of the drone vehicle that carries passengers for liability to attach.

Consultation Question 45.

11.45 We provisionally consider that the current law governing liability for damage to cargo in the UK is adequate for the introduction of remotely piloted and autonomous operations.

Do you agree?

Answer

We partially agree that the current law is adequate for these purposes.

Liability for damage to cargo in the UK is governed by Article 18 of the Montreal Convention 1999. This establishes that the carrier will be liable for damage sustained in the event of the destruction, or loss of, or damage to, cargo upon condition only that the event which caused the destruction, loss or damage took place during the carriage by air. Subsection 4 sets out that the carriage by air does not extend to any carriage by land, by sea, or by inland waterway performed outside of an airport.

Imposing the need for carriers to provide an airway bill reference for performance of contract for carriage by air for the purpose of delivery, would ensure that the current laws governing liability for damage to cargo apply to drone operations.

Consultation Question 48.

11.48 We provisionally propose that there should be a review of product liability law (including the Consumer Protection Act 1987) to take account of the challenges of emerging technologies. The review should cover product liability as a whole, rather than be confined to aviation or automated vehicles.

Do you agree?

Answer

In summary:

- We consider that there are compelling grounds to conduct such a review, particularly given the new Product Liability Directive (PLD) in the EU which is expected to come into force this year.
- We do not consider that such a review should be confined to aviation or automated vehicles.
- The UK should, however, consider carefully how closely to follow reforms enacted by the EU if that is taken as a starting point for updating the current framework.

At Appendix A, we recap our input on other recent and relevant proposals.

We are of the view that there should be a review of the Consumer Protection Act 1987 (CPA) to take account of the challenges of emerging technologies. As innovative and emerging technologies continue to advance at pace, we do not consider that such a review should be confined to aviation or automated vehicles, given that:

- The no-fault liability regime provided for by the CPA was always designed to apply to a wide range of consumer products, from vehicles and smart phones, to toys and medical devices. Many of these products now encompass similar innovative technologies, such as standalone software and automated decision making technologies. For example, the technology used in AI-enabled autonomous robots can be used in various domains¹, such as autonomous vehicles, medical robotics and agricultural robotics.
- The risks and challenges of these technologies, and the complexities arising from the application of the CPA to intangibles such as software and automated decision making, as well as identifying the potentially liable entities, will apply across all lines of consumer products that encompass these technologies. It would therefore be appropriate to conduct a broader review of the regime under the CPA. Confining a review of the product liability regime to aviation and autonomous vehicles risks a possibly unnecessarily complex or fragmented approach.

In respect of any future review of the CPA, we make the following observations:

¹ https://www.researchgate.net/publication/372589771_ARTIFICIAL_INTELLIGENCE_IN_ROBOTICS_FROM_AUTOMATION_TO_AUTONOMOUS_SYSTEMS

- The flexibility of the existing regime, including the test for ‘defect’ (discussed below) enables the regime to apply to different types of products and therefore it is already, to a large extent, adaptable to scientific and technological developments.
 - There is, however, legal uncertainty as to whether innovative, intangible technologies such as standalone software (including AI) fall within the current CPA definition of “product”, or whether such technologies are considered a “service” and therefore fall outside the scope of the existing regime. Extending the scope of the definition of ‘product’ to include standalone software would be one approach to provide clarity on whether such technologies fall within the scope of the UK regime.
 - An expansion of the definition of ‘product’ to include standalone software and automated products would logically lead the Law Commission to consider what entities can be held liable under the UK regime, including providers of software and digital services.
 - We see no real attraction to substantive reform of the basic legal test to establish defect, as provided for under Section 3 of the CPA. Section 3 requires the court to examine whether “*the safety of the product is not such as persons generally are entitled to expect*”.
- The UK Courts have applied extensive judicial scrutiny to this test (in the difficult context of medical devices) with recent significant High Court rulings in [Wilkes v DePuy International Ltd](#) [2016], [Gee & Others v DePuy International Ltd](#) [2018] and in the UK Supreme Court decision in [Hastings v Finsbury Orthopaedics Ltd & DePuy International Ltd](#) [2022].
 - It is now well-established in English jurisprudence that the test is an objective test and asks what persons generally (i.e. the public at large) are entitled to expect, and not what the individual claimant actually expected, having regard to all of the circumstances that the court considers factually and legally relevant to the evaluation of safety. It is a flexible test and the courts are required to maintain a flexible approach to the appropriate level of safety, including which circumstances are relevant, and the weight to be given to each, subject to the particular facts of the case.

The basic operation of a no-fault regime is well established and aims to maintain a fair balance between the interests of consumers and producers - ensuring consumer protection whilst safeguarding innovation.

Enhancing consumer protection has been widely accepted as a welcome goal of legal reform in many areas of life in recent decades. It is nevertheless important from the perspective of many of those for whom we frequently act that any review of the CPA considers carefully the impact of reform on innovation, particularly for businesses operating in the technology sphere. The US Chamber of Commerce previously urged that caution should be exercised in respect of the new PLD, noting that it could discourage US businesses looking to expand operations abroad or established companies that want to invest more resources in EU Member States².

² <https://instituteforlegalreform.com/blog/flawed-revision-to-the-product-liability-directive/>

In a post-Brexit era, it is likely to be an ambition of all UK governments that investors and producers should not be discouraged from developing, producing and supplying innovative technologies in the UK for fear of increased litigation. The litigation landscape in the UK already has established group action mechanisms and widely available third party litigation funding and any discussion of reform should be undertaken with that reality in mind.

Consultation Question 50.

11.50 We seek consultees' views on whether they expect any difficulties applying existing insurance requirements to uncrewed aircraft systems.

Answer

Currently, the insurance requirements depend on purpose of use. If the drone is used for recreation, sport or as a hobby, insurance is not mandatory. Operators flying drones for these purposes could be held liable for any injury or damages caused and do not need to have insurance in place to respond to these claims.

If a drone is flown for any other reason (such as commercial operations), the CAA requires operators to hold third party insurance which includes public liability and complies with EC Regulation 785/2004 (the Regulation). The Regulation applies to general, manned aviation risks.

In the case of cargo, the Regulation imposes a minimum insurance cover of 1,000 SDR per kilogram in commercial operations. We are of the view this would adequately apply to commercial drone operations.

The minimum insurance coverage requirements under the Regulation in respect of liability to third parties is governed by Article 7. Drones issued with a certificate of airworthiness, within which the maximum take off mass will be identified, will need to hold a minimum level of insurance that corresponds with the SDRs set out in Article 7, which is dependent on maximum take off mass of the UAS in kilograms. This is due to the fact that the weight of the UAS may not adequately reflect the risk exposure from swarm operations and, therefore, this would not be a sufficient measure for the level of insurance required (see answer to Question 51).

Accordingly, we do not anticipate difficulties in applying the existing insurance requirements to commercial drones, although the sharing of FINS data will help insurers to accurately price and assess operational risks as use increases.

With regards to non-commercial use of drones, we believe that insurance should remain a discretionary commercial risk that the owner can choose to carry themselves. To enforce mandatory insurance on non-commercial operators of drones would be onerous to consumers, and also onerous to enforce and police.

Consultation Question 51.

11.51 We provisionally propose that multiple simultaneous operations should be considered as the Government develops proposals for the insurance requirements applicable to uncrewed aircraft.

Do you agree?

Answer

Yes, we agree that insurance requirements for multiple simultaneous operations, also called “drone swarms” should be considered carefully.

At present, the extent of insurance requirements is largely dependent on the maximum take-off mass of the individual UAS, with that being used as a proxy for the risk of its operation. However, consideration of other elements such as the flight path taken and purpose of the operation will also need to be considered.

The weight of the drone (or total weight of “drone swarms”) may not adequately reflect the risk exposure from swarm operations and, therefore, this would not be a sufficient measure for the level of insurance required.

Furthermore, it is likely that as technology develops, the weight of drones may decrease, but be used for the same operational purpose; this highlights an example where a decrease in weight is unlikely to have any effect on risk during operation. This is also an example of where sharing of data captured by the FINS technology in drone swarms specifically will be important to insurers pricing such risks.

Appendix A

Question 48

Automated vehicles (AVs)

The Law Commission's proposal for a review of product liability law (including the CPA) follows:

- (i) a review of the law relating to automated vehicles that included three consultations conducted between 2018 and 2020; and
- (ii) a 2021 consultation on possible themes for the proposed 14th Programme of Law Reform.

In February 2019, Kennedys submitted a response to the Joint Preliminary Consultation Paper on Automated Vehicles (published in 2018). In response to the question, *"Is there a need to review the way in which product liability under the Consumer Protection Act 1987 applies to defective software installed into automated vehicles"*, we agreed that there was such a need, noting that *"questions arise as to whether the software technology supplied to an automated vehicle (a non-physical product) is a product in its own right to part of the vehicle product as a whole"*. We also noted that further complexities arose from the inevitable use of over-the-air software updates that would update the software in AVs remotely.

In March 2021, we responded to the Law Commission's Automated Vehicles Consultation Paper 3 (CP3) published in December 2020. In response to the provisional proposal that *"(1) product liability law should be reviewed to take account of the challenges of emerging technologies; and (2) any review should cover product liability as a whole, rather than be confined to automated vehicles; it should not therefore form part of this project on automated vehicles"*, we agreed that product liability law should be reviewed to take account of the challenges of emerging technologies and that the review should cover product liability as a whole, rather than be confined to AVs.

The CP3 Analysis of Responses noted that *"most people agreed that product liability law should be reviewed as whole, rather than specifically AVs"*, and that *"Consultees pointed to many difficult issues in how product liability law applied to new technologies. However, those who agreed with the proposal thought it was important to keep consistency between AVs and other consumer products"*.

On 26 January 2022, having considered over 400 responses received, the Law Commission published a joint report with the Scottish Law Commission with recommendations for legal reform. The report included a Recommendation (Recommendation 71 at paragraph 13.34) that *"the UK Government should review product liability law (including the Consumer Protection Act 1987) to take account of the challenges of emerging technologies. The review should cover product liability as a whole, rather than be confined to automated vehicles"*.

The Law Commission's proposed 14th Programme of Law Reform

"Product liability and emerging technology" was identified as a possible theme for the Law Commission's proposed 14th Programme of Law Reform. Specifically, it raised the question as to whether *"the strict liability product regime"* should be extended to cover all software and other

technological developments. The Law Commission has extended the timetable for finalising the 14th Programme due to its engagement with existing projects.

It is important to note that the Law Commission’s reference to “*the strict liability product regime*” risks being misconstrued. For clarity, the CPA, which transposed the current EU PLD [85/374/EEC] into UK law, imposes strict liability for *defective* products (often described as ‘no fault liability’) which have caused injury or damage to private property. There is not a “strict liability product regime” per se.

The Office for Product Safety and Standards

The Law Commission will be aware that the Office for Product Safety and Standards has also consulted on reviewing the civil product liability regime in light of technological developments, as part of its August 2023 consultation on “*Smarter Regulation: UK Product Safety Review*”.

The new EU Product Liability Directive

The Law Commission will be aware of the EU’s reform of the PLD [85/374/EEC], the current directive, which was transposed into UK law by the CPA, and which remains the basis for the UK regime following our departure from the EU. The new PLD is expected to come into force in 2024, followed by a two-year implementation period.

The new PLD includes:

- An expanded definition of “product”, bringing digital manufacturing files, software, including AI, and AI-enabled goods within scope of the ‘no-fault’ regime³. Free and open-source software that is developed or supplied outside the course of a commercial activity is not covered. The new regime will therefore clearly include products such as autonomous vehicles and AI-enabled smart assistants.
- New circumstances that may be taken into consideration when looking at whether a product is defective. These include the effect on a product’s safety of its ability to learn or acquire new features after it is placed on the market or put into service, and where a product does not fulfil safety-relevant cybersecurity requirements⁴.
- Expansion of the potential defendants who might be liable under the new PLD⁵. Providers of software and digital services, will potentially be liable for defective products.
- An expanded definition of “damage” to include the destruction or irreversible corruption of data and medically recognised damage to psychological health⁶.
- An alleviation of the burden of proof for claimants under certain circumstances⁷:
 - Under the new PLD, there will be a rebuttable presumption of defect if:

³ [Article 4](#)

⁴ [Article 7](#)

⁵ [Article 8](#)

⁶ [Article 6](#)

⁷ [Article 10](#)

- (i) the defendant has failed to disclose relevant evidence;
- (ii) the claimant demonstrates that the defendant has not complied with mandatory safety requirements, as set out in EU or national law, that are intended to protect against the risk of the damage suffered by the injured person; and
- (iii) the claimant demonstrates that the damage was caused by an “*obvious malfunction of the product during reasonably foreseeable use or under ordinary circumstances*”.

If a defect is established, and if the damage caused is of a kind “typically consistent” with the defect, a causal link will be presumed.

- There will also be a rebuttable presumption of defect and/or causation if:
 - (i) notwithstanding the defendant’s disclosure, and having regard to all of the relevant circumstances of the case, it would be excessively difficult for the claimant, in particular due to the technical or scientific complexity of the case, to prove the product is defective, and/or causation; and
 - (ii) the claimant proves that it is “likely” that the product is defective and/or the defect is a “likely” cause of the damage.

Legal and industry bodies have expressed concern that the provisions of the new PLD, particularly those relating to the alleviation of the burden of proof, are likely to encourage increased litigation, resulting in an increased volume and value of claims. For example:

- On 20 October 2023, prior to the EU trilogue negotiations, several industry bodies, including MedTech Europe and Insurance Europe, expressed their concern about the lack of balance in the proposed PLD revision and that the impact of the changes will significantly raise litigation risk, legal complexity and uncertainty for European businesses. Their statement can be read [here](#).
- On 20 December 2023, MedTech Europe issued a statement on the political agreement reached on the revised PLD, which can be read [here](#). The statement sets out their concerns that the newly introduced rebuttable presumptions of defect and/or causation may lead to an increased volume of legal claims, resulting in higher insurance costs, dampening innovation and putting smaller companies at risk.

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RESPONSE TO LAW COMMISSION CONSULTATION ON AVIATION AUTONOMY

(Law Commission Consultation Paper 261)

Please note that this consultation response has been reproduced from information entered on the Citizen Space online portal.

Any personal email addresses and phone numbers have been excluded from this document.

Unanswered questions have been deleted from this document.

About you

What is the name of your organisation?

Light Aircraft Association

Airworthiness and certification

Consultation Question 1

We seek views on how current airworthiness and certification regulation might need to be adapted or developed in light of highly automated and autonomous aircraft. In particular, should provisions be adopted which allow for:

1. the certification of optionally piloted and uncrewed or unoccupied versions of conventional aircraft (hybrid versions); and
2. the separate certification of command units?

Please share your views below

1. Yes

2. Yes

Pilots should be certified in the same system as manned aviation using the relevant subjects and so that they develop an understanding of all forms of aviation operating in the same environment

Command centres should be assessed for their design, integrity and capabilities to operate as intended and certified for their level of capability. The operating philosophy and the response time and actions in an emergency being critical to ensure safety of flight.

Consultation Question 2

We welcome views on what changes to the certification system might be necessary to enable higher automation and autonomy in aviation.

Please share your views below

Pilot certification as in 1 above should mirror the relevant parts / syllabus of licensing / certification for manned flight

Consultation Question 3

We seek views on whether current regulatory tools to support the development of highly automated and autonomous aviation technologies are adequate.

Please share your views below

No, they do not.
The airworthiness, initial and continuing, and the piloting of uncrewed operations whether passenger carrying or not should be brought into a similar system as manned flight and with the necessary engineering capability and experience.

Rules of the air

Consultation Question 4

We seek views on how highly automated and autonomous aircraft should act in emergency scenarios. In particular:

1. should highly automated and autonomous aircraft be given the freedom to operate outside the rules of the air in emergency circumstances; or
2. should a comprehensive set of rules be developed for highly automated and autonomous aircraft in emergency situations.

Please share your views below

1/ No – Automated / autonomous aircraft must operate in a predictable and consistent manner in an emergency situation.
2/ Autonomous etc system should comply with a common set of rules to manned aviation but automatically

To do otherwise would be to damage the existing safety culture and systems that have been developed over time and significant experience not to mention accidents.

Consultation Question 5

We seek consultee views about what challenges remotely piloting an aircraft in an emergency scenario presents and how these might be addressed

Please share your views below

The development and implementation of a consistent and automatically deployable set of rules-based actions, and the communication in an emergency scenario is the challenge for a UAV to UAV incident in particular, where it may be a dense operation with high ground risk, as it is manned to UAV where manned aviation most probably cannot take action through being unsighted.
The safety of manned aviation must not be negatively impacted.

Consultation Question 6

We seek consultees' views on whether the rules of the air relating to communication should be adapted for remotely piloted and autonomous aircraft.

Please share your views below

Probably but too early to be definitive

Consultation Question 7

We ask for consultees' views on how the rules of the air might be adapted or developed for remotely piloted or autonomous flight

Please share your views below

The responsibilities of PIC must be consistent with manned aviation.
Airworthiness must also be consistent
Too early to be definitive on the remainder

VTOLs

Consultation Question 8

We provisionally propose that a person overseeing a VTOL flying automatically, who monitors its course and is able to intervene and change its course at any time should continue to be classified as a "remote pilot". Do you agree?

Yes

Consultation Question 9

We provisionally propose 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. Do you agree?

Yes

Consultation Question 10

We provisionally propose 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.

Do you agree? (Tick all that you agree with)

Please expand on your answer below

Yes, PIC should be consistent across all forms of aviation

Consultation Question 11

We invite views as to whether there are additional operational responsibilities that a remote VTOL pilot should be required to fulfil.

Please share your views below

The "remote" aspect makes PIC Compliance difficult

Consultation Question 12

We provisionally propose that the remote pilot-in-command should be responsible for, amongst other things, ensuring passengers are:

1. given a safety briefing; and
2. seated and wear seat belts during take-off and landing

Do you agree?

Yes

Please expand on your answer below

PIC responsibilities must be consistent

Consultation Question 13

We provisionally propose that air operators (rather than the remote pilot-in-command) should be responsible for preventing passengers from boarding:

3. who appear drunk or under the influence of drugs; or
4. whose carriage would, in the view of the operator's employees, endanger the safety of the aircraft or other passengers.

Do you agree?

Yes

Please expand on your answer below

for consistency

Consultation Question 14

We provisionally propose that the remote pilot-in-command should have the power to take reasonable measures, including restraint of passengers, as set out in section 94 of the Civil Aviation Act 1982. Do you agree?

Yes

Please expand on your answer below

Though how that would work in practice is far from clear. Prevention better than later solution.

Consultation Question 15

We provisionally propose that a person on board a VTOL aircraft (other than a crew member) should be able to take reasonable measures to protect the safety of the aircraft or of persons or property on board. Do you agree?

Other

Please expand on your answer below

It is not clear from the proposals who such a person or persons would be; what authority they would have and how this would relate to the responsibilities proposed elsewhere in respect of the PIC for the flight.

Consultation Question 16

We seek views on whether the powers of crew on board a VTOL aircraft should be broadened to reflect those of the pilot-in-command under the Civil Aviation Act 1982 to:

1. take reasonable measures to protect the safety of the aircraft or persons or property on board;
2. maintain good order and discipline; or
3. enable the crew to disembark or deliver a person.

Please share your views below

Yes - but such crew need to be appropriately qualified and trained.

Consultation Question 17

We provisionally propose that passengers should be able to contact a member of crew at all times during an operation. Do you agree?

Yes

Please expand on your answer below

Common sense. Would be expected by passenger and necessary if one objective is to build confidence of public in such operations

Consultation Question 18

We provisionally propose 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. Do you agree?

Yes

Please expand on your answer below

Yes – consistency in PIC licensing requirements and responsibilities

Consultation Question 19

We provisionally propose that it should be a criminal offence for a person to act as the remote pilot of a VTOL when the level of alcohol in their blood, breath or urine is over a prescribed limit. Do you agree?

Yes

Please expand on your answer below

Yes – consistency in PIC licensing requirements and responsibilities

Consultation Question 20

We provisionally propose that the remote pilot should be subject to the reporting obligations currently applicable to pilots under the Air Operations Regulation. Do you agree?

Yes

Please expand on your answer below

Yes – consistency in PIC licensing requirements and responsibilities

Consultation Question 21

We provisionally propose that a remotely piloted VTOL should be required to be capable of detecting and recording information relating to accidents and near accidents for the purposes of reporting it. Do you agree?

Yes

Please expand on your answer below

Yes. Flights and actions must be data logged and secured from tampering

Consultation Question 22

We provisionally propose that licences should be required for remote VTOL pilots. So far as appropriate, these should follow the classes and ratings adopted for crewed VTOLs. Do you agree?

Yes

Please expand on your answer below

Yes – consistency in PIC licensing requirements and responsibilities between manned and unmanned inc CPL, ATPL and IFR ratings with an appropriate syllabus

Consultation Question 23

We provisionally propose that operators of remotely piloted VTOL should be certified. Do you agree?

Yes

Please expand on your answer below

Yes – consistency in PIC licensing requirements and responsibilities between manned and unmanned inc CPL, ATPL and IFR ratings with an appropriate syllabus

Consultation Question 24

We provisionally propose that operators of remotely piloted VTOLs should continue to be required to:

- ☐ (1) have the means necessary for the scale and scope of operations planned;
- ☒ (2) use only suitably qualified and trained personnel;
- ☒ (3) implement a management system to ensure safety;
- ☒ (4) ensure operations only take place in accordance with the operations manual;
- ☒ (5) establish procedures to minimise the consequences to safe flight operations of disruptive passenger behaviour;
- ☒ (6) develop and maintain security programmes suitable for the aircraft and type of operation;
- ☒ (7) have a management system to prevent fatigue.
- ☒ (8) ensure the continuing airworthiness of the aircraft; and.
- ☒ (9) establish procedures for any reasonably foreseeable emergency situation.

Do you agree? (tick all that you agree with)

Please expand on your answer below

Yes 1 to 9. And consistent with manned aviation operation

Consultation Question 25

We seek views as to whether there are additional responsibilities that operators of remotely piloted VTOLs should need to fulfil.

Please share your views below

The remote aspect is a challenge for operators to deliver their responsibilities which will require thought and development.

Consultation Question 26

We seek views as to whether the law should permit remote pilots to act as pilot-in-command for more than one VTOL at the same time.

Please share your views below

Perhaps though concerns as to the practicalities and how appropriate levels of safety can be assured. Further development required before definitive comment

Consultation Question 28

We seek views as to what additional safeguards should be introduced for remote pilots piloting multiple VTOLs.

Please share your views below

It should depend on the operating procedures and training for the type of flights being operated and for the operator to demonstrate the capability in various scenarios. As is common in other transport industries.

Consultation Question 29

We seek views as to whether there should be a role for a person supervising the flight of an autonomous passenger-carrying VTOL and acting as a point of contact in relation to it. What powers or responsibilities should such a person have?

Please share your views below

The PIC should be the contact for flight related matters. "Customer service" or liaison is a different matter that could be delegated provided PIC informed and agreed.

Consultation Question 30

Should the law permit an uncrewed VTOL to transition between remotely piloted and autonomous flight during an operation?

Yes

Please expand on your answer below

Yes. If done in a consistent manner and according to operating procedure

Consultation Question 33

We seek consultees' views on any other issues with the current legal framework as it relates to operations involving autonomous VTOLs.

Please share your views below

It can only deal with generalities at present (though commenting and not being a lawyer) and the law requires to be updated to deal with the specifics due to the nature of unmanned / autonomous aviation and the need to ensure the responsibilities as well as the liabilities are carried in the same way as the rest of aviation.

Drones

Consultation Question 34

We provisionally propose that a remote pilot for drones should continue to be defined as "a natural person responsible for safely conducting the flight of an unmanned aircraft by operating its flight controls, either manually or, when the unmanned aircraft flies automatically, by monitoring its course and remaining able to intervene and change its course at any time". Do you agree?

Yes

Please expand on your answer below

Yes – consistency in PIC licensing and responsibilities between manned and unmanned

Consultation Question 35

We seek views on whether some low risk autonomous drone operations or drone operations conducted beyond visual line of sight might be accommodated in the open category. In particular:

- (1) whether there are any such use cases which might be suitable for the open category; and
- (2) if so, what conditions should be attached to these use cases if operated in the open category.

Please share your views below

Yes = potentially. for example, when the UAV is operating within a limited envelope around infrastructure controlled by and for the purposes of the infrastructure owner /

operator. Linear inspection of cables and rail track for example. And where the rest of aviation is not able to operate.
But the safety of the rest of aviation must not be negatively impacted.

Consultation Question 36

We provisionally propose that for autonomous operations in the specific category, a UAS 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 manned 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.

Do you agree? (tick all that you agree with)

Consultation Question 37

We seek views on what operational requirements should be applied to autonomous drone operations and drones that operate beyond visual line of sight in the specific and certified categories.

Please share your views below

Detect and particularly avoid, technology appears to be key. They UAV operation must not negatively impact manned / other forms of aviation and must comply with a common set of rules of the air.

Consultation Question 38

We seek views on whether the current concept of a "remote pilot" is compatible with drone MSO. We also seek views on whether the remote pilots of drone MSO should continue to be subject to the same responsibilities as remote pilots for single drone operations.

Please share your views below

MSO should continue to be subject to the same responsibilities as remote pilots for single drone operations.

The capabilities and necessary infrastructure to support MSO are different and so the qualification / licensing and experience should support that before the responsibility can be placed appropriately.

Consultation Question 39

We seek views on whether there should be an upper limit to the number of drones for which an individual remote pilot is responsible.

Please share your views below

Probably yes but experience and developing systems will only show that in time. The numbers must not increase risks for other forms of aviation or for those on the ground.

Consultation Question 40

We seek views as to what additional safeguards should be introduced for remote pilots responsible for multiple drones.

Please share your views below

Experience, training, operating capability assessment and operating procedures must be pre-qualified.

Consultation Question 41

We provisionally propose that use of flight data recorder systems or devices should be mandatory for autonomous drone operations. Do you agree?

Yes

Please expand on your answer below

and tamper proof.

Consultation Question 42

Should the law permit a drone to transition between remotely piloted and autonomous flight during an operation?

Yes

Please expand on your answer below

Yes – under appropriate operating procedures and without increased risk for other forms of aviation.

Consultation Question 43

We seek stakeholder views on any other issues with the current legal framework as it relates to operations involving autonomous drones.

Please share our views below

The legal framework as above is not specific enough for the situations that will arise with unmanned / autonomous aviation.

Civil liability and insurance

Consultation Question 44

We provisionally consider that the current law governing air carrier liability for injury or death of passengers in the UK is adequate for the introduction of remotely piloted and autonomous operations. Do you agree?

Yes - probably

Consultation Question 46

We provisionally propose that liability for surface damage, in the case of UAS, should transfer to the lessee when the lease:

- (1) is for more than 14 days; and
- (2) specifies the aircraft is to be operated under the responsibility of the lessee.

Do you agree?

Difficult – there has to be some responsibility for airworthiness oversight before any responsibility can be placed elsewhere or indeed accepted by others.

Consultation Question 48

We provisionally propose that there should be a review product liability law (including the Consumer Protection Act 1987) to take account of the challenges of emerging technologies. The review should cover product liability as a whole, rather than be confined to aviation or automated vehicles. Do you agree?

Other

Please expand on your answer below

Maybe – but consumer law is not specific enough for the liabilities in aviation and may be a hindrance to other forms of aviation. The applicable law should be consistent across all forms of aviation.

Consultation Question 49

We seek views as to whether the current law regarding liability for mid-air collisions is satisfactory in the case of collisions involving uncrewed aircraft systems.

Please share your views below

Yes – but will be difficult to apply in autonomous situations and will potentially disadvantage manned aviation, through their probable inability to defend in a manned v UAV situation.

Consultation Question 50

We seek consultees' views on whether they expect any difficulties applying existing insurance requirements to uncrewed aircraft systems.

Please share your views below

Probably cost – and probably increase the cost for other forms of aviation – which should be prevented.

Consultation Question 51

We provisionally propose that multiple simultaneous operations should be considered as the Government develops proposals for the insurance requirements applicable to uncrewed aircraft. Do you agree?

Other

Please expand on your answer below

It has to be considered as a probable end result, but its implementation should be treated with extreme caution and managed so as not to increase risk for other forms of aviation.

Criminal liability

Consultation Question 52

We provisionally consider that the current approach in the Air Navigation Order 2016 placing criminal liability on an operator is adequate for autonomous operations.

Do you agree?

Yes

Please expand on your answer below

The PIC and operator must be held liable as with manned aviation.

Consultation Question 53

We provisionally consider that the “reasonable care” defence in article 265(3) of the Air Navigation Order 2016 applies adequately for “direct contraventions” under Article 265(5) to (8) involving autonomous operations. Do you agree?

Yes

Please expand on your answer below

Yes, when the reasonable is judged in the same way as it would be in a manned situation, even though the conditions may be different.

Consultation Question 55

We provisionally propose that a remote pilot of an uncrewed aircraft operating in the certified category should be treated as a pilot-in-command for the purposes of criminal liability pursuant to article 265(1) of the Air Navigation Order 2016. Do you agree?

Yes

Please expand on your answer below

Yes – consistency with manned.

Consultation Question 56

We ask for consultees’ views on the criminal liability of pilots (or remote pilots) when an aircraft operating autonomously returns control to the pilot or vice-versa. In particular, should a pilot (or remote pilot) only become criminally liable for the piloting of the aircraft at the end of a transition period?

Please share your views below

No, the PIC is responsible for the entire flight and all that pertains to it.

Consultation Question 57

We provisionally propose that the pilot-in-command of aircraft in a multiple simultaneous operation should be criminally liable for breach of operating

requirements in the same way as a pilot in command of a single aircraft would be. Do you agree?

Yes

Please expand on your answer below

Yes, when it is safety related.

Consultation Question 58

We invite consultees' views on whether the Air Traffic Management and Unmanned Aircraft Act 2021 operates satisfactorily in the case of highly automated and autonomous flight.

Please share your views below

I doubt it. The technology to facilitate it is not yet common / available.

Consultation Question 60

We ask for consultees' views about whether the offence of hijacking in domestic law should be updated to:

1. include the unauthorised seizure or control of autonomous or remotely piloted aircraft by technological means or by persons not on board the aircraft; and
2. expand the period in which hijacking can occur from the period when an autonomous or remotely piloted aircraft is "in flight" to the period when it is "in service".

Please share your views below

Not enough information but probably. Consider that Interference in autonomy can take many more forms than conventional aviation.

Consultation Question 61

We also ask consultees for views on whether any offences against the aircraft other than hijacking need to be updated to account for increased autonomy in aviation.

Please share your views below

Yes.

Impact

Consultation Question 62

We invite consultees to tell us if they have views on, or have experience or data to indicate, the likely costs and benefits of our provisional proposals in relation to VTOLs.

Please share your views below

The introduction of Evtol and UAVs BVLOS is likely to increase the costs of insurance for other forms of aviation and which would be a negative.

Consultation Question 63

We invite consultees to tell us if they have views on, or have experience or data to indicate, the likely costs and benefits of our provisional proposals in relation to drones.

Please share your views below

The introduction of Evtol and UAVs BVLOS is likely to increase the costs of insurance for other forms of aviation and which would be a negative.

Law Commission
1st Floor, Tower, 52 Queen Anne's Gate,
London SW1H 9AG

28 June 2024

Lloyd's response to the Law Commission consultation on Aviation Autonomy

To whom it may concern,

I am responding to your Consultation Paper (CP) on behalf of the Society of Lloyd's (Lloyd's).

Lloyd's is a (re)insurance market based in London. All insurance at Lloyd's is written by Lloyd's members, organised into 77 syndicates, managed by 52 managing agents. In 2023, the Lloyd's market's gross written premiums (GWP) totalled £52.1bn.

The business written at Lloyd's is primarily non-life (re)insurance. The Lloyd's market also plays a prominent role in global aviation insurance: in 2023, Lloyd's underwriters wrote some £4,297m GWP in Marine, Aviation, and Transport (MAT) insurance, in addition to writing significant MAT related reinsurance.

We note the Law Commission's proposal, set out in Question 48 of the CP, to review UK product liability law to take account of emerging technologies. We agree with the Law Commission that individuals and businesses need legal recourse in the event that AI-related products malfunction. We recognise that ensuring continued legal recourse in the face of technology changes might require changes to product liability law.

As the Law Commission considers how to proceed in this area, we wanted to offer three core reflections on issues raised by Question 48 of the CP:

- Given the key role that the Lloyd's market plays in aviation insurance, we would ask that the Law Commission consults with aviation experts at Lloyd's as it develops and seeks input on more detailed policy options. Changes to product liability law could affect how insurance markets operate: for example, uncertainty as to which party is liable, and by how much they are liable, might impact insurance prices and lead to higher prices for consumers. Aviation insurers could offer the Law Commission insights as to how proposed policy changes could impact insurance markets, and thus help guide it as to the most effective and consumer-friendly policy solutions.
- In its CP, the Law Commission noted the EU's changes to the Product Liability Directive (PLD) and the new AI Liability Directive (AILD). The EU is widening the scope of the PLD so that it covers software, AI systems, and AI products, and giving additional legal recourse to all natural persons who are harmed by such products. The EU is also changing its rules of evidence to make it easier to bring product liability claims. Some of these changes that the EU has introduced are similar to proposals that the Law Commission is considering. We understand the rationale for the changes but note that there are risks associated with these changes too. Many EU insurers are concerned that the EU's new product liability framework will create legal uncertainty and a surge in litigation. We know that the Law Commission will work to avoid this outcome in the UK. Again, however, we would ask if the Law Commissioners could consult with aviation insurance experts at Lloyd's when developing proposals so that insurers can advise on their likely impact.

- The Law Commission notes that the EU is seeking to help claimants seek recourse for potentially defective AI products by changing its rules of evidence. The EU is introducing a rebuttable 'presumption of causality', under which it is assumed that an AI related product is defective because of an AI failure unless proven otherwise. This reform could have potentially quite far-reaching impacts on AI innovation in the EU. The adoption of AI technologies is still at a fairly early stage; there is not yet much evidence to draw on about how different kinds of policy measures might impact upon its adoption. There is a risk that major changes to AI liability regimes might have a chilling effect upon the use of AI and thus also impact on long term productivity growth. We wonder if such a significant change to the laws of evidence as is being proposed in the EU would be necessary or proportionate in the UK, given that there is already a comprehensive system of disclosure in the UK legal system. A more evolutionary approach might be for the Law Commission to recommend that judges are provided with new guidance on how to use their existing powers to require early (or even pre action) provision of independent expert evidence about product defects in AI liability cases. New guidance might also help judges understand how to decide which party should pay for such independent expert evidence in a way that is fair and proportionate, taking into account all material circumstances. We would invite the Law Commission to consider whether approaches such as the above, which build on existing UK court procedures, might provide a more balanced and nuanced approach than adopting the EU's approach wholesale.

We would be pleased to convene Lloyd's market experts to discuss these issues with the Commissioners if helpful, and to answer questions about this response in the meantime.

Yours faithfully,

Cameron Murray,

Head, Government Policy & Affairs, Lloyd's

28th June 2024

By Email
aviationautonomy@lawcommission.gov.uk

Dear Sirs

LMA's response to the Law Commission's consultation in relation to Autonomous Aviation

We thank you for the opportunity to respond to the Law Commission's consultation in relation to Autonomous Aviation. We have consulted with our members and our response is below. As you will see, our response focuses on Question 48 in relation to whether there should be a review of product liability law to take account of the challenges of emerging technologies.

About the LMA

The Lloyd's Market Association (LMA) represents the managing agents at Lloyd's, with 94 active syndicates underwriting in the market plus the four members' agents, which act for third party capital. For 2023, total gross premium income was £52.1billion.

Managing agents are "dual regulated" firms, regulated by the Prudential Regulation Authority (PRA) and Financial Conduct Authority (FCA) and members' agents are regulated by the FCA.

In addition to the PRA and FCA, Lloyd's managing agents are subject to bye-laws and an oversight framework set by the Corporation of Lloyd's which is, itself, a statutory regulator. Lloyd's managing agents may have syndicates containing aligned (corporate) or non-aligned (names) capital.

Our Response

We support the Law Commission's proposal for a review of product liability law to address the challenges posed by emerging technologies. The LMA advocates for a well-balanced and fair system which allows all parties to achieve justice. We recognise that there have been massive leaps in technology, even within the last year with AI and products such as ChatGPT catching the public's imagination. Nevertheless, our members urge that a cautious approach is taken.

Our members believe that the current law maintains a reasonable balance between the rights of consumers and the interests of manufacturers. However, we do recognise that the law must be fit

for purpose if, and when cases arise on the use of emerging technologies to produce or incorporated within products. Although it might be considered premature, we set out below some thoughts. The Consultation Paper refers in passing to what is happening in the EU, with the introduction of the AI Act and the revision of the Product Liability Directive. Very broadly, those pieces of proposed legislation tilt the balance in favour of claimants by:

- (a) easing or reversing the burden of proof, particularly in relation to causation; and
- (b) imposing strict liability on importers of products where the manufacturer is not in the EU;
and
- (c) compelling the provision of evidence.

Our members agree with the position set out in the government's paper "A pro-innovation approach to AI regulation" which calls for "proportionate interventions" to address the fair and effective allocation of responsibility. However, we believe that easing or reversing the burden of proof by way of creating rebuttable presumptions of causation, in the way that the EU proposes, would not be proportionate at this time considering the lack of data and lack of cases demonstrating issues with the current legal regime. Furthermore, any steps toward this could, as the paper sets out, undermine innovation.

We suggest that an alternative solution may be possible which is rooted in the English procedural rules of litigation. The EU is proposing to impose disclosure requirements on the parties involved in a product liability claim. We make the obvious point that we already have a comprehensive system of disclosure within UK litigation, a position not shared amongst all EU members. Recognising information asymmetries introduced by technology and in particular, AI, we would support the idea of enhancing existing disclosure obligations on manufacturers to facilitate claimants, perhaps also requiring early (or even pre action) provision of independent expert evidence at an early stage with an appropriate funding allocation as directed by a judge. We think the key is giving judges the requisite powers and directing their considerations toward an appropriate exercise of discretion. In this regard, the Law Commission may wish to consider the recent Consumer Duty initiative, a policy of the Financial Conduct Authority's (FCA). The Consumer Duty requires insurers to think of their consumers and ensure fair treatment. Similarly, judges could be encouraged to consider potential disadvantaged claimants and apply their enhanced powers accordingly to ensure just outcomes, or equality of arms.

As a postscript, we note that the EU has also provisionally proposed extending the claims period for latent defects to 25 years. The rationale for doing this has, we feel, not been sufficiently justified in the context of technological change and we therefore do not propose to say anything more about it or the attendant difficulties that such a period could cause defendants.

Conclusion

As noted above, we acknowledge that the above points may be premature, as no concrete proposals are currently on the table by the Law Commission in relation to product liability. However, we raise them now because it is crucial that reforms are implemented thoughtfully to maintain the robustness and fairness of our legal framework.

Should you wish to discuss any aspect of this response, please do not hesitate to contact us.

Yours faithfully,

Ray Koh
Legal Counsel
Lloyds Market Association

10 June 2024

FAO: Consultation lead,

The Met Office welcomes the launch of the Law Commission's consultation on aviation automation. We are responding to this consultation in our role as the UK's National Meteorological Service (NMS) and as the organisation responsible for the delivery of a range of weather-safety related services across the range of transport domains (land, air, sea).

As a Public Sector Research Establishment (PSRE) and an Executive Agency of the Department for Science, Innovation and Technology (DSIT), the Met Office is responsible for monitoring and forecasting the weather. We work extensively with the aviation community through our responsibility as one of only two World Area Forecast Centres for civil aviation, via our remit as the designated provider of regulated aviation services for Civil Aviation Authority (CAA) and through our embedded services at airports such as Heathrow. We run the UK's Volcanic Ash Advisory Centre for aviation risk advice related to the eruption of Icelandic volcanoes. We are also responsible for providing the UK's space weather monitoring and forecasting service through the Met Office Space Weather Operations Centre (MOSWOC), supporting HMG and industry such as critical national infrastructure operators.

Beyond operational services, we are a Public Sector Research Establishment and undertake targeted research in support of the further development of these services and to deliver key research for HMG. This includes the work of the Met Office Hadley Centre which provides climate science and services to help departmental, business and public understanding of and preparation for climate change.

Our response builds on our previous submissions: AV098, AVRF064 and HARPS060. Our response is also informed by our work on DBAS, SEES.AI, FFC3, BAE Prismatic, and our work on the [Droneport Framework Guidance Document](#).

The Met Office agrees with the approach that UASs should be expected to achieve an equivalent level of safety to that of a competent and careful human pilot. Evidence from our work on regulation across the aviation industry suggests an equivalent level of safety (to that of a human pilot) is a minimum requirement, before the widespread introduction of UASs, with the goal of increasing safety above this baseline.

As the UK's National Meteorological Service, we support all efforts to improve safety decisions involving weather and climate factors. While weather impacts in conventional aviation systems are relatively well understood, automation of aviation systems introduces new weather sensitivities and vulnerabilities. Our previous work with connected and autonomous vehicles (CAVs) focused on communicating and quantifying these sensitivities, and their uncertainties, to inform the mechanisms for understanding and managing safety-related weather risks. Through this, and experience in the civil aviation industry, we have learned that weather impacts require consideration when demonstrating safety in UASs.

Below are some considerations in response to your inquiry's consultation questions. In addition, we have included learnings from our work in the attached appendix and would be happy to expand on these if that would be useful.

My teams stand ready to support on this, and future policy developments where weather or climate change could be a relevant factor. We would be happy to engage with your team or others prior to public consultation to help answer any questions and help inform your evidence base as you take forward your work. Please do not hesitate to get in touch with myself or my colleague  to follow up on this.

Many thanks,



John Harrison
Markets Director

Met Office Response to the Consultation Questions

11.1 We seek views on how current airworthiness and certification regulation might need to be adapted or developed in light of highly automated and autonomous aircraft. In particular, should provisions be adopted which allow for:

- (1) the certification of optionally piloted and uncrewed or unoccupied versions of conventional aircraft (hybrid versions); and*
(2) the separate certification of command units?

In response to both (1) and (2), we believe that current airworthiness and certification needs to evolve to reflect and account for how highly automated automated and autonomous aircraft (may they be optionally piloted, uncrewed or unoccupied as well as their command units) manage weather without any human involvement. Aviation autonomy is affected by weather challenges that traditional aviation would not be. One such example is the reliance on sensors and the safety-critical decisions made on the basis of what they observe. Met Office has a deep understanding of the environmental challenges different types of sensors face due to our ongoing Sensor Assurance Framework project, fully funded by CCAV/DfT and delivered in partnership with NPL. It is noteworthy that as part of the project we work closely with future self-driving regulators (such as DVSA and VCA) to understand their requirements around roadworthiness and certification (pre-deployment and in-use) and how we may be able to support them going forward.

11.2 We welcome views on what changes to the certification system might be necessary to enable higher automation and autonomy in aviation.

As stated in our reply to 11.1, we believe that current airworthiness and certification needs to evolve to reflect and account for how highly automated automated and autonomous aircraft (may they be optionally piloted, uncrewed or unoccupied as well as their command units) manage weather without any human involvement. Aviation autonomy is affected by weather challenges that traditional aviation would not be. By way of example, when certification considers a new system's capability to operate safely, thought must be given to its operational design domain (ODD), target operational domain (TOD) and any environmental attributes associated with such.

11.3 We seek views on whether current regulatory tools to support the development of highly automated and autonomous aviation technologies are adequate.

This feels unlikely unless they cover new technologies like sensors that make mission critical decisions (in lieu of human). In addition, regulated weather forecast services are not designed for or aimed at RPAS. Furthermore, the impacts that these new systems will encounter due to small scale weather effects are currently beyond the skill of any forecast or measurement technology capability.

11.10 We provisionally propose 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.
Do you agree?

We agree fully with the statement.

We would add that to reduce the probability of (5) that weather measurements need to be shared. This is key from the very start of certification to operations:

- What are the weather limitations on the instruments on board the aircraft?
- Having a suitable weather service to know the risk of overstepping those limitations.
- Having the capability aboard the platform to know when you are approaching those limits.

Sharing those measurements will enable nearby aircraft to also understand the environment.

11.11 We seek views as to whether there are additional operational responsibilities that a remote VTOL pilot should be required to fulfil.

We would suggest that it is considered making the sharing of weather measurements a requirement.

11.21 We provisionally propose that a remotely piloted VTOL should be required to be capable of detecting and recording information relating to accidents and near accidents for the purposes of reporting it. Do you agree?

Yes, this should include environmental factors like real time weather elements such as those decreed by the AIB.

11.22 We provisionally propose that licences should be required for remote VTOL pilots. So far as appropriate, these should follow the classes and ratings adopted for crewed VTOLs. Do you agree?

Yes, we suggest that associated training to secure a licence ought to include weather training/awareness.

11.23 We provisionally propose that operators of remotely piloted VTOLs should be certified. Do you agree?

We fully agree with this.

11.24 We provisionally propose that operators of remotely piloted VTOLs should continue to be required to:

- (1) have the means necessary for the scale and scope of operations planned;*
- (2) use only suitably qualified and trained personnel;*
- (3) implement a management system to ensure safety;*
- (4) ensure operations only take place in accordance with the operations manual;*
- (5) establish procedures to minimise the consequences to safe flight operations of disruptive passenger behaviour;*
- (6) develop and maintain security programmes suitable for the aircraft and type of operation;*
- (7) have a management system to prevent fatigue;*
- (8) ensure the continuing airworthiness of the aircraft; and*
- (9) establish procedures for any reasonably foreseeable emergency situation.*

Do you agree?

We fully agree and add that weather factors should be included where appropriate.

11.28 We seek views as to what additional safeguards should be introduced for remote pilots piloting multiple VTOLs.

We would recommend that weather be included as a factor for determining the safety of piloting multiple VTOLs. It may be difficult to define appropriate limits, but it should be considered.

11.30 Should the law permit an uncrewed VTOL to transition between remotely piloted and autonomous flight during an operation?

This needs to include consideration of environmental factors when transition occurs and environmental factors affecting the sensors during autonomous phase.

11.36 We provisionally propose that for autonomous operations in the specific category, a UAS 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.*

Do you agree?

We fully agree and add that weather factors should be included where appropriate.

11.37 We seek views on what operational requirements should be applied to autonomous drone operations and drones that operate beyond visual line of sight in the specific and certified categories.

We suggest that their Operational Design Domain (ODD) needs to be specified to include weather capabilities and some form of measurement of weather to know when they are close to operating outside of their design limits.

11.40 We seek views as to what additional safeguards should be introduced for remote pilots responsible for multiple drones.

We suggest including weather as a factor for determining the safety of piloting multiple VTOLS.

11.42 Should the law permit a drone to transition between remotely piloted and autonomous flight during an operation?

Consideration needs to be given to environmental factors when transition occurs and how environmental factors affect the sensors during autonomous phase.

Appendix

The role of meteorology in aviation

The weather is influenced by many factors, such as terrain, vegetation, buildings, water bodies, and human activities. These factors can create local variations in temperature, humidity, wind, pressure, and precipitation, which can differ significantly from the conditions at higher altitudes or larger scales meaning traditional regulated aviation forecasts may not be applicable. For example, urban areas can create heat islands, where the temperature is higher than the surrounding rural areas, due to the absorption and emission of heat by buildings and roads. Similarly, buildings, valleys and mountains can create complex wind patterns, such as updrafts, downdrafts, and eddies, which can affect the flight performance and safety of aircraft. These variations can occur over distances of meters or kilometres, and over time scales of minutes or hours, making them difficult to predict and monitor with conventional weather observation systems, such as satellites, radars, and weather stations. To ensure that the conditions being experienced by the platforms, both in operations and for accident investigations, measurement of current atmospheric conditions e.g. wind, temperature, pressure and precipitation should be conducted by the platforms themselves.

Current regulations mean that elements of airworthy vehicles are approved to operate within a range of environmental conditions. The dependence of UAS on perception systems that rely heavily on electromagnetic sensors to replace humans will significantly increase their sensitivity to weather even further. We would therefore support a mechanism which either mandates (by the appropriate authority as part of the pre-deployment safety assurance process) the systems required or sets out a minimum list of weather conditions that a sensor, system or feature is able to operate in. In addition, as UAS will have multiple weather-sensitive systems, we believe it will be necessary to define any weather-related Operational Design Domain in terms of UAS capability, not any individual component. By extending the current approaches in different transport domains we believe this means that UAS and their supporting infrastructure could:

- Evidence and be equipped with appropriate instrumentation and systems to effectively measure or confidently determine that they can competently function within the weather conditions in which they are operating.
- Demonstrate confidence when embarking on a journey that the ODD weather criteria are not expected to be exceeded.
- Demonstrate capability to review and assess competence with respect to weather throughout a journey, demonstrating safety-based redundancy on the basis of encountered or expected weather.
- Transmit similar information, especially exceedances, to local and central infrastructure to allow safety measures (e.g. geofencing) around hazards in support of a safer transport network.

From our position as the UK's Space Weather Operations Centre and space weather risk owner, we feel it is also important to consider the risk posed to automated vehicle systems by space weather events. Major space weather events can particularly disrupt or damage electrical equipment, including high frequency radio communications and satellite systems. Met Office are currently part of the SWAVE (Space Weather Autonomous Transport Effects) consortium, funded by ESA (European Space Agency). The project is assessing the potential impact of space weather on existing and emerging autonomous transport systems across Europe.

Measuring weather data close to the ground is not enough to ensure the safety and efficiency of operations. It is also important to share and enable access to that data widely, so that the value to safety can be maximised, for example:

- Improving weather awareness and situational awareness: By sharing weather data, users can have access to more accurate and timely information about the weather conditions in their area of interest, which can help them make better decisions and avoid potential hazards.
- Enhancing weather forecasting and modelling: by sharing weather data, weather forecasters and researchers can have access to more data sources and inputs, which over time can help them improve the quality and resolution of their weather predictions and simulations.
- Supporting weather research and innovation: By sharing weather data, weather scientists and innovators can have access to more data sets and opportunities, which can help them advance the knowledge and understanding of the weather phenomena and develop new solutions and technologies.

It is likely that sharing observations will not only result in safer operations short term but enable better future weather services and enable more efficient operations.

Further details can be provided on all of the above if requested.

RESPONSE TO LAW COMMISSION CONSULTATION ON AVIATION AUTONOMY

(Law Commission Consultation Paper 261)

Please note that this consultation response has been reproduced from information entered on the Citizen Space online portal.

Any personal email addresses and phone numbers have been excluded from this document.

Unanswered questions have been deleted from this document.

About you

What is the name of your organisation?

NATS

Airworthiness and certification

Consultation Question 1

We seek views on how current airworthiness and certification regulation might need to be adapted or developed in light of highly automated and autonomous aircraft. In particular, should provisions be adopted which allow for:

1. the certification of optionally piloted and uncrewed or unoccupied versions of conventional aircraft (hybrid versions); and
2. the separate certification of command units?

Please share your views below

It would seem reasonable to allow for both (1) and (2), but as air navigation service provider we do not have a strong view on the matter. The EASA approach seems reasonable and alignment would seem helpful to UK operators and manufacturers also active in the EU. Note that the EASA proposals made in Opinion 3/23 have now been adopted by the European Commission under a suite of 5 implementing / delegated regulations with applicability in the EU from 1 May 2025.

Rules of the air

Consultation Question 4

We seek views on how highly automated and autonomous aircraft should act in emergency scenarios. In particular:

Consultation Question 6

We seek consultees' views on whether the rules of the air relating to communication should be adapted for remotely piloted and autonomous aircraft.

Please share your views below

Provisions should be developed, possibly adapted from existing ones, to ensure they reflect the operational and technical environment presented by highly automated / autonomous vehicles. We expect this will need to extend procedures beyond ATCO-Pilot (or remote pilot) communication to include a designated focal point within the operating entity responsible for an autonomous aircraft.

Consultation Question 7

We ask for consultees' views on how the rules of the air might be adapted or developed for remotely piloted or autonomous flight

Please share your views below

Certainly, provisions need to define roles and safety accountabilities of flight supervisors and those who can intervene / re-programme / take over autonomous aircraft. In general, it will be key that uncrewed aviation remains well clear of crewed aviation, but when in proximity they follow the tried and tested rules for which way to turn, who has right of way etc. All aircraft need to behave in the same manner as in certain situations (VFR) it will not be evident if a proximate aircraft is crewed or uncrewed (an uncrewed Cessna Caravan looks the same as a crewed Cessna Caravan).

However, we consider it too soon to say exactly how the rules might be adapted. We anticipate a future integrated airspace and service environment for both crewed and uncrewed vehicles where the needs of all airspace users are respected whilst optimising the performance of the system as a whole. Any requirements governing the Rules of the Air must enable the safe and expeditious operation of numerous actors, performing a diverse set of operations, displaying a range of operational and/or performance characteristics. It is reasonable to expect that highly automated and/or autonomous systems, operating within an integrated, digitised service ecosystem shall require a corresponding set of Flight Rules to fully exploit those higher levels of automation and/or autonomy. The key challenges are therefore on the applicability (or not) of existing Flight Rules, the requirements for new Flight Rules to harness high(er) levels of automation and/or autonomy, and the implications of potentially varying degrees of autonomy amongst actors within the system. We note developments elsewhere, such as the 'Digital Flight' proposals being explored by NASA/FAA should be considered/assessed for applicability/suitability. For example, such proposals may inform thinking regarding the use of cooperative behaviours and associated decision making for Conflict Management (and the requirement to codify such principles within a new/discreet set of Flight Rules). Equally, it may be determined that other approaches are better suited to answer the key questions of service and/or rules-based integration.

Whatever approach is followed, the subsequent implications on required Rules of the Air for remotely piloted and/or autonomous operations is likely significant.

VTOLs

Consultation Question 8

We provisionally propose that a person overseeing a VTOL flying automatically, who monitors its course and is able to intervene and change its course at any time should continue to be classified as a “remote pilot”. Do you agree?

Yes

Consultation Question 9

We provisionally propose 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. Do you agree?

Yes

Consultation Question 10

We provisionally propose 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.

Do you agree? (Tick all that you agree with)

Consultation Question 11

We invite views as to whether there are additional operational responsibilities that a remote VTOL pilot should be required to fulfil.

Please share your views below

From an air traffic services (ATS) perspective, ensuring that the necessary flight authorisations / approvals are in place and communication has been established with any relevant ATS units or other relevant service providers.

Consultation Question 12

We provisionally propose that the remote pilot-in-command should be responsible for, amongst other things, ensuring passengers are:

1. given a safety briefing; and
2. seated and wear seat belts during take-off and landing

Do you agree?

Yes

Please expand on your answer below

As with question 10 – this assumes the remote pilot is present at the departure site, which is not necessarily a given. The rules need to consider the scenario where the remote pilot is located elsewhere.

Consultation Question 13

We provisionally propose that air operators (rather than the remote pilot-in-command) should be responsible for preventing passengers from boarding:

1. who appear drunk or under the influence of drugs; or
2. whose carriage would, in the view of the operator's employees, endanger the safety of the aircraft or other passengers.

Do you agree?

Other

Consultation Question 14

We provisionally propose that the remote pilot-in-command should have the power to take reasonable measures, including restraint of passengers, as set out in section 94 of the Civil Aviation Act 1982. Do you agree?

Other

Consultation Question 15

We provisionally propose that a person on board a VTOL aircraft (other than a crew member) should be able to take reasonable measures to protect the safety of the aircraft or of persons or property on board. Do you agree?

Other

Please expand on your answer below

It is unclear how this scenario would arise when there is no flight crew on board unless one of the passengers were trained and adequately briefed.

Consultation Question 17

We provisionally propose that passengers should be able to contact a member of crew at all times during an operation. Do you agree?

Other

Consultation Question 18

We provisionally propose 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. Do you agree?

Yes

Please expand on your answer below

To be aligned with provisions related to crewed aviation.

Consultation Question 19

We provisionally propose that it should be a criminal offence for a person to act as the remote pilot of a VTOL when the level of alcohol in their blood, breath or urine is over a prescribed limit. Do you agree?

Yes

Please expand on your answer below

To be aligned with provisions related to crewed aviation.

Consultation Question 20

We provisionally propose that the remote pilot should be subject to the reporting obligations currently applicable to pilots under the Air Operations Regulation. Do you agree?

Yes

Please expand on your answer below

To be aligned with provisions related to crewed aviation.

Consultation Question 21

We provisionally propose that a remotely piloted VTOL should be required to be capable of detecting and recording information relating to accidents and near accidents for the purposes of reporting it. Do you agree?

Yes

Consultation Question 22

We provisionally propose that licences should be required for remote VTOL pilots. So far as appropriate, these should follow the classes and ratings adopted for crewed VTOLs. Do you agree?

Yes

Consultation Question 23

We provisionally propose that operators of remotely piloted VTOL should be certified. Do you agree?

Yes

Please expand on your answer below

This seems appropriate where “remotely piloted VTOL” means passenger carrying aircraft, cargo or operating a flight for commercial reasons such as surveying

Consultation Question 24

We provisionally propose that operators of remotely piloted VTOLs should continue to be required to:

- ☒ (1) have the means necessary for the scale and scope of operations planned;
- ☒ (2) use only suitably qualified and trained personnel;
- ☒ (3) implement a management system to ensure safety;
- ☒ (4) ensure operations only take place in accordance with the operations manual;
- ☒ (5) establish procedures to minimise the consequences to safe flight operations of disruptive passenger behaviour;
- ☒ (6) develop and maintain security programmes suitable for the aircraft and type of operation;
- ☒ (7) have a management system to prevent fatigue.
- ☒ (8) ensure the continuing airworthiness of the aircraft; and.

☒ (9) establish procedures for any reasonably foreseeable emergency situation.

Do you agree? (tick all that you agree with)

Please expand on your answer below

This seems appropriate where “remotely piloted VTOL” means passenger carrying aircraft, cargo or operating a flight for commercial reasons such as surveying.

Consultation Question 26

We seek views as to whether the law should permit remote pilots to act as pilot-in-command for more than one VTOL at the same time.

Please share your views below

Yes, there should be a pathway from 1-1 to 1-many to 100%-system

Consultation Question 27

We seek views as to whether there should be an upper limit to the number of VTOLs for which a remote pilot can act as pilot-in-command at the same time.

Please share your views below

Possibly. This is highly dependent upon the autonomy and the assurance of the airframes / systems – for early capability the limit will be 1-1 but we should assume a future that allows full autonomy and therefore define the requirements for the full spectrum.

Consultation Question 28

We seek views as to what additional safeguards should be introduced for remote pilots piloting multiple VTOLs.

Please share your views below

This requires further work to establish criteria and procedures for offloading operators of multiple VTOLs, e.g. including considerations for ensuring that a remote pilot is not overloaded in the first place, how to off-load tasks when one VTOL has an issue requiring full attention, etc.

Consultation Question 29

We seek views as to whether there should be a role for a person supervising the flight of an autonomous passenger-carrying VTOL and acting as a point of contact in relation to it. What powers or responsibilities should such a person have?

Please share your views below

Yes, provisions should be developed to define the responsibilities of person(s) performing supervisory roles through the various flight stages and scenarios. It is conceivable that a VTOL Operator could delegate safety accountability to, for example, air traffic controller or airspace manager in certain situations.

Consultation Question 30

Should the law permit an uncrewed VTOL to transition between remotely piloted and autonomous flight during an operation?

Yes

Please expand on your answer below

Provisions should be developed for handover procedures; these should include air traffic service functions.

Consultation Question 31

We seek views as to whether initial airworthiness standards for uncrewed VTOLs should include accessibility standards for persons with disabilities and reduced mobility.

Please share your views below

Yes, in principle, though it is unclear whether new legislation / CAA regulation is needed in this respect as we would expect it to be covered by existing broader disability and discrimination legislation.

Consultation Question 32

We seek views as to whether the CAA should be able to include accessibility standards within the licences granted to uncrewed VTOL operators.

Please expand on your answer below

Yes, in principle, though it is unclear whether new legislation / CAA regulation is needed in this respect as we would expect it to be covered by existing broader disability and discrimination legislation.

Drones

Consultation Question 34

We provisionally propose that a remote pilot for drones should continue to be defined as “a natural person responsible for safely conducting the flight of an unmanned aircraft by operating its flight controls, either manually or, when the unmanned aircraft flies automatically, by monitoring its course and remaining able to intervene and change its course at any time”. Do you agree?

Yes

Consultation Question 35

We seek views on whether some low risk autonomous drone operations or drone operations conducted beyond visual line of sight might be accommodated in the open category. In particular:

1. whether there are any such use cases which might be suitable for the open category; and
2. if so, what conditions should be attached to these use cases if operated in the open category.

Please share your views below

Yes – noting that ‘low risk’ will need careful definition – this should be considered – but equally this feels like a short term ‘enablement’ consideration rather than a longer-term change to law/regulation. Additionally given that this is BVLOS and therefore does not have the benefit of VLOS – this will need to be framed within the appropriate framework considering (a) flight worthiness (b) risk assessment (c) pilot competency (d) airspace.

Consultation Question 36

We provisionally propose that for autonomous operations in the specific category, a UAS 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 manned 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.

Do you agree? (tick all that you agree with)

Please expand on your answer below

Agree on all.

Consultation Question 37

We seek views on what operational requirements should be applied to autonomous drone operations and drones that operate beyond visual line of sight in the specific and certified categories.

Please share your views below

Considering (a) flight worthiness (b) risk assessment (c) pilot competency (d) airspace – operational requirements should include a known airspace environment, both intent and actual flight data – supported by a qualified UTM-Service Provider

Consultation Question 38

We seek views on whether the current concept of a “remote pilot” is compatible with drone MSO. We also seek views on whether the remote pilots of drone MSO should continue to be subject to the same responsibilities as remote pilots for single drone operations.

Please share your views below

Yes, the current concept of a “remote pilot” is compatible with MSO. The “remote pilot” should have the same responsibilities as a remote pilot of a single drone operation.

Consultation Question 39

We seek views on whether there should be an upper limit to the number of drones for which an individual remote pilot is responsible.

Please share your views below

Yes, possibly, in line with Qu 27, i.e. this should likely be dependent on the autonomy and the assurance of the airframes / systems – for early capability the limit will be 1-1 but we should assume a future that allows full autonomy and therefore define the requirements for the full spectrum.

Consultation Question 40

We seek views as to what additional safeguards should be introduced for remote pilots responsible for multiple drones.

Please share your views below

The same applies to drones as for VTOLs (Qu 28). This requires further work to establish criteria and procedures for offloading operators of multiple drones, e.g. including considerations for ensuring that a remote pilot is not overloaded in the first place, how to off-load tasks when one drone has an issue requiring full attention, etc.

Consultation Question 41

We provisionally propose that use of flight data recorder systems or devices should be mandatory for autonomous drone operations. Do you agree?

Yes

Please expand on your answer below

Yes, but noting that data / parameters will not be the same as today in crewed aviation – appropriate specification is required for the minimum information.

Consultation Question 42

Should the law permit a drone to transition between remotely piloted and autonomous flight during an operation?

Yes

Civil liability and insurance

Consultation Question 44

We provisionally consider that the current law governing air carrier liability for injury or death of passengers in the UK is adequate for the introduction of remotely piloted and autonomous operations. Do you agree?

Other

Consultation Question 45

We provisionally consider that the current law governing liability for damage to cargo in the UK is adequate for the introduction of remotely piloted and autonomous operations. Do you agree?

Other

Consultation Question 46

We provisionally propose that liability for surface damage, in the case of UAS, should transfer to the lessee when the lease:

1. is for more than 14 days; and
2. specifies the aircraft is to be operated under the responsibility of the lessee.

Do you agree?

Other

Consultation Question 47

We provisionally propose 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. Do you agree?

Other

Consultation Question 48

We provisionally propose that there should be a review product liability law (including the Consumer Protection Act 1987) to take account of the challenges of emerging technologies. The review should cover product liability as a whole, rather than be confined to aviation or automated vehicles. Do you agree?

Other

Consultation Question 49

We seek views as to whether the current law regarding liability for mid-air collisions is satisfactory in the case of collisions involving uncrewed aircraft systems.

Please share your views below

Our preliminary view is that the current law is adequate to deal with these types of damage. However, this view may be subject to change depending on how the landscape in relation to uncrewed aircraft systems develop.

Consultation Question 51

We provisionally propose that multiple simultaneous operations should be considered as the Government develops proposals for the insurance requirements applicable to uncrewed aircraft. Do you agree?

Other

Criminal liability

Consultation Question 52

We provisionally consider that the current approach in the Air Navigation Order 2016 placing criminal liability on an operator is adequate for autonomous operations.

Do you agree?

Yes

Please expand on your answer below

Preliminary view is that the current law may potentially be adequate, however, this view may be subject to change depending on how the landscape in relation to autonomous operations develops over time.

Consultation Question 53

We provisionally consider that the “reasonable care” defence in article 265(3) of the Air Navigation Order 2016 applies adequately for “direct contraventions” under Article 265(5) to (8) involving autonomous operations. Do you agree?

Other

Please expand on your answer below

No comment from air navigation service perspective.

Consultation Question 55

We provisionally propose that a remote pilot of an uncrewed aircraft operating in the certified category should be treated as a pilot-in-command for the purposes of criminal liability pursuant to article 265(1) of the Air Navigation Order 2016. Do you agree?

Yes

Please expand on your answer below

No comment from air navigation service perspective.

Consultation Question 57

We provisionally propose that the pilot-in-command of aircraft in a multiple simultaneous operation should be criminally liable for breach of operating requirements in the same way as a pilot in command of a single aircraft would be. Do you agree?

Yes

Please expand on your answer below

No comment from air navigation service perspective.

Consultation Question 60

We ask for consultees' views about whether the offence of hijacking in domestic law should be updated to:

1. include the unauthorised seizure or control of autonomous or remotely piloted aircraft by technological means or by persons not on board the aircraft; and
2. expand the period in which hijacking can occur from the period when an autonomous or remotely piloted aircraft is "in flight" to the period when it is "in service".

Please share your views below

Yes, this sounds appropriate, but it probably needs clarified how this is defined with respect to, for example, GNSS spoofing. Consideration could be given to extending the definition of 'hijacking' to include 'manipulation' i.e. not taking control but (for example) impacting an operation via GNSS spoofing etc.

Consultation Question 61

We also ask consultees for views on whether any offences against the aircraft other than hijacking need to be updated to account for increased autonomy in aviation.

Please share your views below

See Q 60 – potentially the 'manipulation' of an aircraft, not necessarily with the intent of seizing could be considered an offence separate from hijacking.

RESPONSE TO LAW COMMISSION CONSULTATION ON AVIATION AUTONOMY

(Law Commission Consultation Paper 261)

Please note that this consultation response has been reproduced from information entered on the Citizen Space online portal.

Any personal email addresses and phone numbers have been excluded from this document.

Unanswered questions have been deleted from this document.

About you

What is your name?

Niall Greenwood

Airworthiness and certification

Consultation Question 1

We seek views on how current airworthiness and certification regulation might need to be adapted or developed in light of highly automated and autonomous aircraft. In particular, should provisions be adopted which allow for:

1. the certification of optionally piloted and uncrewed or unoccupied versions of conventional aircraft (hybrid versions); and
2. the separate certification of command units?

Please share your views below

The 'future flight' sector is growing from the ground up in a fragmented, emergent and unstructured way. The 'as is' world of aircraft manufacturers being able to dominate/monopolise market segments, won't be the case again, and regulators will need to adapt to this. Certification will need to find a way to take place in a manner that doesn't just 'kick the can down the road' (this damages industry), and is timely, proportional and effective.

An Uncrewed Aviation Association has been proposed to tackle this problem in the same ways that the British Microlight Aircraft Association, the Light Aircraft Association and the British Glider Association do. This is an option, but complicated by each of the above mentioned groups having agreed their own approaches. The alternative, of Recognised Assessment Entities (RAEs) is currently favoured by the CAA (seems to be), but much more needs to be understood about how these would work, and be upskilled and funded. The certification of (the mentioned) hybrid versions, and command units, could fit under this construct.

Consultation Question 2

We welcome views on what changes to the certification system might be necessary to enable higher automation and autonomy in aviation.

Please share your views below

Certify at the module, not platform level. Yes, systems need to be integrated, but this isn't pharma (where every territory repeats the same clinical trials!).

Consultation Question 3

We seek views on whether current regulatory tools to support the development of highly automated and autonomous aviation technologies are adequate.

Please share your views below

I suspect they are 'gappy', this tends to be the case in times of change, and with centrally controlled processes.

Rules of the air

Consultation Question 4

We seek views on how highly automated and autonomous aircraft should act in emergency scenarios. In particular:

1. should highly automated and autonomous aircraft be given the freedom to operate outside the rules of the air in emergency circumstances; or
2. should a comprehensive set of rules be developed for highly automated and autonomous aircraft in emergency situations.

Please share your views below

This is a complex question, because well established aircraft eg military helicopters already operate outside the rules of the air, eg an Apache helicopter is a highly advanced and effective system, but it was optimised for 'tank-busting' on the central European plains (conveniently, now!), but never to be integrated into civil airspace in the UK countryside, so it still can't easily do this. But it's still an essential and high-performant aircraft. So short answer, yes, this circumstance may be needed.

It follows straight after saying the above, that a rule set for highly automated and autonomous aircraft in emergency situations will be needed though.

Consultation Question 5

We seek consultee views about what challenges remotely piloting an aircraft in an emergency scenario presents and how these might be addressed

Please share your views below

It depends on the type of emergency and aircraft conspicuity; bear in mind that remotely piloted aircraft are already far better equipped to, and more successful at, seeing (transponding) aircraft that pilots following visual flight rules are at the moment.

Consultation Question 6

We seek consultees' views on whether the rules of the air relating to communication should be adapted for remotely piloted and autonomous aircraft.

Please share your views below

As above, they probably have to be - who avoids who, being a key one.

Consultation Question 7

We ask for consultees' views on how the rules of the air might be adapted or developed for remotely piloted or autonomous flight

Please share your views below

Follow the path of least risk, in an integrated air environment (it works for the military...).

VTOLs

Consultation Question 8

We provisionally propose that a person overseeing a VTOL flying automatically, who monitors its course and is able to intervene and change its course at any time should continue to be classified as a "remote pilot". Do you agree?

Yes

Consultation Question 9

We provisionally propose 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. Do you agree?

Yes

Consultation Question 10

We provisionally propose 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.

Do you agree? (Tick all that you agree with)

Consultation Question 11

We invite views as to whether there are additional operational responsibilities that a remote VTOL pilot should be required to fulfil.

Please share your views below

Ensure good detect and avoid look out, over appropriate systems, (but this is normal 'see and be seen').

Consultation Question 12

We provisionally propose that the remote pilot-in-command should be responsible for, amongst other things, ensuring passengers are:

1. given a safety briefing; and
2. seated and wear seat belts during take-off and landing

Do you agree?

Yes

Consultation Question 13

We provisionally propose that air operators (rather than the remote pilot-in-command) should be responsible for preventing passengers from boarding:

1. who appear drunk or under the influence of drugs; or
2. whose carriage would, in the view of the operator's employees, endanger the safety of the aircraft or other passengers.

Do you agree?

Yes

Consultation Question 14

We provisionally propose that the remote pilot-in-command should have the power to take reasonable measures, including restraint of passengers, as set out in section 94 of the Civil Aviation Act 1982. Do you agree?

Yes

Consultation Question 15

We provisionally propose that a person on board a VTOL aircraft (other than a crew member) should be able to take reasonable measures to protect the safety of the aircraft or of persons or property on board. Do you agree?

Yes

Please expand on your answer below

Is this question necessary?

Consultation Question 16

We seek views on whether the powers of crew on board a VTOL aircraft should be broadened to reflect those of the pilot-in-command under the Civil Aviation Act 1982 to:

1. take reasonable measures to protect the safety of the aircraft or persons or property on board;
2. maintain good order and discipline; or
3. enable the crew to disembark or deliver a person.

Please share your views below

Within reasonable limits.

Consultation Question 17

We provisionally propose that passengers should be able to contact a member of crew at all times during an operation. Do you agree?

Other

Please expand on your answer below

Unless they are engaged in higher priority emergency tasks.

Consultation Question 18

We provisionally propose 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. Do you agree?

Yes

Consultation Question 19

We provisionally propose that it should be a criminal offence for a person to act as the remote pilot of a VTOL when the level of alcohol in their blood, breath or urine is over a prescribed limit. Do you agree?

Yes

Consultation Question 20

We provisionally propose that the remote pilot should be subject to the reporting obligations currently applicable to pilots under the Air Operations Regulation. Do you agree?

Yes

Consultation Question 21

We provisionally propose that a remotely piloted VTOL should be required to be capable of detecting and recording information relating to accidents and near accidents for the purposes of reporting it. Do you agree?

Yes

Consultation Question 22

We provisionally propose that licences should be required for remote VTOL pilots. So far as appropriate, these should follow the classes and ratings adopted for crewed VTOLs. Do you agree?

Yes

Consultation Question 23

We provisionally propose that operators of remotely piloted VTOL should be certified. Do you agree?

Yes

Consultation Question 24

We provisionally propose that operators of remotely piloted VTOLs should continue to be required to:

- ☒ (1) have the means necessary for the scale and scope of operations planned;
- ☒ (2) use only suitably qualified and trained personnel;
- ☒ (3) implement a management system to ensure safety;
- ☒ (4) ensure operations only take place in accordance with the operations manual;
- ☒ (5) establish procedures to minimise the consequences to safe flight operations of disruptive passenger behaviour;
- ☒ (6) develop and maintain security programmes suitable for the aircraft and type of operation;
- ☒ (7) have a management system to prevent fatigue.
- ☒ (8) ensure the continuing airworthiness of the aircraft; and.
- ☒ (9) establish procedures for any reasonably foreseeable emergency situation.

Do you agree? (tick all that you agree with)

Consultation Question 26

We seek views as to whether the law should permit remote pilots to act as pilot-in-command for more than one VTOL at the same time.

Please share your views below

Not in the immediate future, but eventually.

Consultation Question 27

We seek views as to whether there should be an upper limit to the number of VTOLs for which a remote pilot can act as pilot-in-command at the same time.

Please share your views below

Not yet known.

Consultation Question 28

We seek views as to what additional safeguards should be introduced for remote pilots piloting multiple VTOLs.

Please share your views below

Not yet known.

Consultation Question 29

We seek views as to whether there should be a role for a person supervising the flight of an autonomous passenger-carrying VTOL and acting as a point of contact in relation to it. What powers or responsibilities should such a person have?

Please share your views below

Not yet known.

Consultation Question 30

Should the law permit an uncrewed VTOL to transition between remotely piloted and autonomous flight during an operation?

Other

Please expand on your answer below

Yes, eventually.

Consultation Question 31

We seek views as to whether initial airworthiness standards for uncrewed VTOLs should include accessibility standards for persons with disabilities and reduced mobility.

Please share your views below

Not yet known.

Consultation Question 32

We seek views as to whether the CAA should be able to include accessibility standards within the licences granted to uncrewed VTOL operators.

Please expand on your answer below

Not yet known.

Drones

Consultation Question 34

We provisionally propose that a remote pilot for drones should continue to be defined as “a natural person responsible for safely conducting the flight of an unmanned aircraft by operating its flight controls, either manually or, when the unmanned aircraft flies automatically, by monitoring its course and remaining able to intervene and change its course at any time”. Do you agree?

Yes

Consultation Question 36

We provisionally propose that for autonomous operations in the specific category, a UAS 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 manned 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.

Do you agree? (tick all that you agree with)

Consultation Question 37

We seek views on what operational requirements should be applied to autonomous drone operations and drones that operate beyond visual line of sight in the specific and certified categories.

Please share your views below

Meet quantified safety standards (I accept that this is a huge debate, but in the end you need a number...)

Consultation Question 38

We seek views on whether the current concept of a “remote pilot” is compatible with drone MSO. We also seek views on whether the remote pilots of drone MSO should continue to be subject to the same responsibilities as remote pilots for single drone operations.

Please share your views below

MSO = multiple drones? If so, yes.

Consultation Question 39

We seek views on whether there should be an upper limit to the number of drones for which an individual remote pilot is responsible.

Please share your views below

6 (possibly 5), although it is likely that this number would increase over time. NB This is the number Google Wing have been trialling in the US.

Consultation Question 40

We seek views as to what additional safeguards should be introduced for remote pilots responsible for multiple drones.

Please share your views below

Probably higher SQEP (suitably qualified and experienced personnel) levels, maybe a multi-drone waiver/endorsement.

Consultation Question 41

We provisionally propose that use of flight data recorder systems or devices should be mandatory for autonomous drone operations. Do you agree?

Yes

Please expand on your answer below

Yes, but I wouldn't go mad. Positional data history is probably going to be enough for 99.9% of cases.

Consultation Question 42

Should the law permit a drone to transition between remotely piloted and autonomous flight during an operation?

Yes

Please expand on your answer below

There is an inevitability to this question, so I think it's more a question of when this happens, and how it can happen safely.

Consultation Question 43

We seek stakeholder views on any other issues with the current legal framework as it relates to operations involving autonomous drones.

Please share our views below

They're coming - look at how robotic Tesla's are just about to (massively) upset the driver based taxi/ride hailing market. So there's no point putting our heads in the sand. I would get some other, more urgently needed rules in place first, attractive though the 'autonomous debate' is, it's still a way off, maybe 2030?

Civil liability and insurance

Consultation Question 44

We provisionally consider that the current law governing air carrier liability for injury or death of passengers in the UK is adequate for the introduction of remotely piloted and autonomous operations. Do you agree?

Yes

Consultation Question 45

We provisionally consider that the current law governing liability for damage to cargo in the UK is adequate for the introduction of remotely piloted and autonomous operations. Do you agree?

Yes

Consultation Question 46

We provisionally propose that liability for surface damage, in the case of UAS, should transfer to the lessee when the lease:

1. is for more than 14 days; and
2. specifies the aircraft is to be operated under the responsibility of the lessee.

Do you agree?

Yes

Consultation Question 47

We provisionally propose 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. Do you agree?

Yes

Consultation Question 48

We provisionally propose that there should be a review product liability law (including the Consumer Protection Act 1987) to take account of the challenges of emerging technologies. The review should cover product liability as a whole, rather than be confined to aviation or automated vehicles. Do you agree?

Other

Please expand on your answer below

Doesn't seem to be directly relevant to this market research; if consumer law is outdated it should be updated in the round, not because of a new aircraft type?

Consultation Question 49

We seek views as to whether the current law regarding liability for mid-air collisions is satisfactory in the case of collisions involving uncrewed aircraft systems.

Please share your views below

Yes, with proper detect and avoid systems in place.

Consultation Question 50

We seek consultees' views on whether they expect any difficulties applying existing insurance requirements to uncrewed aircraft systems.

Please share your views below

Probably, I think some insurance estimates are unrealistically high for what is primarily a delivery substitute service.

Consultation Question 51

We provisionally propose that multiple simultaneous operations should be considered as the Government develops proposals for the insurance requirements applicable to uncrewed aircraft. Do you agree?

Yes

Criminal liability

Consultation Question 52

We provisionally consider that the current approach in the Air Navigation Order 2016 placing criminal liability on an operator is adequate for autonomous operations.

Do you agree?

Yes

Consultation Question 53

We provisionally consider that the “reasonable care” defence in article 265(3) of the Air Navigation Order 2016 applies adequately for “direct contraventions” under Article 265(5) to (8) involving autonomous operations. Do you agree?

Yes

Consultation Question 54

We seek views on whether for autonomous operations the reasonable care defence should be applicable to the vicarious liability created in article 265(1) of the ANO.

Please share your views below

Yes.

Consultation Question 55

We provisionally propose that a remote pilot of an uncrewed aircraft operating in the certified category should be treated as a pilot-in-command for the purposes of criminal liability pursuant to article 265(1) of the Air Navigation Order 2016. Do you agree?

Yes

Consultation Question 56

We ask for consultees’ views on the criminal liability of pilots (or remote pilots) when an aircraft operating autonomously returns control to the pilot or vice-versa. In particular, should a pilot (or remote pilot) only become criminally liable for the piloting of the aircraft at the end of a transition period?

Please share your views below

Yes, makes sense?

Consultation Question 57

We provisionally propose that the pilot-in-command of aircraft in a multiple simultaneous operation should be criminally liable for breach of operating

requirements in the same way as a pilot in command of a single aircraft would be. Do you agree?

Yes

Please expand on your answer below

See earlier comments on multiple operations, these are still some way off in an open, broad market sense.

Consultation Question 58

We invite consultees' views on whether the Air Traffic Management and Unmanned Aircraft Act 2021 operates satisfactorily in the case of highly automated and autonomous flight.

Please share your views below

Yes.

Consultation Question 59

We invite views on how operator responsibilities for dangerous goods might need to be adapted in light of autonomous operations.

Please share your views below

Take more care; learn lessons, adapt and overcome - you can't legislate for every scenario.

Consultation Question 60

We ask for consultees' views about whether the offence of hijacking in domestic law should be updated to:

1. include the unauthorised seizure or control of autonomous or remotely piloted aircraft by technological means or by persons not on board the aircraft; and
2. expand the period in which hijacking can occur from the period when an autonomous or remotely piloted aircraft is "in flight" to the period when it is "in service".

Please share your views below

Yes. Yes, agree.

Consultation Question 61

We also ask consultees for views on whether any offences against the aircraft other than hijacking need to be updated to account for increased autonomy in aviation.

Please share your views below

Interfering with an aircraft in flight - per [REDACTED] recent suggestions to shoot drones down) - do need clarifying and reinforcing as an offence in law (Aviation Security Act). We hardly need his type of 'influencer' manipulating the media to interfere with established aviation best practices!

Impact

Consultation Question 63

We invite consultees to tell us if they have views on, or have experience or data to indicate, the likely costs and benefits of our provisional proposals in relation to drones.

Please share your views below

Try to keep it 'fit for purpose', these are £2-£3 alternatives for delivery scooters...

RESPONSE TO LAW COMMISSION CONSULTATION ON AVIATION AUTONOMY

(Law Commission Consultation Paper 261)

Please note that this consultation response has been reproduced from information entered on the Citizen Space online portal.

Any personal email addresses and phone numbers have been excluded from this document.

Unanswered questions have been deleted from this document.

About you

What is the name of your organisation?

National Police Chiefs' Council

INTRODUCTION

- 1.2 The NPCC thanks the Law Commission for the opportunity to comment on the review of the UK's regulatory framework to prepare the UK for autonomy in aviation on behalf of the UK CAA and the UK Research and Innovation Future Flight Challenge.
- 1.3 The NPCC recognises the focus of this Consultation Paper is on reforms that will enable autonomous and remotely piloted flight to take place safely, lawfully, and with appropriate legal mechanisms for attributing criminal and civil liability when things go wrong.
- 1.4 As a collection of 43 entities (police forces) who are anticipating utilising highly automated and autonomous flight to achieve policing objectives, the NPCC represents a significant stakeholder community regarding this consultation.
- 1.5 The NPCC recognises the existing legal definition: an "autonomous operation" as one during which an uncrewed aircraft operates without a remote pilot being able to intervene, and that there is no legal definition of "highly automated". The NPCC is particularly interested in drone flight beyond the visual line of sight of a remote pilot, or multiple simultaneous operations, where one remote pilot is in charge of many drones flying at the same time. Furthermore, the NPCC is keen to explore the potential of drone activity which will only require pilot oversight and monitoring of fully autonomous operations.
- 1.6 This focus on the regulatory framework is welcomed by the NPCC, reviewing the existing law and identifying where there are gaps, uncertainties, or provisions which could prevent the safe deployment of highly automated and autonomous systems. This is of particular interest to the NPCC as the UK Police currently operate drones outside UK Regulation (EU) 2019/947 because of the aircraft and their associated activities are defined as non-military State aircraft. State aircraft (and thereby State

operations) are currently 'out of scope' of the Basic Regulation, as detailed in UK Regulation (EU) 2018/1139, Chapter 1, Article 2, paragraph 3.

- 1.7 The NPCC Drones Portfolio Lead has issued operational guidance that stipulates that all police drone operations should be conducted as if the regulations did apply (i.e. as if there were no State aircraft exemption). The NPCC Drones Team has also worked with the CAA to identify 'easements' from the regulations that, when exceptionally invoked, facilitate critical policing objectives while maximising the safety of officers/police staff and minimising risk to people over whom Remote Pilots (RPs) have no control.
- 1.8 Forces are generally following the NPCC Drones guidance, which, alongside work to standardise and professionalise police drone operations UK-wide, is providing stakeholders with some assurance that police drones are operated safely. However, NPCC Drones operational guidance does not replace a formal approach to regulation of police drone operations.
- 1.9 In circumstances when there is a clear policing benefit, the NPCC believes police drone pilots should continue to be allowed to operate beyond civil regulations where it is safe to do so and where the appropriate risk assessments, mitigations and controls have been implemented. There are many examples of where police are permitted to operate beyond the restrictions applied to civil activities (e.g. pursuit driving, deploying firearms etc) and the NPCC believed drone operations should be afforded the same degree of flexibility beyond restrictions ordinarily applied to civilian drone operators to allow them to support police operations the fullness of their capabilities.
- 1.10 Recognising this Consultation Paper has been asked to concentrate on three use cases: drones; advanced air mobility; and air traffic management and air navigation services, there is little mention of ground risk and associated regulations and policies. The NPCC experience is that there is equal, if not more, attention shown to the risk to communities on the ground (uninvolved persons (UPs), and assemblies of people). The regulations and policies pertaining to these risks (Assimilated Regulation (EU) 2019/947, and CAP 722) are not specifically addressed in this Consultation.

Airworthiness and certification

Consultation Question 1

We seek views on how current airworthiness and certification regulation might need to be adapted or developed in light of highly automated and autonomous aircraft. In particular, should provisions be adopted which allow for:

1. the certification of optionally piloted and uncrewed or unoccupied versions of conventional aircraft (hybrid versions); and
2. the separate certification of command units?

Please share your views below

1. Provisions should be adopted which allow for piloted and uncrewed or unoccupied versions.

Recommend that aircraft that are classed as 'complex' (see PART NCC definition of complex), would require certification. Those aircraft that are non-complex should probably remain uncertified.

2. The certification of command units is inevitable, but question whether this should be a separate certification to the aircraft or considered to be part of the same system and therefore subject to a single certification (on the basis that they are mutually dependent and part of the aircraft system).

Consultation Question 2

We welcome views on what changes to the certification system might be necessary to enable higher automation and autonomy in aviation.

Please share your views below

Recommend that the certification system should be able to evaluate the technical safety of all AI-based systems, and not be limited by their complexity or level of human involvement. A judgement on the suitability, appropriateness and safety of the intended application of the technology will need to be addressed by a separate regulation pertaining to Airspace, UAS or Flight Operations.

Consultation Question 3

We seek views on whether current regulatory tools to support the development of highly automated and autonomous aviation technologies are adequate.

Please share your views below

The development of highly automated and autonomous aviation technologies is restricted in the UK through limited access to test, trials and evaluation facilities, airspace and appropriate regulatory expertise. The experimental category, and test and trials regulations do not adequately support the ambitions for the timely development of highly automated and autonomous aviation technologies. Current regulatory tools do not support synthetic modelling, digital twinning or other virtual prototyping and digital engineering.

Rules of the air

Consultation Question 4

We seek views on how highly automated and autonomous aircraft should act in emergency scenarios. In particular:

1. should highly automated and autonomous aircraft be given the freedom to operate outside the rules of the air in emergency circumstances; or

2. should a comprehensive set of rules be developed for highly automated and autonomous aircraft in emergency situations.

Please share your views below

(1) It may not be possible for highly automated and autonomous aircraft to continue to operate inside the rules of the air in an emergency situation. Where possible, all aircraft should operate within the rules of the air, but other users should be made aware when an aircraft is no longer able to operate inside the rules of the air in an emergency.

(2) It is logical to agree that a comprehensive set of rules be developed for highly automated and autonomous aircraft in emergency situations, to ensure aircraft behave in a predictable manner in particular circumstances.

The rule set may need to allow for the highly automated and autonomous aircraft to evolve their responses to given emergency scenarios having benefitted from the learnings gained from all other highly automated and autonomous aircraft (layered architecture of learning).

Consultation Question 5

We seek consultee views about what challenges remotely piloting an aircraft in an emergency scenario presents and how these might be addressed

Please share your views below

The following challenges are experienced when remotely piloting an aircraft in an emergency scenario:

Situational awareness

Prioritising multiple emergencies

False negatives, false positives

Fault diagnosis

Ethical dilemmas

Consultation Question 6

We seek consultees' views on whether the rules of the air relating to communication should be adapted for remotely piloted and autonomous aircraft.

Please share your views below

The following challenges are experienced when remotely piloting an aircraft in an emergency scenario:

- Situational awareness
- Prioritising multiple emergencies
- False negatives, false positives
- Fault diagnosis
- Ethical dilemmas

Consultation Question 7

We ask for consultees' views on how the rules of the air might be adapted or developed for remotely piloted or autonomous flight

Please share your views below

A new set of rules of the air relating to communications for remotely piloted and autonomous operations would be the most appropriate. Assumptions and predilections that voice communications are the primary means of communications could begin to be challenged by new digital forms of communications. This work should be developed in line with the 'electronic conspicuity' programme, with a phased transition based and approvals granted on assessments against use cases.

VTOLs

Consultation Question 8

We provisionally propose that a person overseeing a VTOL flying automatically, who monitors its course and is able to intervene and change its course at any time should continue to be classified as a "remote pilot". Do you agree?

Yes

Please expand on your answer below

This would seem appropriate. However, there is a question whether there needs to be a clear differentiation between drones operating in the Certified category, VTOL aircraft and conventional rotary aircraft? The piloting of all 3 categories of aircraft share similarities and will very likely share similar airspace. Automation already features in all 3 categories and is likely to increase. The term remote pilot should refer to all types of uncrewed aircraft and not just VTOL.

Consultation Question 9

We provisionally propose 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. Do you agree?

Yes

Please expand on your answer below

This should extend to every element of the flight; the pre-flight preparation, briefings, flightworthiness, conduct of the mission, and post-mission responsibilities, not just in-flight.

Consultation Question 10

We provisionally propose 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.

Do you agree? (Tick all that you agree with)

Please expand on your answer below

Yes, except for airworthiness. It is believed that accountability for airworthiness comes with specific engineering competencies, it might be better to use the terminology 'flightworthy'. The remote pilot must take responsibility for the condition of the aircraft in relation to the task it is about to perform.

Consultation Question 12

We provisionally propose that the remote pilot-in-command should be responsible for, amongst other things, ensuring passengers are:

1. given a safety briefing; and
2. seated and wear seat belts during take-off and landing

Do you agree?

Other

Please expand on your answer below

The remote pilot-in-command should be accountable for these duties, but responsibility may be delegated to a member of the groundcrew, with assurance being given to the remote pilot-in-command by the member of the crew who has delegated responsibility.

Consultation Question 13

We provisionally propose that air operators (rather than the remote pilot-in-command) should be responsible for preventing passengers from boarding:

1. who appear drunk or under the influence of drugs; or
2. whose carriage would, in the view of the operator's employees, endanger the safety of the aircraft or other passengers.

Do you agree?

Yes

Please expand on your answer below

The air operators should be accountable for these duties through their processes and procedures, but every member of the 'crew' has a responsibility to intervene when and where the safety of an operation might be compromised. This should follow established practices, procedures and regulations relating to AOCs.

Consultation Question 14

We provisionally propose that the remote pilot-in-command should have the power to take reasonable measures, including restraint of passengers, as set out in section 94 of the Civil Aviation Act 1982. Do you agree?

Yes

Please expand on your answer below

Yes, but it is unclear how this would be conducted.

Consultation Question 15

We provisionally propose that a person on board a VTOL aircraft (other than a crew member) should be able to take reasonable measures to protect the safety of the aircraft or of persons or property on board. Do you agree?

Other

Please expand on your answer below

Only where competent to do so and where measures taken are certain not to worsen the situation. It might be helpful to work through some use cases to understand more about how this could be managed safely (presumably by untrained passengers).

Consultation Question 16

We seek views on whether the powers of crew on board a VTOL aircraft should be broadened to reflect those of the pilot-in-command under the Civil Aviation Act 1982 to:

1. take reasonable measures to protect the safety of the aircraft or persons or property on board;
2. maintain good order and discipline; or
3. enable the crew to disembark or deliver a person.

Please share your views below

It would be more appropriate for crew on board a VTOL aircraft to reflect those of the crew in commercial aviation aircrew regulations.

Consultation Question 17

We provisionally propose that passengers should be able to contact a member of crew at all times during an operation. Do you agree?

Yes

Please expand on your answer below

This would seem sensible and appropriate to ensure the safety and security of passengers and the aircraft. But there must be a method of managing this function as too much communication can hinder (distract) the human performance of the crew and should be predominantly contained to emergency situations.

Consultation Question 18

We provisionally propose 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. Do you agree?

Yes

Please expand on your answer below

Yes, and this has already been adopted by drone operators and pilots as detailed in CAP 722.

Consultation Question 19

We provisionally propose that it should be a criminal offence for a person to act as the remote pilot of a VTOL when the level of alcohol in their blood, breath or urine is over a prescribed limit. Do you agree?

Yes

Please expand on your answer below

Yes, and this has already been adopted by drone operators and pilots as detailed in CAP 722. This would reflect both drone and commercial aviation regulations and guidance.

Consultation Question 20

We provisionally propose that the remote pilot should be subject to the reporting obligations currently applicable to pilots under the Air Operations Regulation. Do you agree?

Yes

Please expand on your answer below

Yes. Remote pilots should be subject to the reporting obligations detailed in CAP 382 for Mandated Occurrence Reports.

Consultation Question 21

We provisionally propose that a remotely piloted VTOL should be required to be capable of detecting and recording information relating to accidents and near accidents for the purposes of reporting it. Do you agree?

Yes

Please expand on your answer below

A system similar to the helicopter Health and Usage Monitoring System (HUMS) would be ideal.

Consultation Question 22

We provisionally propose that licences should be required for remote VTOL pilots. So far as appropriate, these should follow the classes and ratings adopted for crewed VTOLs. Do you agree?

Yes

Please expand on your answer below

Yes. However, different syllabi will be required to cater for the out of cockpit differences.

Consultation Question 23

We provisionally propose that operators of remotely piloted VTOL should be certified. Do you agree?

Yes

Please expand on your answer below

Yes. Further work will be required to determine how the certification will align with UK Regulation (EU) No. 1178/2011 Part FCL.

Consultation Question 24

We provisionally propose that operators of remotely piloted VTOLs should continue to be required to:

- ☒ (1) have the means necessary for the scale and scope of operations planned;
- ☒ (2) use only suitably qualified and trained personnel;
- ☒ (3) implement a management system to ensure safety;
- ☒ (4) ensure operations only take place in accordance with the operations manual;
- ☒ (5) establish procedures to minimise the consequences to safe flight operations of disruptive passenger behaviour;
- ☒ (6) develop and maintain security programmes suitable for the aircraft and type of operation;
- ☒ (7) have a management system to prevent fatigue.

☒ (8) ensure the continuing airworthiness of the aircraft; and.

☒ (9) establish procedures for any reasonably foreseeable emergency situation.

Do you agree? (tick all that you agree with)

Please expand on your answer below

Yes. A fully functioning and comprehensive Safety Management System (SMS) - referred to in bullet (3) above, would cover all requirements.

Consultation Question 25

We seek views as to whether there are additional responsibilities that operators of remotely piloted VTOLs should need to fulfil.

Please share your views below

Human Factors/Human Performance training, management and oversight will be unique in remotely piloted VTOL operations and will require additional attention.

Consultation Question 26

We seek views as to whether the law should permit remote pilots to act as pilot-in-command for more than one VTOL at the same time.

Please share your views below

Yes, in due course the law should permit remote pilots to act as pilot-in command for more than one VTOL at the same time. There is a logical conclusion that a single pilot would be able to command multiple uncrewed aircraft that operate relative to each other more easily than operations where uncrewed aircraft operate independently of each other. However, this logic is challenged during an emergency, leading to the 'uncoupling/separation' of the multiple aircraft formation and the subsequent actions required by a single pilot in command attempting to control multiple aircraft. It is reasonable to expect that the pilot in command will focus on the aircraft with the emergency to the detriment of attention being paid to the other aircraft over which the pilot in command will have responsibility. It is recommended that regulations follow a graduated path to remote pilots acting in command of multiple aircraft on a risk-based test and trials basis. Development of regulation in this area must not be designed without evidence-based testing against multiple emergency scenario.

Consultation Question 27

We seek views as to whether there should be an upper limit to the number of VTOLs for which a remote pilot can act as pilot-in-command at the same time.

Please share your views below

This should be the subject of the same rigorous testing and trialling detailed in the answer to Q26. However, it is fair to assume that there will be a reasonable expectation that there will be a finite capacity to the number of VTOLs for which a remote pilot can act as pilot-in-command at the same time.

Consultation Question 28

We seek views as to what additional safeguards should be introduced for remote pilots piloting multiple VTOLs.

Please share your views below

The piloting of the VTOL is just one element of a complex and integrated aviation system. Modelling, testing and trialling the integration of remote piloted multiple VTOLs must be conducted to consider some of the following (in no particular order); ATC/ATM, flightworthiness, airworthiness, ground operations, consumer rights, vulnerable consumers, ethical dilemmas, situational awareness, sustainability, community appetite. It would be inappropriate to introduce new legislation and/or regulation without considering the impacts of piloting multiple VTOLs remotely. This modelling may identify a number of additional safeguards relating to remote pilots responsible for multiple VTOL.

Consultation Question 29

We seek views as to whether there should be a role for a person supervising the flight of an autonomous passenger-carrying VTOL and acting as a point of contact in relation to it. What powers or responsibilities should such a person have?

Please share your views below

As those required of a nominated person as detailed in UK Regulation (EU) No. 965/2012 (ORO.GEN 200).

Consultation Question 30

Should the law permit an uncrewed VTOL to transition between remotely piloted and autonomous flight during an operation?

Yes

Please expand on your answer below

Yes, but after the same rigorous testing and trialling detailed in the answer to Q26.

Consultation Question 31

We seek views as to whether initial airworthiness standards for uncrewed VTOLs should include accessibility standards for persons with disabilities and reduced mobility.

Please share your views below

Yes, otherwise these operations would contravene the laws and regulations detailed in the Consultation Paper. It is also important to reference the requirements of public bodies under the Public Sector Equality Duty (PSED). The general duty requires decision-makers to have due regard to the need to eliminate conduct prohibited by the act, advance equality of opportunity, and foster good relations in relation to activities such as:

- recommending new or revised public policy to a minister
- publishing a consultation document
- designing and providing a public service

Consultation Question 32

We seek views as to whether the CAA should be able to include accessibility standards within the licences granted to uncrewed VTOL operators.

Please expand on your answer below

Yes, as detailed in the answer to Q31.

Drones

Consultation Question 34

We provisionally propose that a remote pilot for drones should continue to be defined as “a natural person responsible for safely conducting the flight of an unmanned aircraft by operating its flight controls, either manually or, when the unmanned aircraft flies automatically, by monitoring its course and remaining able to intervene and change its course at any time”. Do you agree?

Other

Please expand on your answer below

It is unclear how the terms pilot and pilot-in-command are delineated in highly automated or autonomous aircraft operations. The pilot-in-command must be a ‘natural person’, but in theory the pilot may be autonomous. This is likely to require use cases and testing against a number of scenarios / desk top exercises in order

to fully understand the implications of these definitions and the safety practicalities behind them.

Consultation Question 35

We seek views on whether some low risk autonomous drone operations or drone operations conducted beyond visual line of sight might be accommodated in the open category. In particular:

1. whether there are any such use cases which might be suitable for the open category; and
2. if so, what conditions should be attached to these use cases if operated in the open category.

Please share your views below

This is a balance of risk. Open category drone operations are considered lower risk, largely due to the size (and mass) of the aircraft being operated in this category. However, further modelling would be required to understand the risk of automating drones or conducted beyond visual line of sight operations in the Open category, which may increase the level of risk beyond that acceptable to the regulator, operators and affected communities. A potential alternative would be to omit the Open category from autonomous drone operations or drone operations conducted beyond visual line of sight, restricting these types of operations to the Specific and Certified Categories.

Consultation Question 36

We provisionally propose that for autonomous operations in the specific category, a UAS 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 manned 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.

Do you agree? (tick all that you agree with)

Please expand on your answer below

Emergency Services and other State Aircraft are out of scope of the 'Basic Regulation'. The NPCC believes that it is essential that while demonstrating acceptable levels of safety, State aircraft should be permitted to continue to operate outside regulations to be able to deliver their full range of capabilities in support of the Police achieving their policing outcomes.

Consultation Question 37

We seek views on what operational requirements should be applied to autonomous drone operations and drones that operate beyond visual line of sight in the specific and certified categories.

Please share your views below

All users of the airspace should be capable of detecting each other non-visually (as detailed in the DfT/CAA electronic conspicuity work).

Electronic Conspicuity (EC) is an umbrella term for the technology that can help pilots, unmanned aircraft users and air traffic services be more aware of what is operating in surrounding airspace. EC includes the devices fitted to aircraft and unmanned systems that send out the information, and the supporting infrastructure to help them work together. Airborne transponders, air traffic data displays, ground-based antennas and satellite surveillance services are all examples of EC. The information generated by these can be presented to pilots and air traffic services visually, audibly or both to provide them with information on other traffic nearby. This strengthens the principle of 'see and avoid' by adding the ability to 'detect and be detected'. To be most effective it needs 100% of users operating in a designated block of airspace using compatible EC devices, and be able to be detected by others.

Consultation Question 38

We seek views on whether the current concept of a "remote pilot" is compatible with drone MSO. We also seek views on whether the remote pilots of drone MSO should continue to be subject to the same responsibilities as remote pilots for single drone operations.

Please share your views below

It is reasonable to accept that remote pilots can be responsible for a defined number of multiple drones for as long as the drones operate in a predictable and expected manner. The responsibilities for MSO are challenged if one (or more) of the drones is compromised, operates in an unintended manner, during an emergency or requires additional capacity from the remote pilot.

It is reasonable to expect that the pilot in command will focus on the aircraft with the

emergency to the detriment of attention being paid to the other aircraft over which the pilot in command will have responsibility. It is recommended that regulations follow a graduated path to remote pilots acting in command of multiple aircraft on a risk-based test and trials basis. Development of regulation in this area must not be designed without evidence-based testing against multiple emergency scenario. This may lead to a requirement to amend the current concept of a “remote pilot” for MSO.

Consultation Question 39

We seek views on whether there should be an upper limit to the number of drones for which an individual remote pilot is responsible.

Please share your views below

This should be the subject of the same rigorous testing and trialling detailed in the answer to Q26. However, it is fair to assume that there will be a reasonable expectation that there will be a finite capacity to the number of drones for which a remote pilot can act as pilot-in-command at the same time.

Consultation Question 40

We seek views as to what additional safeguards should be introduced for remote pilots responsible for multiple drones.

Please share your views below

The piloting of multiple drones is just one element of a complex and integrated aviation system. Modelling, testing and trialling the integration of remote piloted multiple drones must be conducted to consider some of the following (in no particular order); ATC/ATM, flightworthiness, airworthiness, ground operations, consumer rights, vulnerable consumers, ethical dilemmas, situational awareness, sustainability, community appetite. It would be inappropriate to introduce new legislation and/or regulation without considering the impacts of piloting multiple drones remotely. This modelling may identify a number of additional safeguards relating to remote pilots responsible for multiple drones.

Consultation Question 41

We provisionally propose that use of flight data recorder systems or devices should be mandatory for autonomous drone operations. Do you agree?

A flight data recorder systems or devices would be extremely beneficial for autonomous drone operations in the event of an incident/accident for agencies such as the AAIB. Furthermore, the data collected for each flight would be extremely beneficial during routine operations to assist the operator and other agencies (such as the CAA, ANSPs, Future of Flight) to understand the dynamics and

characteristics of operations and the wider sector. The size and mass of the data recorder systems or devices needs to be considered for any second order effects on performance.

If data can be shared across the drone community, highly automated and autonomous aircraft can evolve their responses to given emergency scenarios having benefitted from the learnings gained from all other highly automated and autonomous aircraft (layered architecture of learning) - see also answer to Q4.

Consultation Question 42

Should the law permit a drone to transition between remotely piloted and autonomous flight during an operation?

Yes

Please expand on your answer below

Yes, but after the same rigorous testing and trialling detailed in the answer to Q26.

Consultation Question 43

We seek stakeholder views on any other issues with the current legal framework as it relates to operations involving autonomous drones.

Please share our views below

Manufacture standards are only required for Certified UAS (but these are yet to be defined). If autonomous drones are being proposed for Specific category (and possibly Open category (although not supported here)), it might be prudent to consider manufacture standards (with certification) for any aircraft flying with autonomy. Current drones already have functions such as; return to home (RTH), land immediately, auto position/hover, geofencing. Therefore, does the legal framework need to account for the current operation of drones?

Current UK Police drone operations are out of scope of UK Regulation (EU) 2019/947 because of the drones' status as non-military State aircraft. It is assumed that this arrangement will continue in a future legal framework.

Civil liability and insurance

Consultation Question 44

We provisionally consider that the current law governing air carrier liability for injury or death of passengers in the UK is adequate for the introduction of remotely piloted and autonomous operations. Do you agree?

Yes

Please expand on your answer below

Yes. Although, in the future it might be possible for a private drone remote pilot to operate an autonomous drone. It is unclear who the 'air carrier' would be in this instance. Liability and associated insurance cover will need to be clearly articulated.

Consultation Question 45

We provisionally consider that the current law governing liability for damage to cargo in the UK is adequate for the introduction of remotely piloted and autonomous operations. Do you agree?

Yes

Consultation Question 46

We provisionally propose that liability for surface damage, in the case of UAS, should transfer to the lessee when the lease:

1. is for more than 14 days; and
2. specifies the aircraft is to be operated under the responsibility of the lessee.

Do you agree?

Yes

Consultation Question 47

We provisionally propose 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. Do you agree?

Yes

Please expand on your answer below

Yes, for drones compliant with the Basic Regulation. It is recommended that non-military State aircraft / entities (such as the emergency services) remain outside the Basic and Implementing Regulation and therefore these entities remain out of scope of liability for private nuisance and trespass in section 76 of the Civil Aviation Act 1982.

Consultation Question 48

We provisionally propose that there should be a review product liability law (including the Consumer Protection Act 1987) to take account of the challenges of emerging

technologies. The review should cover product liability as a whole, rather than be confined to aviation or automated vehicles. Do you agree?

Yes

Please expand on your answer below

Yes, agree with the proposal to engage a range of experts, including technicians and lawyers, to consider the problem leading to a thorough review of the law in this area, ideally supported by public consultation.

Consultation Question 49

We seek views as to whether the current law regarding liability for mid-air collisions is satisfactory in the case of collisions involving uncrewed aircraft systems.

Please share your views below

It would appear that the current law regarding liability for mid-air collisions is satisfactory in the case of collisions involving uncrewed aircraft systems.

Consultation Question 50

We seek consultees' views on whether they expect any difficulties applying existing insurance requirements to uncrewed aircraft systems.

Please share your views below

Not known at this time.

Consultation Question 51

We provisionally propose that multiple simultaneous operations should be considered as the Government develops proposals for the insurance requirements applicable to uncrewed aircraft. Do you agree?

Yes

Please expand on your answer below

Yes, this would seem appropriate.

Criminal liability

Consultation Question 52

We provisionally consider that the current approach in the Air Navigation Order 2016 placing criminal liability on an operator is adequate for autonomous operations.

Do you agree?

Yes

Consultation Question 53

We provisionally consider that the “reasonable care” defence in article 265(3) of the Air Navigation Order 2016 applies adequately for “direct contraventions” under Article 265(5) to (8) involving autonomous operations. Do you agree?

Yes

Consultation Question 54

We seek views on whether for autonomous operations the reasonable care defence should be applicable to the vicarious liability created in article 265(1) of the ANO.

Please share your views below

The 'reasonable care' defence would seem more appropriate.

Consultation Question 55

We provisionally propose that a remote pilot of an uncrewed aircraft operating in the certified category should be treated as a pilot-in-command for the purposes of criminal liability pursuant to article 265(1) of the Air Navigation Order 2016. Do you agree?

Yes

Consultation Question 56

We ask for consultees' views on the criminal liability of pilots (or remote pilots) when an aircraft operating autonomously returns control to the pilot or vice-versa. In particular, should a pilot (or remote pilot) only become criminally liable for the piloting of the aircraft at the end of a transition period?

Please share your views below

Further modelling of potential scenarios is required. Essentially, yes criminal liability for the piloting of the aircraft should be assumed at the end of a transition period. However, it should also depend on whether the return of control is initiated/demanded or un-initiated/un-demanded by the remote pilot.

Consultation Question 57

We provisionally propose that the pilot-in-command of aircraft in a multiple simultaneous operation should be criminally liable for breach of operating requirements in the same way as a pilot in command of a single aircraft would be. Do you agree?

Yes

Consultation Question 58

We invite consultees' views on whether the Air Traffic Management and Unmanned Aircraft Act 2021 operates satisfactorily in the case of highly automated and autonomous flight.

Please share your views below

ATM and Unmanned Aircraft Act 2021 does operate satisfactorily in the case of highly automated and autonomous flight for appropriately equipped aircraft in controlled airspace. ATM is not satisfactory for automated and autonomous flight outside controlled airspace and when operating in the same airspace as aircraft not equipped with the appropriate technology for detect and avoid. Automated aircraft can only operate in a fully automated environment / system when all users of that environment are fitted with (and operate (switched on)) equivalent/complementary and serviceable detect and avoid capabilities.

Consultation Question 59

We invite views on how operator responsibilities for dangerous goods might need to be adapted in light of autonomous operations.

Please share your views below

In the case of autonomous operations, and in the event of an emergency, it should still be possible for a remote pilot-in-command to inform air traffic services of dangerous goods on board. Additionally, the operator can still provide the remote pilot-in-command with written information about any dangerous goods on board and information for use during an in-flight emergency. The responsibilities do not need to be adapted.

Consultation Question 60

We ask for consultees' views about whether the offence of hijacking in domestic law should be updated to:

1. include the unauthorised seizure or control of autonomous or remotely piloted aircraft by technological means or by persons not on board the aircraft; and

2. expand the period in which hijacking can occur from the period when an autonomous or remotely piloted aircraft is “in flight” to the period when it is “in service”.

Please share your views below

It would seem appropriate to update domestic law in relation to the offence of hijacking in relation to the 2 points listed above.

Consultation Question 61

We also ask consultees for views on whether any offences against the aircraft other than hijacking need to be updated to account for increased autonomy in aviation.

Please share your views below

It may be prudent to explore the offences relating to prohibited behaviour in the ANO. In particular, sections 240 & 241 (shown below). These offences may need to be reviewed for appropriateness in relation to direct physical attacks on drones. There is a potential risk as the number of drones increases and aggressors decide to take decisive action against them (and they may be seen as flying at heights which invite unwanted intervention). It may be appropriate to add ‘wilful’ to “recklessly or negligently”.

Endangering safety of an aircraft

240. A person must not recklessly or negligently act in a manner likely to endanger an aircraft, or any person in an aircraft.

Endangering safety of any person or property

241. A person must not recklessly or negligently cause or permit an aircraft to endanger any person or property.

RESPONSE TO LAW COMMISSION CONSULTATION ON AVIATION AUTONOMY

(Law Commission Consultation Paper 261)

Please note that this consultation response has been reproduced from information entered on the Citizen Space online portal.

Any personal email addresses and phone numbers have been excluded from this document.

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About you

What is your name?

Ramin Norouzi

Airworthiness and certification

Consultation Question 1

We seek views on how current airworthiness and certification regulation might need to be adapted or developed in light of highly automated and autonomous aircraft. In particular, should provisions be adopted which allow for:

1. the certification of optionally piloted and uncrewed or unoccupied versions of conventional aircraft (hybrid versions); and
2. the separate certification of command units?

Please share your views below

(1) No, I believe UAS have significantly different use cases, technology demands, design implications, and safety requirements compared to manned aircraft, making it impractical and inefficient for manufacturers to modify manned aircraft and create hybrid versions. Thus, contrary to the EASA's August 2023 Opinion, I do not foresee such modifications becoming widespread enough to warrant the development of type certification specifications for hybrid versions. In fact, I believe that simplifying the initial airworthiness certification process of UAS by introducing a single certificate for modified manned aircraft would pose critical safety issues. In my opinion, although UAS/VTOL are currently emerging with considerably different designs, making it challenging to develop certification specifications for their initial airworthiness, by 2027 initially, and significantly by 2033, we will see UAS/VTOL designs aimed at AAM/UAM operations mostly conforming to certain design outlines. Therefore, I believe the best practice would be to continue certifying UAS/VTOL using SC-VTOL and corresponding MOCs, and allowing these special conditions to shape future comprehensive certification specifications, until in due

course (likely in 6-7 years) CS-UAS/CS-VTOL are developed and used in place of SC-VTOL.

(2) Yes, Control and Monitoring Unit (CMU) is the integral and vital part of UAS/VTOL. Specifically, the main responsibility of ensuring safe and efficient AAM/UAM operations rests on the CMU, such as preventing in-flight loss of control (LOC) following impairment or damage. Therefore, I believe it entails a dedicated type certificate, though I believe the CMU should be assessed as part of the UAS and not separately.

Consultation Question 2

We welcome views on what changes to the certification system might be necessary to enable higher automation and autonomy in aviation.

Please share your views below

I believe the cornerstone of safe and efficient AAM/UAM operations of unmanned VTOL and UAS in general, is the utilization of AI capabilities to their fullest potential. Utilizing advanced and autonomous AI-based guidance and control systems in both manned and unmanned aircraft can significantly enhance aviation safety. For instance, such autonomous systems can be incorporated in commercial airliners' flight management system to address post-failure dynamic identification and in-flight loss of control (LOC) avoidance in the event of failures. Yet their advantages would be even more pivotal in case of unmanned VTOL and UAS operating in urban areas (i.e. UAM) as LOC in UAM operations poses a greater risk to urban safety, because UAM operations will be performed at considerably lower altitudes than commercial airliners, in and around urban areas with various terrain. Therefore, in contrast to what presented as AI difficulties in the Consultation Paper and the EASA views on this matter, one of the main strengths of AI systems such as those developed by ML and DL (e.g. DNN) is that they are not predictable in the traditional sense. This is why such systems are much more capable and intelligent than conventional and traditional explicit methods. It's unrealistic to expect AI systems to be predictable in the traditional sense and simultaneously act smarter than humans. However, such traditional unpredictability does not mean uncontained unpredictability that can pose risks to aviation safety, rather it is the powerful capability of the AI system to generate solutions and handle situations where humans fall short of predicting a viable solution or comprehending complex situations. The above misunderstanding regarding the AI unpredictability arises from a misconception that AI systems are unexplainable black boxes. However, AI experts are well aware of the processes within an AI system and often even utilize them. For instance, at Dronzit Aerospace, we have leveraged the regression equations of neural networks, which are used to predict specific impaired aircraft manoeuvrability parameters in failure scenarios, to conduct accurate sensitivity analyses quantifying the effectiveness of key parameters that further limit impaired aircraft manoeuvrability. Thus, even complex ML/DL driven systems can be appropriately explained. In my opinion, authorities such as EASA and CAA should enhance the certification process by recruiting AI experts for such certification processes, who possess the required knowledge of advanced AI systems. Another important strength of the advanced AI systems is

their ability to learn from new data that continuously enhance their accuracy and performance. In fact, the susceptibility of AI systems to biases and overfitting to new data is more evident in frozen systems that are not continuously trained on new data, and less occurring with dynamically updating systems. The aforementioned so-called unpredictability and the utilization of new datasets are pillars of AI systems adaptability, and all three together should be considered as enhancements AI is providing over traditional systems, rather than certification difficulties. I believe, BVLOS UAS operations in integrated airspace at scale by 2027, and autonomous eVTOL flight by 2030 (Strategic Outcomes of the UK Future of Flight Action Plan), won't be feasible using preliminary frozen models and data, and without advanced dynamic deep learning AI methods. While we at Dronzit Aerospace are striving to comply with certification specifications such as CS XX.1309, I believe a significant change of mindset is required regarding the certification of AI systems utilized in AAM/UAM UAS/VTOL aircraft. Essentially, certain regulatory requirements that hinder the advancement and adoption of AAM/UAM AI-based technologies must be relaxed. These especially include those imposing cumbersome limitations on dataset and evolving capability of AI systems, for certification.

Consultation Question 3

We seek views on whether current regulatory tools to support the development of highly automated and autonomous aviation technologies are adequate.

Please share your views below

I believe CAA's regulatory sandboxes are a proper approach to shaping future regulations, specifically in regards to adaptable AI-systems. However, regarding the section 4.74 of the Consultation Paper I need to reemphasize that in my opinion, adaptable AI-systems are not only appropriate for placement in safety-critical systems such as aircraft, but will significantly enhance aircraft safety to an extent impossible with traditional systems. In my opinion, frozen or low-autonomy hybrid systems will not be a fit for the envisioned advanced AAM/UAM ecosystem, limiting huge safety advantages and consequently limiting the integration of UAS in to the airspace at scale. I think through regulatory sandboxes, it will become evident how adaptable AI-systems can be safely developed for high authority automated systems while focusing the corresponding regulations on important aspects of these systems such as cyber-security rather than limiting their core functionalities.

Rules of the air

Consultation Question 4

We seek views on how highly automated and autonomous aircraft should act in emergency scenarios. In particular:

1. should highly automated and autonomous aircraft be given the freedom to operate outside the rules of the air in emergency circumstances; or

2. should a comprehensive set of rules be developed for highly automated and autonomous aircraft in emergency situations.

Please share your views below

In my opinion, highly automated and fully autonomous aircraft, i.e. aircraft utilizing advanced autonomous flight management, and guidance and control systems, should be able to operate freely in emergency cases. Because these advanced systems which will be powered by AI, will provide aircraft with the highest level of critical decision-making in emergency circumstances beyond what most human pilots are capable of. Specifically, according to annual reports published by Boeing, in-flight LOC has always been the main contributor to fatal accidents of commercial airliners. Ironically, considerable number of these fatal accidents could have been prevented if advanced and autonomous decision-making and guidance and control systems were present on commercial airliners. This is simply due to limited comprehension and computational capacity of human pilots especially under the stress of emergency circumstances. As many emergency cases require complex levels of impaired aircraft's altered dynamic evaluation and post-failure emergency trajectory optimization – which are beyond the capabilities of human pilots and current aircraft onboard systems, the way the pilot of the impaired aircraft addresses the emergency case nowadays is mainly dependent on their experience-based inference instead of accurate factual calculations. In fact, the examples provided in the Consultation Paper (i.e. flight 1549 and GA accident in 2010) corroborate that in some cases, extensively experienced pilots may be able to make the best decision but in most cases their choices have been far less than the safest and in many cases have led to fatal accidents. Unfortunately, in the Consultation Paper, autonomous aircraft have been considered with capabilities of current non-autonomous aircraft that require human pilot and their experience as an integral part, whilst in reality, many of the autonomous aircraft to be flown as part of AAM/UAM will possess highly intelligent systems that enable the unmanned aircraft to adhere to complex rules of the air far beyond maintaining speed or altitude. Moreover, the ongoing projects such as ATM-X will accommodate the traffic control communication requirements of such advanced unmanned aircraft. Overall, in my opinion, it is very inaccurate to talk about advanced autonomous aircraft adherence to rules of the air whilst considering their capabilities to be as limited as current conventional aircraft. Most of the programming challenges mentioned in the Consultation Paper regarding the adaptation of the current rules of air to autonomous aircraft seem to have been considered whilst overlooking the automated technologies such aircraft will possess. Such autonomous approaches have been successfully shown to be feasible in academic research and are being developed in industry, and thus should be taken into account when contemplating how autonomous aircraft should act in future. As I mentioned above, such advanced systems are not only capable of handling complex emergency cases in unmanned aircraft but can also significantly improve the safety of conventional aircraft such as commercial airliners, due to their enhanced decision-making capability and computational capacity.

Consultation Question 5

We seek consultee views about what challenges remotely piloting an aircraft in an emergency scenario presents and how these might be addressed

Please share your views below

UAS and VTOLs are emerging with diverse designs and hence vastly different governing nonlinear flight dynamics. Therefore, in case of a failure, it would be much harder for the remote pilot to evaluate the altered dynamics of the impaired aircraft and its remaining manoeuvrability. Therefore, in order to perform emergency approach and landing, the remote pilot might try to execute a manoeuvre outside the limited manoeuvring flight envelope of the impaired aircraft, leading to LOC. This especially has far more safety implications in UAM operations. Hence, remotely piloted aircraft, similar to fully autonomous aircraft, must be equipped with flight management systems integrating advanced intelligent guidance and control systems. Please refer to my answers to consultation questions 1 to 4 for more details. Moreover, remotely piloted aircraft, similar to fully autonomous aircraft, must be equipped with advanced sensors and algorithms (e.g. Stereo-depth and SLAM tracking cameras, LiDAR and Sonar sensors, and AI-based computer vision algorithms) providing situational awareness beyond what a conventional pilot generally has.

Consultation Question 6

We seek consultees' views on whether the rules of the air relating to communication should be adapted for remotely piloted and autonomous aircraft.

Please share your views below

In my opinion, communication rules should be revised for remotely piloted and autonomous aircraft to allow for the remote pilot or the flight supervisor (in case of fully autonomous aircraft) to carry out the communication with other parties including ATC, and intercepting authorities. I anticipate that every non-remotely-piloted fully autonomous aircraft will have a supervisor or handler. These supervising services will be provided by corresponding companies, with each supervisor overseeing multiple autonomous aircraft. In the case of remotely piloted aircraft, the remote pilot will act as the flight supervisor and will be responsible for communication tasks. These supervisors will be able to perform any form of the required communications. It should be noted that observations such as meteorological irregularities can be conducted by the suite of autonomous aircraft sensors/cameras/LiDARs that are able to detect such irregularities more accurately than the onboard human pilots. Once the detection is made, remote pilot or supervisor will be notified via the system and they can communicate this information verbally. Additionally, signals rules regarding the movement of aircraft on the ground is less applicable to the AAM/UAM aircraft as they are most likely to be VTOL, eVTOL. Finally, within the current developing framework of advanced Air Traffic Management for AAM/UAM operations, novel solutions are being envisioned as traditional communication with ATC is verbal.

Consultation Question 7

We ask for consultees' views on how the rules of the air might be adapted or developed for remotely piloted or autonomous flight

Please share your views below

In my opinion, we definitely need to have an entirely new set of rules of the air developed for the fully autonomous aircraft. As I mentioned in my response to the Consultation Question 4, many of the autonomous aircraft to be flown as part of AAM/UAM will possess highly intelligent systems that enable the unmanned aircraft to adhere to complex rules of the air. Amending the current rules will still hinder the employment of the capabilities of autonomous aircraft to the fullest. The applicable requirements approach is not straightforward but I believe is suitable to be used until a set of new rules is developed. The time required to develop a new set of rules is not necessarily a drawback, as it allows developing technologies to reach a safe deployable stage. The new rules can coexist with current flight rules, as the interaction between autonomous and conventional aircraft will be feasible using autonomous flight management systems and flight supervisor/remote pilots in place (please refer to my response to Consultation Question 6 in this regard).

VTOLs

Consultation Question 8

We provisionally propose that a person overseeing a VTOL flying automatically, who monitors its course and is able to intervene and change its course at any time should continue to be classified as a "remote pilot". Do you agree?

Yes

Please expand on your answer below

Yes, I do agree that the fully autonomous VTOL supervisor should be classified as a remote pilot. I myself have used both remote pilot and supervisor terms to convey a slight difference between the two in my answers to Consultation Questions 6 and 7, however this slight difference is only from the technical point of view regarding the level of engagement of each role. While the remote pilot role may be more suited to pilots of small UAS/drones incapable of fully autonomous flight, the supervisor term corresponds to pilots overseeing multiple fully autonomous aircraft with full capabilities of remote pilots, able to fly the fully autonomous aircraft when necessary. Therefore, I believe the MVS role of Boeing/Wisk is consistent with the FAA human-over-the-loop passive monitoring role as supervisors only become actively engaged with an aircraft under their supervision when strictly needed. Nevertheless, I do not see any need to overcomplicate the definitions by introducing a new supervisor role as supervisors will have complete competence as remote

pilots. The public can be well educated in this regard over time as these aircraft become more commonplace.

Consultation Question 9

We provisionally propose 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. Do you agree?

Yes

Please expand on your answer below

Yes, I agree. Considering that as per Regulation 965/2012, the 'pilot-in-command' shall be termed the 'commander', and that remote pilots of UAS/VTOL operating commercial air transports are indeed pilots-in-command, it is appropriate to consider the remote pilot as the commander of the AAM/UAM operation. However, the phrase "any other pilot in the aircraft" in section 94(7) of the Civil Aviation Act 1982, which according to the Consultation Paper could suggest that at least one pilot is expected to be on board, should be taken into account in order to prevent any legal inconsistencies.

Consultation Question 10

We provisionally propose 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.

Do you agree? (Tick all that you agree with)

Please expand on your answer below

Yes, I generally agree with the proposition that items 1 to 5 fall within the broad responsibilities of the remote pilot. However, as mentioned in the Consultation Paper, it is noteworthy that the fulfilment of items 1 to 4 is ensured by the remote pilot via monitoring certain information provided to the remote pilot by both the

aircraft systems and ground crew. The remote pilot should be able to assess this information through their control panels while stationed in the flight control room. Moreover, considering that “remote pilot” of VTOL includes the MVS role as seen in Boeing/Wisk and FAA concepts, where such MVS would mainly supervise fully autonomous aircraft enhanced with advanced safety systems controlling the operation of the aircraft within its safe flight envelope, the fulfilment of item 5 becomes an indirect responsibility of the remote pilot. In other words, advanced systems such as adaptive flight planners comprising AI-based flight envelope estimation and protection will be directly responsible of the aircraft operation within its safe operating limits, and the remote pilot would be responsible for ensuring that such advanced systems are operational and not malfunctioned or compromised.

Consultation Question 11

We invite views as to whether there are additional operational responsibilities that a remote VTOL pilot should be required to fulfil.

Please share your views below

The nature of remotely piloting a VTOL (including MVS role in fully autonomous VTOL) differs from piloting conventional passenger-carrying aircraft such as commercial airliners. The difference lies in one-to-one active human-aircraft interaction in a human-in-the-loop autonomy level in conventional aircraft, compared to one-to-many passive (on-demand) human-aircraft interaction in a human-over-the-loop autonomy level in autonomous VTOL. Hence, the operational responsibilities of a remote VTOL pilot are partially different from the existing pilot responsibilities. Important ones include the responsibility to oversee multiple aircraft alertly without degradation in decision-making capability, and the responsibility to effectively and efficiently interact with advanced systems currently not existing on conventional aircraft. This interaction is crucial throughout the flight, but especially in emergency circumstances where such systems play a vital role in safely concluding the flight.

Consultation Question 12

We provisionally propose that the remote pilot-in-command should be responsible for, amongst other things, ensuring passengers are:

1. given a safety briefing; and
2. seated and wear seat belts during take-off and landing

Do you agree?

Yes

Please expand on your answer below

Yes, I agree. (1) pre-recorded safety briefings are common nowadays in commercial airliners and the remote pilot should ensure that the briefing is being played correctly and timely for the passengers. (2) in addition to live video footage of the passengers, seat load sensors and seat belt sensors should also be used as to support the remote pilot.

Consultation Question 13

We provisionally propose that air operators (rather than the remote pilot-in-command) should be responsible for preventing passengers from boarding:

1. who appear drunk or under the influence of drugs; or
2. whose carriage would, in the view of the operator's employees, endanger the safety of the aircraft or other passengers.

Do you agree?

Other

Please expand on your answer below

This is a controversial issue. In case of the existence of the ground crew of the air operator, yes these should be their responsibilities rather the remote pilot. However, the existence of an air operator and ground crew is only applicable to point-to-point commute provided by AAM/UAM operators from their own vertiports (similar to regional airlines or air taxi companies), and does not apply to VTOL operations of personal VTOL owners from their personal lift-off point. I anticipate that these personal operations will become conventional post-2030 as manufacturers such as Archer have already planned their business model around this type of VTOL utilization. As I explained in my response to Consultation question 6, for such personal operations, there will be MVS service providing companies. Therefore, there will be no ground crew to prevent the VTOL owner boarding their own aircraft at their personal vertiport, along with their accompanying passengers, under the influence of drugs/alcohol or while carrying dangerous goods. This issue will be very similar to the case of DUI in cars. I believe a workaround to this could be the utilization of advanced technologies similar to driver drowsiness detection existing in cars nowadays. Then it should be the responsibility of the MVS to intervene and gain control of the VTOL and land it safely. Obviously this will have legal implications, thus laws should be accordingly amended for this matter.

Consultation Question 14

We provisionally propose that the remote pilot-in-command should have the power to take reasonable measures, including restraint of passengers, as set out in section 94 of the Civil Aviation Act 1982. Do you agree?

Yes

Please expand on your answer below

Yes, I agree. The remote pilot-in-command should be able take such reasonable measures when deemed necessary.

Consultation Question 15

We provisionally propose that a person on board a VTOL aircraft (other than a crew member) should be able to take reasonable measures to protect the safety of the aircraft or of persons or property on board. Do you agree?

Other

Please expand on your answer below

If "a person" means a passenger as discussed in paragraph 6.80 of the Consultation Paper, then no, I do not agree with granting passengers the unconditional power to take such measures. This proposition should be conditional upon passengers being able to hear and follow instructions from the remote pilot.

Consultation Question 16

We seek views on whether the powers of crew on board a VTOL aircraft should be broadened to reflect those of the pilot-in-command under the Civil Aviation Act 1982 to:

1. take reasonable measures to protect the safety of the aircraft or persons or property on board;
2. maintain good order and discipline; or
3. enable the crew to disembark or deliver a person.

Please share your views below

I believe the powers of onboard crew should be extended to reflect the existing powers of the pilot-in-command only in the case that the communications link with the remote pilot is lost and the crew cannot receive instructions. Otherwise onboard crew should be instructed by the remote pilot at all times during the flight in regards to actions described in items 1 to 3.

Consultation Question 17

We provisionally propose that passengers should be able to contact a member of crew at all times during an operation. Do you agree?

Yes

Please expand on your answer below

Yes I agree. Passengers should be able to contact a representative at all times while they are onboard the aircraft. This representative should be able to resolve passengers' requests and relay the messages to the remote pilot only when necessary.

Consultation Question 18

We provisionally propose 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. Do you agree?

Yes

Please expand on your answer below

Yes I agree, as this is strictly necessary. It is very important that the criminal offences contained in sections 92 and 93 of the Railways and Transport Safety Act 2003 apply to "remote pilots" in the broad definition that includes MVS roles as well.

Consultation Question 19

We provisionally propose that it should be a criminal offence for a person to act as the remote pilot of a VTOL when the level of alcohol in their blood, breath or urine is over a prescribed limit. Do you agree?

Yes

Please expand on your answer below

Yes, I agree. This is indeed imperative.

Consultation Question 20

We provisionally propose that the remote pilot should be subject to the reporting obligations currently applicable to pilots under the Air Operations Regulation. Do you agree?

Yes

Please expand on your answer below

Yes, I agree. The remote pilot should be obligated to log and report bird strikes, bird hazards, and collision avoidance manoeuvres performed by the aircraft's autonomous guidance and control system or the pilot themselves. There will be

adequate situational awareness technologies onboard the autonomous UAS/VTOL aircraft to alert the remote pilots of these situations.

Consultation Question 21

We provisionally propose that a remotely piloted VTOL should be required to be capable of detecting and recording information relating to accidents and near accidents for the purposes of reporting it. Do you agree?

Yes

Please expand on your answer below

Yes I agree. A remotely pilot VTOL should be able to record information provided by its situational awareness and sense and avoid technologies regarding the detected accidents and near accidents.

Consultation Question 22

We provisionally propose that licences should be required for remote VTOL pilots. So far as appropriate, these should follow the classes and ratings adopted for crewed VTOLs. Do you agree?

Yes

Please expand on your answer below

Yes, I agree. Considering the diverse and unconventional design layouts of emerging VTOLs (i.e. number and positions of wings, propulsion units, etc.), remote VTOL pilots should be licensed and have specific type ratings for each VTOL they fly, similar to crewed VTOLs.

Consultation Question 23

We provisionally propose that operators of remotely piloted VTOL should be certified. Do you agree?

Yes

Please expand on your answer below

Yes, I agree. Operators of remotely piloted VTOLs should continue to require certification.

Consultation Question 24

We provisionally propose that operators of remotely piloted VTOLs should continue to be required to:

- ☒ (1) have the means necessary for the scale and scope of operations planned;
- ☒ (2) use only suitably qualified and trained personnel;
- ☒ (3) implement a management system to ensure safety;
- ☒ (4) ensure operations only take place in accordance with the operations manual;
- ☒ (5) establish procedures to minimise the consequences to safe flight operations of disruptive passenger behaviour;
- ☒ (6) develop and maintain security programmes suitable for the aircraft and type of operation;
- ☒ (7) have a management system to prevent fatigue.
- ☒ (8) ensure the continuing airworthiness of the aircraft; and.
- ☒ (9) establish procedures for any reasonably foreseeable emergency situation.

Do you agree? (tick all that you agree with)

Please expand on your answer below

Yes, I agree that all the requirements 1 to 9 are applicable to the operators of remotely piloted VTOLs.

Consultation Question 25

We seek views as to whether there are additional responsibilities that operators of remotely piloted VTOLs should need to fulfil.

Please share your views below

In my opinion, the establishment of procedures for emergency situations should not be limited to “reasonably foreseeable” ones. Considering the low flying altitudes of remotely piloted VTOLs in UAM operations, safety implications of emergency circumstances could be more severe. Hence, procedures must be established and provided as checklists even for abnormal and emergency conditions not deemed reasonably foreseeable. This includes establishing procedures for the required tasks in case of a-priori unknown abnormal circumstances.

Consultation Question 26

We seek views as to whether the law should permit remote pilots to act as pilot-in-command for more than one VTOL at the same time.

Please share your views below

Yes the law should permit this provided that “remotely piloting in MSO” only includes the MVS role, i.e. one-to-many passive (on-demand) human-aircraft interaction in a human-over-the-loop autonomy level in autonomous VTOL. The “remotely piloting MSO” should not include simultaneous active (continuous and permanent) “manually flying” multiple aircraft, as it is not safely feasible. As I explained in my responses to Consultation Questions 8 and 11, I believe the AAM/UAM VTOLs will become fully autonomous, enabling them to be supervised in a group by a remote pilot holding an MVS role, as envisaged by Boeing and Wisk. While the MVS should be permitted to act as the pilot-in-command for all autonomous VTOLs under his supervision and intervene and gain control of any of the supervised VTOLs when necessary, a remote pilot should not be permitted to manually fly multiple non-autonomous VTOLs simultaneously throughout their entire flight time.

Consultation Question 27

We seek views as to whether there should be an upper limit to the number of VTOLs for which a remote pilot can act as pilot-in-command at the same time.

Please share your views below

The law should not prescribe such a limit as it is heavily dependent on the autonomy level of the aircraft and its technologies. However, a unique upper limit could be included in each aircraft’s flight manual depending on its autonomous capabilities. Such an upper limit should be determined during the development of the aircraft, flight tests, and certification process. It should be noted that the words “act” in “an upper limit to the number of VTOLs for which a remote pilot can act as pilot-in command at the same time”, and “control” in “a limit to the number of aircraft safe for a pilot to control at one time” in paragraph 6.116 of the Consultation Paper, should imply the MVS role as in one-to-many passive (on-demand) human-aircraft interaction in a human-over-the-loop autonomy level in autonomous VTOL, and not manually flying multiple non-autonomous VTOLs simultaneously throughout their entire flight time.

Consultation Question 28

We seek views as to what additional safeguards should be introduced for remote pilots piloting multiple VTOLs.

Please share your views below

Specific operational rules should detail how, in case of a VTOL needing the remote pilot's intervention and gaining control (for instance, due to emergency circumstances), the supervision of other aircraft under that remote pilot's supervision (i.e., the MVS) is temporarily transferred to other supervisors. These rules should include:

Automated Handover Procedures: Clear protocols for automated systems to notify and transfer control of other aircraft to alternate supervisors seamlessly.

Redundancy Plans: Redundant systems and backup personnel to ensure continuous supervision of all aircraft.

Communication Protocols: Defined communication channels and procedures for remote pilots to coordinate and confirm the transfer of supervision.

Training Requirements: Comprehensive training for remote pilots on emergency protocols and transfer procedures.

Technological Support: Advanced technologies and software to facilitate the smooth transition of supervision duties.

Consultation Question 29

We seek views as to whether there should be a role for a person supervising the flight of an autonomous passenger-carrying VTOL and acting as a point of contact in relation to it. What powers or responsibilities should such a person have?

Please share your views below

Unfortunately, the sub-section of the Consultation Paper presenting this question (i.e. "Autonomous Operations", paragraphs 6.121 to 6.134) is inaccurate and ambiguous. Entirely autonomous or fully autonomous VTOL operation should not be considered equivalent to "no ability for a human to intervene and change the course of the aircraft". Such equivalency is unreasonable, insensible, and in contrast to what industry has anticipated such as the MVS role envisaged by FAA and Boeing/Wisk outlined in paragraph 6.58. It's not even obvious why any manufacturer would want to have their fully autonomous VTOL prevent the human-remote-pilot intervention in the control of the aircraft and course of the flight, as it is against fundamental safety requirements and would logically prevent the VTOL from being certified. As I extensively expressed my views in my responses to Consultation Questions 6, 8, 10, 11, 13, 26, 27, and 28, the supervisor role of an autonomous passenger-carrying VTOL should be the envisaged MVS role which in my opinion should be considered a remote-pilot (pilot-in-command) role as supervisors in the MVS role should be responsible to intervene, override, and gain control of the autonomous VTOL when necessary. There shouldn't be any supervisor role other than the envisaged MVS.

Consultation Question 30

Should the law permit an uncrewed VTOL to transition between remotely piloted and autonomous flight during an operation?

Yes

Please expand on your answer below

Indeed such transition should be permitted in the law. In fact, the core functionality within the MVS role envisaged by industry is such transition when necessary. For instance, at Dronzit Aerospace we are developing a fully autonomous cargo eVTOL within the certified category aimed at UAM operations. While we anticipate that all the flight phases of our autonomous eVTOL will be accomplished automatically without any human intervention, it is likely that from time to time, abnormal/emergency circumstances will arise that can't be handled by the autonomous systems of the aircraft. Such events will demand the intervention of our remote pilots who will be supervising multiple aircraft in their MVS role. The required intervention will be implemented by a temporary transition from autonomous flight to remotely piloted flight.

Consultation Question 31

We seek views as to whether initial airworthiness standards for uncrewed VTOLs should include accessibility standards for persons with disabilities and reduced mobility.

Please share your views below

I believe accessibility standards for persons with disabilities and reduced mobility should be included in the initial airworthiness standards of the UK passenger-carrying VTOLs. In my opinion, having such distinct standards in the UK, as compared to those recognized globally, is not a potential drawback; rather, it is a necessary distinction for the UK to establish itself as a global leader, paving the way for other countries to follow suit.

Consultation Question 32

We seek views as to whether the CAA should be able to include accessibility standards within the licences granted to uncrewed VTOL operators.

Please expand on your answer below

In my opinion, the inclusion of accessibility standards in the airworthiness standards from the onset should be the preferred approach, yet as an alternative approach, CAA should be able to include accessibility standards within the licences granted to uncrewed VTOL operators.

Consultation Question 33

We seek consultees' views on any other issues with the current legal framework as it relates to operations involving autonomous VTOLs.

Please share your views below

An important issue that bears into my mind and has not been discussed in the Consultation Paper is the adaptation of current legal framework to "Data collection and usage" in autonomous VTOL operations. Obviously, autonomous VTOLs will be equipped with suite of advanced sensors and algorithms (e.g. Stereo-depth and SLAM tracking cameras, LiDAR and Sonar sensors, and AI-based computer vision algorithms) providing situational awareness beyond what a conventional pilot generally has. Inevitably, such visual sensors/cameras might collect visual data that will be used to navigate the aircraft through urban terrain, in aggregation with other types of data collected by other sensors. Most probably, such visual data will not be high-resolution footages of people/buildings, yet as they will be used in deep learning of VTOLs' AI-based guidance and navigation systems, they might trigger certain issues within privacy policy regulations regarding collection and processing of third-party data. Therefore, it is expected the current legal framework will be amended in way that allows for such "data collection and processing", as it is one of the core prerequisites of improving advanced safety systems of future autonomous VTOLs.

Drones

Consultation Question 34

We provisionally propose that a remote pilot for drones should continue to be defined as "a natural person responsible for safely conducting the flight of an unmanned aircraft by operating its flight controls, either manually or, when the unmanned aircraft flies automatically, by monitoring its course and remaining able to intervene and change its course at any time". Do you agree?

Yes

Please expand on your answer below

Yes, I agree. The current definition of a drone remote pilot is consistent and should be kept. In fact, autonomous drones will mostly be autonomous non-passenger-carrying VTOLs aimed at flying BVLOS in UAM operations. Whether they are designed to carry goods for delivery purposes or designed for other applications such as emergency response; infrastructure inspection; agriculture; wildlife and historical conservation; and surveillance, it will be possible for a remote pilot to monitor multiple autonomous drones at the same time and intervene when necessary. Hence, the drone remote pilot definition in question encompasses the remote pilot definition of autonomous VTOLs (i.e. the VMS role) and as such is appropriate.

Consultation Question 35

We seek views on whether some low risk autonomous drone operations or drone operations conducted beyond visual line of sight might be accommodated in the open category. In particular:

1. whether there are any such use cases which might be suitable for the open category; and
2. if so, what conditions should be attached to these use cases if operated in the open category

Please share your views below

I believe, autonomous or BVLOS drone operations will remain risky enough to not fall within the risk-based subcategories of the open category, especially in the operation in the urban areas. An important aspect of such autonomous BVLOS operations are the licensed/certified operators and their licensed remote pilot/supervisors (i.e. MVS) mainly operating in the certified category. CAA could authorize certain companies/groups to administer the applications in the specific category in order to unload the administration burden, however, in no way such burden of individual attention from the regulator shall lead to permitting autonomous/BVLOS operations in the open category. In my opinion, such permission could have serious safety and security implications for AAM and UAM operations of autonomous VTOLs in the certified category and even for the safe operation of commercial airliners over the urban areas.

Consultation Question 36

We provisionally propose that for autonomous operations in the specific category, a UAS 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 manned 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.

Do you agree? (tick all that you agree with)

Please expand on your answer below

I agree that the UAS operator should be required to use a UAS capable of complying with points 1 to 5, but I do not agree with the presumption leading to this proposition. Specifically, similar to the incorrect assumption of “Autonomous Operations” of passenger-carrying VTOLs detailed in paragraphs 6.121 to 6.134, the assumption of “no remote pilot able to intervene” in paragraphs 7.22 and 7.27 regarding the autonomous operation of drones is incorrect. In my opinion, and I believe this is the industry’s common point of view, fully autonomous operations of VTOLs and drones (UAS) should be permitted only under the supervision of an MVS remote pilot capable of intervening and gaining control of the VTOL/UAS when necessary. Therefore, I believe certain services currently being offered by unqualified companies that they can use on-the-market drones to make fully autonomous deliveries/surveillance without a comprehensive in-flight situational awareness accompanied by a licensed remote pilot supervisor, are void of the safety intended in the regulations and shall not be permitted in any of the categories.

Consultation Question 37

We seek views on what operational requirements should be applied to autonomous drone operations and drones that operate beyond visual line of sight in the specific and certified categories.

Please share your views below

In my opinion, for autonomous and BVLOS drone operations in the specific and certified categories, the most important applicable operational requirements are the SERA.3201 - Collision Avoidance, SERA.3210 - Right of way, SERA.3215 – Lighting, and SERA Section 4- Flight Plans. Moreover, the requirements needed for the safe transition of autonomous flight to remotely piloted flight in BVLOS abnormal/emergency circumstances should be defined and taken into account.

Consultation Question 38

We seek views on whether the current concept of a “remote pilot” is compatible with drone MSO. We also seek views on whether the remote pilots of drone MSO should continue to be subject to the same responsibilities as remote pilots for single drone operations.

Please share your views below

I believe that the current concept of a “remote pilot” (similar to the MVS remote pilot in VTOLs) is compatible with fully autonomous/highly autonomous drone MSO for both types of MSO. In my opinion, the intervention of the remote pilot should only occur in abnormal/emergency circumstances where necessary, such as due to malfunctioning of the onboard autonomous guidance, navigation, and control systems. In such scenarios, the intervention of the remote pilot would not undermine the operational safety, and thus the remote pilots of drone MSO should

continue to be subject to the same responsibilities as remote pilots for single drone operations.

Consultation Question 39

We seek views on whether there should be an upper limit to the number of drones for which an individual remote pilot is responsible.

Please share your views below

In my opinion, the law should not prescribe such a limit as it is heavily dependent on the autonomy level of the drone and its technologies. However, a unique upper limit could be included in each drone's flight manual depending on its autonomous capabilities. Such an upper limit should be determined during the development of the drone, and its flight tests.

Consultation Question 40

We seek views as to what additional safeguards should be introduced for remote pilots responsible for multiple drones.

Please share your views below

Specific operational rules should detail how, in case of a drone needing the remote pilot's intervention and gaining control (for instance, due to emergency circumstances), the supervision of other drones under that remote pilot's collective control is temporarily transferred to other supervisors. These rules should include:

Automated Handover Procedures: Clear protocols for automated systems to notify and transfer control of other drones to alternate supervisors seamlessly.

Redundancy Plans: Redundant systems and backup personnel to ensure continuous supervision of all drones.

Communication Protocols: Defined communication channels and procedures for remote pilots to coordinate and confirm the transfer of supervision/collective control.

Training Requirements: Comprehensive training for remote pilots on emergency protocols and transfer procedures.

Technological Support: Advanced technologies and software to facilitate the smooth transition of supervision duties.

Consultation Question 41

We provisionally propose that use of flight data recorder systems or devices should be mandatory for autonomous drone operations. Do you agree?

Yes

Please expand on your answer below

Yes, I agree. Drones capable of autonomous operations can collect detailed and accurate flight data. To assist with investigations of potential accidents and incidents, such data should either be recorded onboard the aircraft, or communicated to recording systems on the ground.

Consultation Question 42

Should the law permit a drone to transition between remotely piloted and autonomous flight during an operation?

Yes

Please expand on your answer below

Certainly. As I explained in my response to Consultation Question 40, there will be circumstances where the remote pilot should intervene and gain control of the drone. In such scenarios, the drone should temporarily perform a safe and timely transition between the autonomous flight and remotely piloted flight modes.

Consultation Question 43

We seek stakeholder views on any other issues with the current legal framework as it relates to operations involving autonomous drones.

Please share our views below

Similar to the case of VTOLs, and as I explained in my response to the Consultation Question 33, an important issue that bears into my mind is the adaptation of current legal framework to “Data collection and usage” in autonomous drone operations. Obviously, autonomous drones will be equipped with suite of advanced sensors and algorithms (e.g. Stereo-depth and SLAM tracking cameras, LiDAR and Sonar sensors, and AI-based computer vision algorithms) providing situational awareness beyond what a conventional pilot generally has. Inevitably, such visual sensors/cameras might collect visual data that will be used to navigate the aircraft through urban terrain, in aggregation with other types of data collected by other sensors. Most probably, such visual data will not be high-resolution footages of people/buildings, yet as they will be used in deep learning of drones’ AI-based guidance and navigation systems, they might trigger certain issues within privacy policy regulations regarding collection and processing of third-party data. Therefore, it is expected the current legal framework will be amended in way that allows for such “data collection and processing”, as it is one of the core prerequisites of improving advanced safety systems of future autonomous drones.

Impact

Consultation Question 62

We invite consultees to tell us if they have views on, or have experience or data to indicate, the likely costs and benefits of our provisional proposals in relation to VTOLs.

Please share your views below

In my opinion, overall, the provisional proposals presented in the Consultation paper, in relation to VTOLs will potentially enhance the safe integration of VTOLs into the national airspace and facilitate their AAM/UAM operations.

Consultation Question 63

We invite consultees to tell us if they have views on, or have experience or data to indicate, the likely costs and benefits of our provisional proposals in relation to drones.

Please share your views below

In my opinion, the provisional proposals presented in the Consultation paper regarding drones will enhance the safe integration of drones into the national airspace and facilitate their urban operations, particularly in the specific and certified categories.

Consultation Question 64

We invite consultees to tell us if they believe or have evidence or data to suggest that any of our provisional proposals could result in advantages or disadvantages to certain groups or based on particular characteristics (with particular attention to age, disability, transgender identity, marriage and civil partnership, pregnancy and maternity, race, religion or belief, sex or gender, and sexual orientation).

Please share your views below

I believe the proposition of the inclusion of accessibility standards in the airworthiness standards for the UK passenger-carrying VTOLs will result in considerable advantage to persons with disabilities and reduced mobility.

Ministry of Justice- Law

Commission consultation on aviation autonomy

The Royal Aeronautical Society response combining the Air Law, RPAAS and Rotorcraft Specialist Groups comments

DATE OF SUBMISSION: June 2024

General Comments

RPAAS and Rotorcraft SG original comments are shown in Blue. Additional comments based on those of Chris Daniels are shown in green. Items identified for consideration by the Air Law Group are shown in Red.

The RPAAs SG comments are, in general, 'high-level' in nature aligned with the consultation intent to 'identify gaps, uncertainties, or provisions (in existing law) that could prevent the safe deployment of highly automated and autonomous aviation systems in Remotely Piloted Air Systems (RPAS) and the Specific and Certified categories of drones.

Although eVTOLs may be early adopters of more autonomous functions, including being optionally piloted, conventional aircraft will become increasingly automated once there is a proven path to do so. In this regard, the Law Commission should seek to develop a framework for autonomy that is as vehicle agnostic as possible. Furthermore, autonomous use cases will develop over time so the law must allow this. If it does not, it will stifle innovation and may adversely affect safety.

Laws / requirements for the use of autonomy must be realistic and based on the relevant operational risk of the use case and applied equally to all relevant parties, regardless of the technology chosen to implement the capability.

The fast pace of drone development has resulted in regular (good intentioned) issue responsive updates to drone regulations issued periodically by the CAA, which Operators often find confusing, sometimes even contradictory, and prescriptive. This is causing a drag on the development of the sector. Introducing a principles-based legislative framework, rather than a rules-based framework is likely to be the best approach and should future-proof the legislation, in what is a fast-moving technological area.

We consider there are two key challenges:

- There are gaps in appropriate specifications for RPAS / UAS in the certified category.
- Inclusion of autonomous technologies into VTOL Capable Aircraft (e.g. eVTOL), RPAS / UAS, and Optionally Piloted aircraft will make their certification difficult in the Certified Category, and Operational Risk Assessments difficult for RPAS/UAS in the Specific category.

Definitions / Terminology

Providing appropriate answers to the questions in this consultation depends on clear definitions and associated terminology.

Terminology needs to be precise for the avoidance of doubt. It should align where possible with national and international terms already in existence (e.g. CAA, EASA, FAA, ICAO, and JARUS) Where there are several terms in use, the most appropriate to the UK should be selected.

There are several anomalies that need to be corrected if the Law Commission is to use them in follow-on reports / recommendations. Accordingly, as set out below, additional definitions and amended definitions of terms listed in the Glossary section are proposed as follows:

- **Adaptive Systems:** these respond suitably to complex and varied inputs without having to be explicitly programmed to handle them in a particular (deterministic) way. Note: depending on application, the use of these could be very dangerous. In some circumstances e.g. flight control, responses have to be strictly bounded to remain compliant with the rules of the air except in extreme circumstances.
- **Automated Systems:** The terminology 'Highly Automated' is confusing noting that increasing automation is a feature of the aviation industry. Current generation aircraft already have high levels of deterministic automation including Autoland and 4D navigation. While the intention of identifying automation of functions beyond what is currently common in aviation, and in particular where this affects roles of humans involved in the system, is understood, the use of the term "Highly Automated" to describe these systems is too vague, focused on commonality rather than level of automation and should not be used. Instead, for the purposes of an Automated System, the definitions proposed by JARUS should be adopted. As you note at paragraph 2.5-2.8, JARUS defines 5 levels: 0 Manual Operation, 1 Assisted operation, 2 Task reduction, 3 Supervised Automation, 4 Manage by Exception, and 5 Full Automation. As you note at 2.9, an Automated System would be a system falling in category 3-5 (where the machine is "in control"). A Highly Automated System could therefore be defined as one falling in category 4 or above. While we note that as you state at 2.10, for certification purposes it is necessary to consider the capacity of the whole aircraft and its supporting systems, this definition nevertheless is necessary to be clear in the discussion.
- **Autonomous:** The definition for an 'autonomous operation contained within Regulation 2019/47 as 'an operation during which an unmanned aircraft operates without the remote pilot being able to intervene' does not adequately capture the reality that VTOLs and drones will be operated on the continuum from remotely piloted to autonomous control with control moving from the RP to the aircraft and vice-versa depending on circumstance. Rather than duplicative definitions of Autonomous System and Autonomous Aircraft which are both applications of the defined term, 'Autonomous', we recommend a single defined term 'Autonomous' with the following definition: 'operating independently of human control and able to make decisions using information obtained from onboard sensors and systems and offboard sources of information but can be capable of responding to a remote pilot's – or other appropriate external control – when required'. This definition encompasses flights when there is no human intervention from pre-take off to after landing, and flights where a remote pilot can be in control for certain sectors of the flight and then hands control to the autonomous system for other sectors as stated in para 2.56 and 2.57.
- **C2 (Command and Control) Link:** data link between a remotely piloted aircraft and ground control station. Datalink implies node-to-node communications. We suggest

'Datalink and associated communications networks and systems between a remotely piloted aircraft and a Control & Monitoring Unit.'

- **Commercial Air Transport:** operations conducted for the purpose of transporting passengers, cargo or mail for remuneration or other valuable consideration. UAS can be used for variety of other tasks. Suggest use of term 'Commercial Air Operations' and extension of use-cases to include surveillance, agricultural work, pollution control etc.
- **Control and Monitoring Unit.** Suggest this EASA definition instead of GCS / Control Unit as monitoring of RPAS and drones will be required and is vital for medical delivery use cases (and probably deliveries in general) when potentially integrating with non-elective emergency response.
- **Deterministic Systems:** Definition should be added to highlight differences between these systems, where for a given set of inputs the output will always be the same, and therefore straightforward to certify, and Non-Deterministic systems. We suggest 'Deterministic automated systems operate within the rules they are given and are not allowed to change the rules.' These systems are certifiable today. However, there are examples where deterministic systems use information where there is always a probabilistic error rate caused by, for example, slightly inaccurate navigation sensors. The acceptable solution to this has been to make sure the overall system design takes into account such errors.
- **Flight Termination System:** A system that enables an aircraft to be safely recovered to the ground in emergency situations; for example, a vehicle parachute.
- **IFR: Instrument Flight Rules.** The rules applicable when the pilot flies an aircraft solely by reference to aircraft instruments, rather than by sight.
- **Machine learning (ML):** systems able to learn and adapt without following explicit instructions, by using algorithms and statistical models to analyse and draw inferences from patterns in data. There are three (or possibly more) ML paradigms which yield different results. These should be explored in the Law Commission report.
- **Multiple Simultaneous Operations (MSO):** multiple uncrewed aircraft which are under collective control and are in flight simultaneously. Define 'collective control' as being a single operator or operating entity.
- **Non-Deterministic Systems:** Definition should be added to show differences (i.e. outputs may probabilistic in nature and not absolutely repeatable for a given set of inputs) with Deterministic Systems and note that industry and regulators will need to determine how these types of system will be developed, tested, and validated as part of the authorisation / certification process. Depending on application, some non-deterministic systems might be impossible to certify in specified uses.
- **Non-part 21 aircraft:** Should read Non-Part 21 Aircraft
- **Optionally Piloted:** New definition required to cover these types of fixed and rotary wing aircraft.
- **Part 23, Part 25, Part 27, and Part 29** all for heavier aircraft should be defined.
- **RPAS: Remotely Piloted Aircraft System.** Remotely piloted aircraft and any associated equipment. This could be interpreted as equipment on the aircraft. Suggest closer alignment with UAS definition in the consultation. 'RPAS means an uncrewed aircraft and the equipment to control it remotely – potentially including Automatic Take-Off and Landing Systems.'
- **UA: uncrewed aircraft.** Aircraft with no pilot on board, including remotely piloted and autonomous aircraft systems. Suggest renaming to UAV: Uncrewed air vehicle with ...
- **UAS: uncrewed aircraft system.** Uncrewed aircraft, together with any associated equipment. Suggest closer alignment with definition in consultation. Suggest uncrewed aircraft system means "an uncrewed aircraft and the equipment to control it remotely – potentially including Automatic Take-Off and Landing Systems."

- **Uncontrolled airspace: Class G airspace.** There is no obligation [for the pilot of a crewed aircraft](#) to be in contact with an air traffic controller or flight information service officer and air traffic services may not always be available.
- **VFR: Visual Flight Rules.** The rules applicable when the pilot relies primarily on sight to fly aircraft.
- **VTOL:** a heavier-than-air aircraft, other than aeroplane or helicopter, capable of performing vertical procedures by means of more than two lift/thrust units and certified for use by one or more occupants. [For reader awareness, EASA uses the definition 'VTOL Capable Aircraft' \(VCA\).](#)

Categories of Interest

The two uses being considered are:

- 1) drones defined as remotely piloted, non-passenger carrying vehicles, and
- 2) advanced air mobility particularly Vertical Take Off & Landing providing short journeys for up to 10 people.

The aim of this consultation is to enable the Law Commission to *'propose a set of reforms which will prepare the legislative and regulatory framework for future advances in automation and, ultimately, autonomous flight.'* This is a one in generation opportunity to reset the legislative and regulatory framework in the UK and should be all inclusive to all UAS / RPAS. Its scope should therefore also include:

- 3) Regional Uncrewed Freight Aircraft, defined as cargo carrying vehicles in the class of regional 10 to 70 seat passenger aircraft covered by CS23 (<8618kg) and CS25 (>8618kg); smaller aircraft may be purpose designed while larger aircraft are likely to be optionally piloted.
- 4) Trans/Intercontinental Freight Aircraft, probably optionally piloted variants of crewed freighters.
- 5) Optionally Piloted Helicopters, defined as helicopters designed to Part 27 and Part 29 capable of being flown autonomously or remotely to carry cargo without passengers onboard.
- 6) Uncrewed / Optionally Piloted Airships, defined as lighter than air vehicles able to carry cargo and a variety of mission systems (e.g. surveillance equipment, or emergency medical equipment).
- 7) High Altitude Pseudo Satellites: these will be operating in relevant classes of airspace en-route to/from their operating altitudes.

Resources

Given the technical nature of the consultation, we respectfully propose that the Law Commission involves RPAAS SG, Rotorcraft SG (to cover eVTOL), ATM, and UTM Subject Matter Experts on a paid basis to assist its staff with the preparation of follow-on reports and consultations.

Consultation Question 1.

11.1 We seek views on how current airworthiness and certification regulation might need to be adapted or developed in light of highly automated and autonomous aircraft. In particular, should provisions be adopted which allow for:

- (1) the certification of optionally piloted and uncrewed or unoccupied versions of conventional aircraft (hybrid versions); and
- (2) the separate certification of command units?

Consultation Answer 1.

- (1) Airworthiness requirements impact safety for both users of RPAS/UAS and third parties, the latter perhaps being significantly more exposed than at present given the potential operating envelope of RPAS/UAS.
- (2) As a preliminary matter, a decision will be required in principle as to whether the minimum airworthiness requirements under Annex 8 to the Chicago Convention are appropriate for Highly Automated and Autonomous aircraft operations where they will not, by definition, be remotely piloted. Annex 8 of the Chicago Convention specifies broad standards which are required as the minimum basis for the recognition of certificates of airworthiness to enable aircraft to fly over other States including additional provisions at Part VIII and Part IX relating to remotely piloted aircraft and helicopters. There are currently no provisions relating to Highly Automated or Autonomous Aircraft operations, although planned provisions in November 2026 may begin to address these types of operation.
 - a. A decision to depart from the Annex 8 framework will both dispense with the hard-earned lessons, paid for with lives, which have enabled commercial air travel to be safest mode of transport, and potentially consign UK Highly Automated and Autonomous aircraft development to a backwater in which the market is limited to the UK in relation to both products and operations, given that the adapted airworthiness requirements may be unique to the UK if not followed by other States and/or ICAO in due course.
 - b. The risk of choosing to follow Annex 8 requirements, and ICAO's Airworthiness Technical Manual, is that any changes to those requirements to reflect the operational possibilities and flight envelope of Highly Automated and Autonomous aircraft will inevitably be slower than a solely national regime as it will require agreement at an international level or otherwise may result in unsatisfactory attempts to fit the operational possibilities of Highly Automated and Autonomous aircraft within the parameters of manned or remotely piloted operation.
 - c. The preference may be to anticipate the changes that will made to Annex 8 and align any adaptation and development of airworthiness and certification with those anticipated changes. This is the preferable option provided sufficient intelligence on the changes can be gathered.
- (3) On the assumption that Annex 8 minimum airworthiness requirements are either satisfactory or the changes to the Annex 8 framework can be anticipated for Highly Automated and Autonomous aircraft operations, we comment as follows:
- (4) Yes, provisions should be adopted which allow the certification of optionally piloted and uncrewed or unoccupied versions of conventional aircraft. Extant airworthiness and certification regulations should be used to certify automatic systems on the aircraft where possible but may have to be developed for Level 5 automated systems (where the aircraft can operate independently of human control) that are Non-Deterministic. Note: Experience of integrating major modifications into highly automated / glass cockpit aircraft would suggest the Original Equipment Manufacturer (OEM) will play a major part in any modification to convert a crewed aircraft to an autonomous aircraft. This could range introducing the modification under the Type Certificate, under a Supplemental Type Certificate or providing a Statement of No Technical Objection.
- (5) Yes, provisions should be adopted for the separate certification of command units (or Control and Monitoring Units (CMU)). This will allow Operators of several types

of UAS/RPAS to use a single common CMU type across their organisations thereby reducing training and support costs associated with the use of different CMUs. A key requirement will be to ensure that all CMUs being proposed for separate certification are interoperable with as many types of RPAS/UAS as possible; this will require adoption of internationally recognised common C2 and Information Exchange standards. Provision should be made to address the potential for some CMU capabilities to be hosted using 'Cloud' technologies at some time in the future.

- (6) Provisions should be adopted for certification of dedicated C2 datalinks that do not rely on third party terrestrial and/or satellite-based communications systems and networks.
- (7) Provisions should be adopted to ensure that C2 and communications systems are designed to cyber-security standards appropriate to operational risk to prevent interference in operations, either inadvertent or planned, by 3rd parties.
- (8) Provisions should be made to enable operators of UAS and optionally piloted aircraft to use third party terrestrial and/or satellite-based communication systems and networks for C2. This may require the terrestrial / satellite-based systems to declare what Levels of Service they will guarantee for criteria including C2 message length, format, size, acceptable speed / latency (from CMU to aircraft and vice-versa).
- (9) General Comment: For an uncrewed aircraft, the airworthiness issue is around avoiding contact with other aircraft (air risk) and ground risk. The former is primarily a function of the ATM system and how it interacts with the UAV; the latter is a combination of how airworthy the aircraft is, and how robust and reliable any Flight Termination System (FTS) is (e.g. a vehicle parachute system, or automatic identification of a safe low risk landing area and execution of a safe landing). It would be entirely feasible to have a perfectly safe aircraft (even if currently deemed un-airworthy) if its ATM interface and FTS was robust. Therefore "airworthiness" as a concept needs to be looked at and legislated for in the round, considering ATM and FTS concepts. The concepts extrapolate to VTOL aircraft. The key is to understand the risks, the redundancies, and the causal links of any software systems on board. For example, in what scenarios does a failure in the Flight Control Software result in a potential failure in FTS, or failure in the interaction with ATM systems, or Detect and Avoid capability). It is less a case of the robustness or failure rate of an individual system, but more the layering of what all the systems do in extreme events. Accordingly, systems architectures will need defined levels of redundancy that needs to be fully understood in order to be certified. That level of understanding is for a Regulator, rather than something that necessarily needs defining in law.

Consultation Question 2.

- 11.2 We welcome views on what changes to the certification system might be necessary to enable higher automation and autonomy in aviation.

Paragraph 4.72

Consultation Answer 2.

- (1) The majority of AI or ML systems use a statistical approach of assessing / analysing large data sets. This is the same approach a human expert uses to

assess whether a system is safe (to a degree of certainty, say, 10^{-9}) and a machine should be less prone to error. There are many examples of humans accepting the results of other humans, even when the order of magnitude of potential errors is not fully understood¹. The solution is to have sufficient redundancy of systems which can take over in failure modes, but are not linked to, nor affected by, the AI/ML system.

- (2) Given the paucity of data sets of the novel configurations of a lot of VTOLs and drones, any assessment of the likely chance of an event happening is almost certain to be incorrect. Therefore, layering redundancy of different methods of safety is going to be key to delivering robust aircraft which will be certifiable. The challenge is likely to be when statistical assessments (through ML or any other manner) are made using sparse datasets. Simulation can be used to develop the required larger datasets and will be key and adopting a similar approach to the one described above would also be helpful.
- (3) In principle, no changes to the certification system should be necessary to certify Automated Systems that are Deterministic Systems in nature whereby for a given set of inputs the resulting output(s) are absolutely repeatable. However, a major change with RPAS/UAS is that there will system-wide certification requirements beyond that of the RPA/UA itself.
- (4) As noted, Autonomous and Highly Automated Systems will invariably require the use of AI technologies to achieve the required level of operational safety and control. The challenges to certify systems reliant on AI technologies are understood but defining and implementing the required changes to accommodate AI technologies in a certification system, to ensure that the risks to human life do not increase compared to comparable crewed systems, is not straightforward. See comments on Autonomous Systems and Deterministic Systems above.
- (5) Provision should be made for the phased implementation of AI-based Adaptive Systems based on risk. Initially AI-based systems should be introduced for lower levels of decision making where the result of a bad decision is low risk and/or there are additional Deterministic Systems monitoring the output of the AI-based system that can over-ride it if required. This approach would enable confidence in AI-Learning to be built up with a 'safety net.'
- (6) Recognising the concerns of using adaptive Machine Learning processes in safety critical applications, provision should be adopted to allow the use of a safety-critical AI-based system in parallel with a deterministic / repeatable system whereby the proposed AI-based output / decision has to be checked by the Deterministic System as being safe before implementation during flight.
- (7) Unless there is a pilot in the loop back-up, then elements of the system software will have to be designed to Design Assurance Level A (DAL-A) the highest level of design assurance (applied to airborne software) that is applied when failure or malfunction of the software could contribute to a catastrophic failure of the aircraft. To our knowledge, DAL-A criteria have yet to be successfully applied to AI systems.

¹ It would be helpful to assess how accurately the 10^{-9} figure is with humans assessing it (there are plenty of times when it has not hit those marks, even after people have signed off on it) and comparing when machines assess it. It is also worth noting Nassim Taleb's many comments on the issue of low probability events and human's failings in assessing the high impact and low probability issues.
<https://www.edge.org/conversation/the-fourth-quadrant-a-map-of-the-limits-of-statistics>

- (8) Provision should be made that require OEMs to conduct a thorough Failure Modes and Effects Analysis (FMEA) and ensure appropriate redundancy / mitigation measures are in place to address any possible computational outputs of the AI-based Adaptive System that are catastrophic in nature or consequence.

Predictability & Explainability

- (9) Provisions should be adopted to ensure that certification authorities are provided with sufficiently deep insight into the prediction of and explanation of the outputs of AI-based systems (i.e. Development Explainability) by the system developers. The depth of insight should be proportionate to the level of operational risk being managed by the AI-based system, for example there should be very deep insight if the AI-based system is to be used for safety-of-flight applications.
- (10) Provisions should be adopted to ensure certification authorities have appropriate 'in-house' staff with required expertise and experience to oversee test, assessment and validation of AI-based systems and technologies against pre-determined risk-based criteria.
- (11) Provisions should be adopted to ensure that, once AI-based systems are certified, Operators are provided with sufficient insight into the prediction of and explanation of the outputs of AI-based systems (i.e. Operational Explainability) to be provided by the system developers (via the UAS OEM). The depth of insight should be proportionate to the level of operational risk being managed by the AI-based system.
- (12) Provisions should be adopted to ensure Operators using AI-based systems have appropriate 'in-house' or access to 3rd party staff with required expertise and experience to oversee / monitor the operation of AI-based systems and technologies during operations to ensure there are no deviations from predicted risk-based performance. Staff will also be necessary to undertake any related software / firmware updates.

Learning Data and Adaptability

- (13) Provision should be adopted to ensure correctness, completeness, and representativeness of learning data used to provide AI-based with their initial level of 'knowledge / understanding.' To this end developers need to provide certification authorities with sufficiently deep insight into learning datasets including but not limited to relevance / alignment of data to proposed operational use, the completeness of the data compared to proposed operational scenarios, use-cases, flight rules, flight management options, and environmental factors etc. The level of correctness, completeness, and representativeness should be proportionate to the level of operational risk.
- (14) Provisions should be adopted to ensure certification authorities have appropriate 'in-house' staff with required expertise and experience to oversee the development, test, assessment, and validation of learning datasets being developed by the systems developer, as well as associated test systems and test datasets.
- (15) Provisions should be adopted to ensure that, once AI-based systems are certified and have initial learning, Operators are provided with sufficient insight into the learning datasets used and relevance to operational scenarios and use cases. The

depth of insight should be proportionate to the level of operational risk being managed by the AI-based system.

- (16) Provisions should be adopted whereby AI-based systems developers have to develop certified test systems and test datasets to allow Operators to assess how the AI-based system and its learning are evolving over time and if bias is being introduced into the system. If bias is being introduced, then provisions will be required to enable AI-based to be re-baselined during their operational lives.
- (17) Provisions should be adopted to ensure that suitably varied data sets (i.e. input conditions) including unusual and unexpected inputs have been applied during the training and development of the model to reduce bias and avoid a scenario where real-world unexpected inputs result in problematic computational outputs.

Consultation Question 3.

- 11.3 We seek views on whether current regulatory tools to support the development of highly automated and autonomous aviation technologies are adequate.

Paragraph 4.86

Consultation Answer 3.

- (1) No. The current approach is holding back innovation and stifling an industry which could be just as safe, albeit by taking different approaches to those traditionally used in aerospace, as described above.
- (2) The development / test tools identified in the consultation are limited to Permit to Fly (PtF) for crewed aircraft and Regulatory Sandboxes for uncrewed aircraft. However, the CAA has authorised flight of many uncrewed air systems in the UK using the Specific Operations Risk Assessment (SORA) methodology.
- (3) CAA Sandboxes for BVLOS trials are welcome but will not be appropriate for the anticipated number of development activities required in the UK to support flight test programmes. Provision should be made to enable several dedicated test sites able to test smaller UAS and fewer more capable dedicated sites able to test larger UAS to be established in the UK. There are already several test sites in the UK, and the CAA should initially focus on the creation of protected airspace, infrastructure, and services around and between these sites, to not only demonstrate viability but also to initiate the necessary redesign of national airspace for eventual UAS / AAM operations. These would encourage innovation, but more importantly, also become areas where the regulator could have access to vast amounts of flight data of novel aircraft and learn about the regulatory process in a safe and ring-fenced environment.
- (4) The use of modelling and simulation (M&S) is widespread within the aviation industry and will be an important tool to develop, test and teach AI-based systems. Increasing computational speeds and capacity will allow AI-based system developers to create operational scenarios that mimic the real-world (as already done within flight simulators) into which highly automated and autonomous systems can be introduced alongside other actors including crewed platforms. These scenarios can then run and re-run several hundreds if not thousands of times to create learning datasets and teach the AI-based systems. Provision

therefore needs to be for regulators to gain an in-depth understanding of the M&S tools used to develop AI-based systems.

- (5) Equally, provisions should be adopted to ensure that the AI-based systems are tested in models and simulations with unusual or unexpected input variables in order to increase the likelihood that AI-based system react in a non-biased and predictable way.

Consultation Question 4.

- 11.4 We seek views on how highly automated and autonomous aircraft should act in emergency scenarios. In particular:
- (1) should highly automated and autonomous aircraft be given the freedom to operate outside the rules of the air in emergency circumstances; or
 - (2) should a comprehensive set of rules be developed for highly automated and autonomous aircraft in emergency situations.

Paragraph 5.59

Consultation Answer 4.

- (1) The autonomy and “brains” of any aircraft will develop over time. However, the law is unlikely to develop in step with technology development, so it is imperative to develop a legal framework that recognises this. In future, a Highly Automated / Autonomous aircraft should be able to decide for itself the safest course of action in an emergency.
- (2) Many emergency situations are the result of several individual events that culminate in the emergency. Catastrophic situations can be mitigated by a) ensuring the design and flightworthiness of the aircraft is appropriate to operational risk, b) aircraft health, flightworthiness and operational capabilities are continually monitored during flight to identify any anomalies, and c) appropriate action is taken to avoid an emergency situation, or d) appropriate action is taken in response to an emergency situation.
- (3) Provisions should be adopted to ensure that Highly Automated and Autonomous aircraft have capabilities to detect deteriorating situations and act within the rules of the air to avoid emergency situations. For example, appropriate sensors, monitoring equipment and automated analysis systems can detect anomalies in safety-critical vehicle equipment and systems during flight that if not acted on would lead to an emergency, and flight management systems can take appropriate action within the rules of the air, such as altering its flight plan or making a diversion, to avoid the emergency; and communicating those proposed actions to the remote pilot or Air Traffic Control for authorisation.
- (4) Provisions should allow Highly Automated and Autonomous aircraft to have a range of options to intentionally operate outside the rules of the air in lower-risk situations to avoid a catastrophic emergency so long as the options are risk-based and proportionate to air and ground risk. For example, aircraft could have several automatic options (i.e. fly left, fly right, fly up, fly, down and combinations thereof) to avoid a bird-strike in isolated areas and be allowed to make a precautionary landing (using sensors to detect and avoid any human / animal life in the landing area) in a low-density population area that is much lower risk than an emergency landing in a densely populated area.

- (5) There is a range of opinion within the industry on whether a comprehensive set of rules should be developed for Highly Automated and Autonomous aircraft in emergency situations. This will largely turn on the importance the government places on innovation as a driving factor:
- a. Options to operate outside of the rules of the air in higher operational risk areas are likely to be more limited for each emergency situation and these could be addressed by creating a comprehensive set of rules for higher-risk situations, but the development and certification effort to do so is likely to be significant.
 - b. Furthermore, from a commercial standpoint, having a comprehensive rule set (beyond basic rules of the air) is likely to be counterproductive to innovation and may not allow AI to develop to react in the best manner possible in a particular circumstance. This could potentially be addressed by modelling and repeated simulation of emergency scenarios.
 - c. From a legal view, in emergencies situations, unpredictability is common, and unpredictability is the enemy of an AI-based system. Humans will interpret the situation and more importantly the potential development of the situation based upon their experience and appreciation of the risks. While developments in AI-technologies may result in Adaptive Systems capable of accurately determining the best possible outcome, such considerations are historically fraught with difficulty (see the moral dilemmas previously posed re driverless cars). To the extent that the approach set out above in (3) is not possible, in the air law group's view any decision to allow an approach as set out above in (4) or (5)(a) still needs to be within a comprehensive set of additional rules in which the Highly Automated and Autonomous aircraft strictly operate so as to avoid any problematic weighing of outcome-based decision-making. We appreciate that this may stifle innovation. There would have to be a significant level of trust in modelling and simulation results to support (5)(b)
- (6) Flight data generated from operations can enhance modelling and simulation and digital twins with real-world data. For example, operational data could inform the modelling of how an elective drone delivery service might be diverted or share airspace safely in an emergency. This will require sensitive ethical consideration and protection of commercial interests but could be a condition of government (e.g. emergency services / healthcare) contracts.

Consultation Question 5.

- 11.5 We seek consultee views about what challenges remotely piloting an aircraft in an emergency scenario presents and how these might be addressed.

Paragraph 5.63

Consultation Answer 5.

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



- (2) Provisions should be made to ensure remotely piloted aircraft have capabilities to detect deteriorating situations onboard / in-flight and communicate these to / alert the remote pilot for awareness and action.
- (3) Provisions should be made for remotely piloted aircraft without connectivity to the remote pilot (i.e. lost link) to act in the same way as Highly Automated and Autonomous aircraft during emergency scenarios.

Consultation Question 6.

- 11.6 We seek consultees' views on whether the rules of the air relating to communication should be adapted for remotely piloted and autonomous aircraft.

Paragraph 5.73

Consultation Answer 6.

- (1) Voice communications can be replaced by two-way electronic conspicuity and communications and integrated with onboard sensing systems. For example, icing conditions and other meteorological conditions such as wind speed and direction can be detected in sophisticated Autonomous aircraft and icing locations and met data can be automatically transmitted to the ground or other aircraft providing real-time granular information. This is likely to be realised within 5-10 years. Even "Follow Me" instructions can be replicated electronically and be mandated to be pre-programmed in UAVs. The first step is to mandate Electronic Conspicuity to agreed standards for all air users. These standards for both crewed and uncrewed aircraft should be appropriate to operational use and risk.
- (2) The rules of the air will have to be adapted for larger (specific or certified category) remotely piloted and Autonomous aircraft interacting with Air Traffic Services (ATS), other aircraft, and ground handlers.
- (3) Provisions should be made, based on operational need and risk assessments, to enable voice communications between remote pilots and ATS to be addressed in several ways including use of the aircraft as a radio frequency (voice) communications relay between the remote pilot and the ATS provider, or establishing voice communications between the remote pilot and the ATS provider using other types of communication networks (e.g. telecoms).
- (4) Provisions should be made, based on operational need and risk assessments, to enable messages including requests for information, flight management instructions, ground-handling instructions, and information messages to be communicated digitally between highly automated and autonomous aircraft and ATS providers, intercepting aircraft, and ground-personnel to replace voice communications. This will require the development of standard 'message-sets' in the same way as they have developed for military datalinks.
- (5) Provisions should be made, based on operational need and risk assessments, for remotely piloted and Autonomous aircraft to use vision-based systems to a) detect and assess an intercepting aircraft and its movements and then respond as appropriate, and b) detect and assess marshallers / ground-handlers signals and respond as appropriate.



- (6) Provision should also be made for machine-to-machine communications between Autonomous aircraft and Highly Automated ATS. However, in any safety critical /safety involved operation, as a minimum, communications between the entities should be recorded for later analysis when required e.g. in the event of an incident but more generally to improve the system operation. These 'messages' must therefore be amenable to human interpretation but not necessarily in real time. For many autonomous operations close human monitoring of the communication in real time will not be feasible (nor required) although many systems will require that a human is monitoring for alerts and warnings transmitted between the system entities. We must anticipate that these systems will fail, on occasion in ways that their autonomous control functions cannot anticipate.

Consultation Question 7.

- 11.7 We ask for consultees' views on how the rules of the air might be adapted or developed for remotely piloted or autonomous flight.

Paragraph 5.95

Consultation Answer 7.

- (1) As noted in the consultation, it will be problematic to attempt to adapt the current rules of the air whilst autonomous use cases are still in their relative infancy. Furthermore, the industry is progressing from 'open' category operations to 'specific' category operations, but has not yet, within the UK, started to certify and operate 'certified' UAS.
- (2) While the development of regulations enabling specific category operations has been slow, and authorisations take time, the processes to do so are in place and are being developed under the CAA's Digitising Specific Category Operations (DiSCO) initiative. These should form the basis of formalising rules of the air for remotely piloted or autonomous flight by certified aircraft.
- (3) Provisions should therefore be made to develop applicable rules of the air for UAS communications with Air Traffic Services (ATS) for specific category operations as a bridge towards development of more comprehensive changes and potentially new rules likely to be required for certified UAS.
- (4) The Consultation has a view that changing the rule set will be a challenge. However, for a working ATM system in Shared Airspace to function, a clear and new set of rules will need to be created digitally (akin to the NASA proposal). Accordingly, the key issue may be that the ATM system chosen will dictate changes to the rules of the air.

Consultation Question 8.

- 11.8 We provisionally propose that a person overseeing a VTOL flying automatically, who monitors its course and is able to intervene and change its course at any time should continue to be classified as a "remote pilot".
Do you agree?

Paragraph 6.62



Consultation Answer 8.

- (1) Yes.
- (2) There are probably some roles of (piloting) authority, which don't involve the flying of the aircraft, but do involve decision making of what the aircraft or its passengers are doing that may need defining.

Consultation Question 9.

- 11.9 We provisionally propose 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.
Do you agree?

Paragraph 6.66

Consultation Answer 9.

- (1) No. A remote pilot may be under training.
- (2) The proposal will be acceptable if it states that the remote pilot **can be capable of being** the commander of a commercial air transport operation within the meaning of the UK Air Operations Regulation 965/2012.

Consultation Question 10.

- 11.10 We provisionally propose 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.
- Do you agree?

Paragraph 6.73

Consultation Answer 10.

- (1) Yes.
- (2) We agree with the proposed responsibilities for the remote pilot of a VTOL. They should be in a position to conduct a standard pre-flight checklist similar or even more extended than that currently conducted by a pilot. These are fundamental requirements for the safe operation of a flight, and it is important to ensure that they are complied with even in the absence of a pilot on board.
- (3) Provisions should be adopted to a) define the responsibilities of person(s) responsible for pre-flight inspection(s) of the aircraft at its location prior to take-off,

and b) ensure the responsible person communicates this information to the remote pilot.

Consultation Question 11.

11.11 We seek views as to whether there are additional operational responsibilities that a remote VTOL pilot should be required to fulfil.

Paragraph 6.74

Consultation Answer 11.

- (1) Provisions should be adopted to ensure the remote pilot ensures:
 - a. the Control and Monitoring Unit is fully functional and operative prior to flight;
 - b. the C2 link is fully functional and operative prior to flight; and will be available during flight;
 - c. communications are established with the appropriate ATS providers; and
 - d. necessary flight approvals have been obtained from ATS providers.
- (2) Furthermore, a remote VTOL pilot should be responsible for the operational planning (i.e weather conditions, airspace restrictions, the intended flight path, noise abatement procedures) and/or to ensure that appropriate flight conditions are available prior to the operation of the VTOL in the event the operational planning is done centrally. The remote pilot should also have inflight responsibilities as well as post-flight responsibilities, such as the reporting of any incidents.
- (3) VTOL emergency landing procedures are likely to be a unique feature of these aircraft, due to regular flying over built up areas at low level, and provisions should be made to ensure procedures optimise the safety of those on the ground as well as those in the air.

Consultation Question 12.

11.12 We provisionally propose that the remote pilot-in-command should be responsible for, amongst other things, ensuring passengers are:

- (1) given a safety briefing; and
- (2) seated and wear seat belts during take-off and landing.

Do you agree?

Paragraph 6.83

Consultation Answer 12.

- (1) Yes.
- (2) Provisions should be adopted to a) define the responsibilities of person(s) delivering safety briefings and ensuring passengers wear seat belts (or are restrained by 'roller coaster' style bars), and b) ensure the responsible person communicates this information to the remote pilot.
- (3) The responsible person could be remote to the aircraft and, in this case, provisions would be required to ensure the responsible person has real-time video of the passengers and be able to communicate with them, and 'seatbelt latched' signals are sent by the aircraft to the responsible person.

- (4) Provisions should be adopted to ensure that if remote / pre-recorded briefings are given, the remote pilot has real-time video of the passengers and can communicate with them.
- (5) Provisions should be adopted to ensure that the remote pilot is advised when doors are closed and latched; for example, a 'doors closed and latched' signal is sent by the aircraft to the pilot.
- (6) Overall, remote pilot should have same responsibilities usually carried by a pilot with the exception of those that require physical presence to be executed (and then alternative arrangements must be made). It is important that the safety of an operation is not compromised by the absence of a pilot on board.

Consultation Question 13.

- 11.13 We provisionally propose that air operators (rather than the remote pilot-in-command) should be responsible for preventing passengers from boarding:
- (1) who appear drunk or under the influence of drugs; or
 - (2) whose carriage would, in the view of the operator's employees, endanger the safety of the aircraft or other passengers.
- Do you agree?

Paragraph 6.84

Consultation Answer 13.

- (1) Yes.
- (2) We agree that duties which require physical presence in order to ensure compliance should be allocated to air operator employees (or contracted third parties) responsible to undertake such pre-flight duties. In Autonomous VTOL operations, the threshold for denying boarding to such passengers might be stricter due to the absence of on board crew to restrain them during flight.
- (3) Given the potential risks of unruly and therefore unsafe passengers travelling in a small and enclosed cabin, Operators may wish to assess passenger suitability before issuing a ticket, and again prior to boarding. Provisions should be adopted for Operators to conduct pre-ticketing screening of passengers.

Consultation Question 14.

- 11.14 We provisionally propose that the remote pilot-in-command 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.
- Do you agree?

Paragraph 6.85

Consultation Answer 14.

- (1) Yes.
- (2) However, the remote pilot in command should not be responsible for monitoring passenger behaviour. This should be done by another responsible person taking the place of cabin crew with authority to instruct passengers to behave.

- (3) Provisions should be adopted to ensure that a) responsible person monitoring the cabin has real-time video of the passengers, b) can take reasonable measures to restore order, and c) the remote pilot can access the real-time video of the passengers upon notification of a disturbance, can communicate with the passengers, and authorise restraint if needed.
- (4) Please refer to the article written by Dewar Donnithorne-Tait on Pilot Training for Unmanned Aircraft. (to be provided).
- (5) However, while the power should be primarily with the pilot-in-command (with responsibility of monitoring delegated to another person to monitor passenger behaviour), there is likely to be a practical difficulty in actually restraining a passenger in circumstances where there is no crew onboard.
- (6) If there is crew onboard, there should be a provision for onboard crew/delegated monitoring person to have similar power, if required, to facilitate situations where a decision is required as a matter of urgency and the pilot-in-command is responsible for the operation of more than one VTOL and therefore may not be able to respond in the urgent manner required.

Consultation Question 15.

- 11.15 We provisionally propose that a person on board a VTOL aircraft (other than a crew member) should be able to take reasonable measures to protect the safety of the aircraft or of persons or property on board.
Do you agree?

Paragraph 6.86

Consultation Answer 15.

- (1) Yes.
- (2) Provision should be made for the remote pilot or remote cabin crew to communicate with the passengers using video and audio during an emergency situation.
- (3) Provision should be made for video and audio monitoring of the cabin to ensure that passenger behaviour is recorded for post-flight assessment of behaviour and if any laws have been broken.
- (4) S.94(3) of the Civil Aviation Act 1982 already provides such a duty in circumstances where they have “reasonable grounds” to believe that the reasonable measures are “immediately necessary” to protect the safety of the aircraft or of persons or property on board the aircraft. The importance of this provision is equally applicable to VTOL. However, it is important that the same requirements for grounds of acting and immediacy are applied to any provision relating to VTOL. It may be worthwhile considering removing reference to “property on board” as the term is ambiguous and capable of abuse. Instead, the provision might reference “property attached to or forming part of the VTOL.”

Consultation Question 16.



- 11.16 We seek views on whether the powers of crew on board a VTOL aircraft should be broadened to reflect those of the pilot-in-command under the Civil Aviation Act 1982 to:
- (1) take reasonable measures to protect the safety of the aircraft or persons or property on board;
 - (2) maintain good order and discipline; or
 - (3) enable the crew to disembark or deliver a person.

Paragraph 6.87

Consultation Answer 16.

- (1) A practical difficulty arises in that there are unlikely to be crew on board.
- (2) Provision should be made for remote cabin crew, video and audio monitoring of the cabin, and communications to ensure that remote cabin crew can communicate with the passengers to maintain good order and discipline.
- (3) Provision should also be made for operators to forcibly remove an unruly person from the aircraft either before or after flight.
- (4) Beyond monitoring or removing a person before or after a flight, “reasonable measures” may only be to land the VTOL (and may need to be defined as such), since it is unlikely that there will be crew on board capable of restraining an individual. However, landing a VTOL on an unplanned landing spot is likely to present considerable difficulties in its own right and is likely to only be possible as a return to departure location. This may still be preferential if the flight is not over halfway through. Nevertheless, some thought needs to be given as to what “reasonable measures” looks like and what practically can be done to maintain good order and discipline on a flight beyond pre-departure removal.
- (5) In circumstances where there *are* crew on board a VTOL, an amendment of this nature will place the regulations concerning VTOL at odds with international law on unruly passengers. While the UK is not yet a party to the 2014 Protocol to Amend the Convention on Offences and Certain Other Acts Committed on Board Aircraft, it is a party to the 1963 Convention on Offences and Certain Other Acts Committed on Board Aircraft which provides that this power is vested in a pilot-in-command. Such broadening might require a consequential change to international law on this point. In circumstances where there is sufficient monitoring of the cabin (as detailed at (2) and at consultation answer 14(3)) there is no obvious reason why there needs to be a devolution in the powers attributed to a pilot-in-command towards crew. This power can remain with the pilot in command with instruction provided to the crew to action, as would happen in manned aviation.
- (6) To the extent that a pilot in command of a VTOL might be responsible for multiple flights at the same time we repeat the points at consultation answer 14(5). The extent of the duties and when these come into force should be clearly indicated. This will assist the investigation in the event of an incident and avoid miscommunication as to who is responsible to take action.

Consultation Question 17.

- 11.17 We provisionally propose that passengers should be able to contact a member of crew at all times during an operation.
Do you agree?

Consultation Answer 17.

- (1) Yes.
- (2) Provision should be made for passengers to contact a remote cabin crew member in case of an incident / emergency using audio, but preferably audio/video.
- (3) Agreed for the reasons given in consultation answers 10-16 above.

Consultation Question 18.

- 11.18 We provisionally propose 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.
Do you agree?

Paragraph 6.91

Consultation Answer 18.

- (1) Yes.

Consultation Question 19.

- 11.19 We provisionally propose that it should be a criminal offence for a person to act as the remote pilot of a VTOL when the level of alcohol in their blood, breath or urine is over a prescribed limit.
Do you agree?

Paragraph 6.92

Consultation Answer 19.

- (1) Yes.

Consultation Question 20.

- 11.20 We provisionally propose that the remote pilot should be subject to the reporting obligations currently applicable to pilots under the Air Operations Regulation.
Do you agree?

Paragraph 6.95

Consultation Answer 20.

- (1) Yes.

Consultation Question 21.

- 11.21 We provisionally propose that a remotely piloted VTOL should be required to be capable of detecting and recording information relating to accidents and near accidents for the purposes of reporting it.
Do you agree?

Paragraph 6.96

Consultation Answer 21.

- (1) Yes.



- (2) Provisions will need to be adopted to ensure the aircraft can automatically record and alert the remote pilot and Operator to system malfunctions, near-misses, accidents or near accidents.
- (3) The Operator should be responsible for the reporting of all accidents, near misses etc.
- (4) It is likely that the ATM provider will know of incidents before the Remote Pilot, and they might also share legal responsibility to report accidents and near misses of which they are or ought to be aware. With Electronic Conspicuity as standard, all flights could be recorded, and simulations of the flight paths could be easily calculated to show near misses and indeed any deterioration in performance against (pre-programmed) and expected norms.

Consultation Question 22.

- 11.22 We provisionally propose that licences should be required for remote VTOL pilots. So far as appropriate, these should follow the classes and ratings adopted for crewed VTOLs.
Do you agree?

Paragraph 6.99

Consultation Answer 22.

- (1) Yes.
- (2) However, this may change as automation increases, so provisions shouldn't be prescriptive about it upfront.

Consultation Question 23.

- 11.23 We provisionally propose that operators of remotely piloted VTOLs should be certified.
Do you agree?

Paragraph 6.108

Consultation Answer 23.

- (1) Yes.
- (2) As automation increase and Remote Pilots become less relevant to the process (as they will have less influence and power over decisions), so the Operators will need to fulfil many of the pilots' current roles.

Consultation Question 24.

- 11.24 We provisionally propose that operators of remotely piloted VTOLs should continue to be required to:
- (1) have the means necessary for the scale and scope of operations planned;
 - (2) use only suitably qualified and trained personnel;
 - (3) implement a management system to ensure safety;
 - (4) ensure operations only take place in accordance with the operations manual;

- (5) establish procedures to minimise the consequences to safe flight operations of disruptive passenger behaviour;
 - (6) develop and maintain security programmes suitable for the aircraft and type of operation;
 - (7) have a management system to prevent fatigue;
 - (8) ensure the continuing airworthiness of the aircraft; and
 - (9) establish procedures for any reasonably foreseeable emergency situation.
- Do you agree?

Paragraph 6.109

Consultation Answer 24.

- (1) Yes.

Consultation Question 25.

- 11.25 We seek views as to whether there are additional responsibilities that operators of remotely piloted VTOLs should need to fulfil.

Paragraph 6.110

Consultation Answer 25.

- (1) Operators should be responsible for ensuring there is a continuous link to ATM (of which Electronic Conspicuity plays a part.)
- (2) Provisions should be adopted to ensure operators of remotely piloted VTOLs:
 - a. develop and maintain security programmes suitable for the Control and Monitoring Unit (CMU), C2 datalink, communications with passengers and ATS providers, the facilities in which they are located, and type of operation.
 - b. ensure the continuing flightworthiness of the CMU, C2 datalink and communications systems.
 - c. use spectrum bandwidth appropriately.
- (3) Operators should also have legal duty regarding privacy concerns (i.e. height of overflight of personal property), and noise.

Consultation Question 26.

- 11.26 We seek views as to whether the law should permit remote pilots to act as pilot-in-command for more than one VTOL at the same time.

Paragraph 6.118

Consultation Answer 26.

- (1) Yes, this is vital for the commercial success of RPAS/drones, but they shouldn't be defined as pilots in this case. They are supervisors. Using the analogy of the early days of steam engines, an engineer would have direct responsibility over a single engine due to the complexity and level of intervention needed. Now an Engineer can supervise 100s of engines in a control room, with a team on-hand to deal with emergencies.



- (2) Provisions should be adopted to allow Multiple Simultaneous Operations (MSO) proportionate to operational risk.
- (3) Provisions should be adopted for the certification of MSO capable Control and Monitoring Units adopting certification standards proportionate to operational risk.
- (4) Provisions should be adopted to require additional pilot licensing and appropriate training to enable a single Supervisor to conduct MSO.
- (5) Provisions should be adopted to enable operators to propose operational rules appropriate to their MSO construct to the regulator for consideration and, if deemed appropriate, authorisation by the regulator.
- (6) Provision for updating the rules of the air for MSO will be required.

Consultation Question 27.

- 11.27 We seek views on whether there should be an upper limit to the number of VTOLs for which a remote pilot can act as pilot-in-command at the same time.

Paragraph 6.119

Consultation Answer 27.

- (1) This is a new operational construct, and we simply don't know how complex the process will be. However, it shouldn't be easier for operators to supervise multiple VTOLs (or drones) compared to operating a single VTOL (or drone) as this will result in operators flying a second aircraft just to obtain regulatory benefit.
- (2) Provisions should be adopted to limit the number of aircraft controlled by a single remote pilot at any time should be proportionate to operational risk (e.g. airspace complexity, air traffic density, ground risk, UAS operational capabilities etc.) at that time. For example, a remote pilot could control several aircraft if they are widely separated en-route over sparsely populated areas in low traffic density, while numbers would be much less or even a single aircraft during operations in a complex terminal area with high density traffic.
- (3) There are parallels with the numbers of aircraft Air Traffic Controllers can control at any one time, depending on operational circumstance (i.e. ground, take-off, climb, en-route, descend, and land in low, medium and high-density traffic) and ATC limitations on numbers controlled by a single person could form the basis of such provisions.
- (4) This could potentially be addressed by modelling and repeated simulation of scenarios involving remote pilots acting as pilot in command for multiple VTOLs, with this testing validated by a third-party provider.

Consultation Question 28.

- 11.28 We seek views as to what additional safeguards should be introduced for remote pilots piloting multiple VTOLs.

Paragraph 6.120

Consultation Answer 28.

- (1) Provisions should be adopted to limit the workload of remote pilots.



- (2) Again, there are parallels with the limiting the workload of aircraft Air Traffic Controllers and ATC workload related rules, procedures and processes could form the basis of such provisions.
- (3) The need for additional safeguards will also depend on the interaction with and the legal status of other systems.
- (4) See also consultation answer 14(5) and 16(6).

Consultation Question 29.

- 11.29 We seek views as to whether there should be a role for a person supervising the flight of an autonomous passenger-carrying VTOL and acting as a point of contact in relation to it. What powers or responsibilities should such a person have?

Paragraph 6.135

Consultation Answer 29.

- (1) Please refer to answers to Questions 10, 11, 12, and 14. However, the legal responsibility should be with the Operator, and how they demonstrate safety and checks is up to their operating procedures. This is a normal process in most general sectors of industry.
- (2) Provisions should be adopted to a) define the responsibilities of person(s) performing pre-flight inspection(s) of the aircraft at its location prior to take-off, and b) ensure the responsible person communicates this information to the flight Supervisor.
- (3) Provisions should be adopted to ensure the Flight Supervisor ensures:
 - a. the Control and Monitoring Unit is fully functional and operative prior to flight;
 - b. the C2 link is fully functional and operative prior to flight;
 - c. communications are established with the appropriate ATS providers; and
 - d. necessary flight approvals have been obtained from ATS providers.
- (4) Provisions should be adopted to a) define the responsibilities of person(s) performing safety briefings and ensuring passengers wear seat belts, and b) ensure the responsible person communicates this information to the Flight Supervisor.
- (5) Provisions should be adopted to ensure that if remote / pre-recorded briefings are given, the Flight Supervisor has real-time video of the passengers and can communicate with them and 'seat belt latched,' 'door latched' signals are sent to the Flight Supervisor.
- (6) Provisions should be adopted to enable the Flight Supervisor to authorise restraint of passengers, subject to the points made in response to question 16.

Consultation Question 30.

- 11.30 Should the law permit an uncrewed VTOL to transition between remotely piloted and autonomous flight during an operation?

Paragraph 6.140

Consultation Answer 30.



- (1) Yes.
- (2) As aircraft performance, and thus range, improves over time there will be an increasing desire to conduct autonomous operations when it is safe to do so.

Consultation Question 31.

- 11.31 We seek views as to whether initial airworthiness standards for uncrewed VTOLs should include accessibility standards for persons with disabilities and reduced mobility.

Paragraph 6.160

Consultation Answer 31.

- (1) The size of VTOL Capable Aircraft (i.e. 4 to 8 seats) and door aperture dimensions will unfortunately limit accessibility for some people with disabilities and reduce mobility.
- (2) Inclusion of accessibility features into the basic design of VCA may not be appropriate to some VCA but could be accommodated in others. For example, the quick removal of a seat to allow the carriage of an assistance dog or mobility equipment. These features are likely to be introduced on a case-by-case basis, either as part of the basic design or as a modification and should be treated as such by the regulator.
- (3) Provisions should be made to provide ground assistance to people with disabilities or reduced mobility to help them board and then leave the aircraft after landing.
- (4) Provisions should also be made for all safety information to be provided in an accessible format.
- (5) Consideration will need to be given as to whether any refusal to carry passengers with disabilities or reduced mobility, notwithstanding the practical dimensional limitations of the VTOL Capable Aircraft, will represent a breach of the Civil Aviation (Access to Air Travel for Disabled Persons and Persons with Reduced Mobility) Regulations 2007. An amendment may be necessary to provide clarity about the bases on which a passenger with disabilities or reduced mobility can be refused carriage on VTOL Capable Aircraft to avoid situations where the dimensional limitations of the aircraft are being used as a means for denying carriage inappropriately.
- (6) Given the rise in the number of people with disabilities, this is rapidly becoming a commercial question as well; an OEM should see the commercial benefit of designing a VTOL that accommodates a sizeable chunk of the market, and one that will only grow.

Consultation Question 32.

- 11.32 We seek views as to whether the CAA should be able to include accessibility standards within the licences granted to uncrewed VTOL operators.

Paragraph 6.161

Consultation Answer 32.



- (1) The imposition of accessibility standards on VCA operators would need to be justified based on actual and anticipated need. This is most likely to be best understood by the VCA operators during initial operations.
- (2) Provision should therefore be made for the CAA to include accessibility standards into operational licenses if requested by uncrewed VCA operators. This will enable the CAA and Operators to better assess what level of accessibility is required and inform whether or not such standards are appropriate.
- (3) Consideration will first need to be given as to how the government intends for the Civil Aviation (Access to Air Travel for Disabled Persons and Persons with Reduced Mobility) Regulations 2007 to apply to VTOL operators. If there is clear approach that arises from this analysis, then it would be helpful to include accessibility standards within the licenses. If not, and if it is to be dealt with on a case-by-case basis, then including such accessibility standards is likely to cause confusion and difficulty.

Consultation Question 33.

- 11.33 We seek consultees' views on any other issues with the current legal framework as it relates to operations involving remotely piloted and autonomous VTOLs.

Paragraph 6.163

Consultation Answer 33.

- (1) There may be legal challenges to, for example, eVTOL operations in terms of environmental (carbon) impact, requests for electricity supply in dense urban areas (where the system is already reaching capacity, priority of use when the airspace and/or ATM system is overloaded, access to clear views of the sky. and the ownership of the air itself – especially at low levels above private property. All of these are likely to lead to legal test cases, so it is prudent to investigate these areas in advance.

Consultation Question 34.

- 11.34 We provisionally propose that a remote pilot for drones should continue to be defined as “a natural person responsible for safely conducting the flight of an unmanned aircraft by operating its flight controls, either manually or, when the unmanned aircraft flies automatically, by monitoring its course and remaining able to intervene and change its course at any time”.
Do you agree?

Paragraph 7.14

Consultation Answer 34.

- (1) Yes, but provisions should be clear that the introduction of Highly Automated and Autonomous systems by definition do not require a Remote Pilot, and therefore do not require someone that meets this definition.
- (2) Expanding on this point: This definition works currently, where almost all flights are conducted VLOS. However, the Future Flight Industry Group's Future Flight Action



Plan² has a timetable for “routine BVLOS” flights by 2027 (although many industry commentators believe this to be an unrealistically optimistic timeframe, due to the challenges of regulation and legislation.)

- (3) BVLOS flights will be wholly or highly reliant on Highly Automated and Autonomous systems whereby the drone itself will be able to change course itself based on its awareness of its surroundings, without human intervention from afar (noting pilot error is a considerable cause of accidents in crewed aircraft). Accordingly, a computer system (i.e. ATM at the airspace level, and GCS at the drone level) is likely to be best placed, and perhaps the only commercially viable option, to monitor BVLOS flights.
- (4) Accordingly, the requirement for a Remote Pilot to be able to intervene at any time during a Highly Automated and Autonomous operation may both not be practically possible in some scenarios (e.g. operations over isolated areas without communications) and in any event contradicts the definition of a Highly Automated and Autonomous system. Provision needs to therefore be made to ensure that the Remote Pilot is not a requirement for such a system.
- (5) However, public opinion will require the Operator to be responsible for safe BVLOS operations and appropriate provisions will be needed.

Consultation Question 35.

- 11.35 We seek views on whether some low-risk autonomous drone operations or drone operations conducted beyond visual line of sight might be accommodated in the open category. In particular:
- (1) whether there are any such use cases which might be suitable for the open category; and
 - (2) if so, what conditions should be attached to these use cases if operated in the open category.

Paragraph 7.20

Consultation Answer 35.

- (1) Until circumstances change as discussed below, BVLOS should not be accommodated in the Open Category.
- (2) The point of the Open Category is that the equipment, level of required training etc. is all kept as simple as possible and is the least risky to operate, such that it can be made available to as many operators as possible.
- (3) BVLOS should continue to be kept in Specific and Certified Categories to ensure proper management of the associated risk.
- (4) The Open Category should remain VLOS to ensure there is not an increase in occurrence rates.
- (5) There is an argument that BVLOS operations are currently viewed as higher risk, but this is due to not having the required infrastructure in place to bring the risk down. For routine BVLOS to happen, Electronic Conspicuity, DAA, ATM systems, and full integration with the GA community will all need to exist. This should make future

² <https://assets.publishing.service.gov.uk/media/661943b7679e9c8d921dfeeb/fof-action-plan.pdf>

BVLOS operations safer than current VLOS drone operations but will clearly take time. Provisions should be made to re-assess BVLOS operations in the Open Category when the necessary infrastructure is established, and the risks are fully understood and comparable with, or better than, VLOS operations (this is generally true of all operations; there should be flexibility for the CAA in reassessing them within the respective categories depending on validated evidence of the applicable risk).

- (6) There are already some very safe BVLOS operations (e.g. over uninhabited areas in Scotland, or bodies of water with little boat traffic) that could potentially be accommodated in the Open Category without increasing risk. However, to do so in the short-term would require provisions for such operations and associated procedures and processes to be introduced to ensure the operational risks are understood and managed. These are already in place and are being developed further for Specific Category operations, so the benefits of this approach are questionable.
- (7) BVLOS will be critical to the success of future drone operations. Making it easier for the lower risk category of drone to experiment in this area will be a key enabler of future drone development. With First Person View (FPV) making drones safer, there is a commercial argument for provisions to let this happen now, so developers can learn by testing and doing, rather than trying to intellectually think through an unknown answer. Provisions should be made to allow the CAA to adopt this approach under the Open Category in dedicated test areas that are low or zero population, with minimal OSC bureaucracy, with safety ensured through robust geofencing and a good Flight Termination System (e.g. parachute).
- (8) There have also been ambiguities where CAA permissions have been granted for nano-drone (<250gm) operations within the confines of an airport where its ATC has safety case primacy, while permission for the same testing in an empty area of the Highlands of Scotland was refused. Provisions need to be made to ensure regulatory permissions are based on safety and not to ease legislative burden.

Consultation Question 36.

- 11.36 We provisionally propose that for autonomous operations in the specific category, a UAS 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.
- Do you agree?

Paragraph 7.28

Consultation Answer 36.

- (1) Agree.



- (2) Provisions should be adopted for autonomous drone operations in the specific category proportionate to risk.
- (3) Provisions should be adopted requiring the UAS (including Control and Monitoring Unit) to:
 - a. comply with the authorised limitations and conditions.
 - b. have mid-air collision and terrain avoidance capabilities based on an accepted target level of safety for the operation, and proportional to the operational air and ground risk (i.e. air traffic density, population density, UAS collision and terrain avoidance capabilities). Note: to avoid ANY risk of mid-air collision between crewed and uncrewed aircraft will be almost impossible to prove to any decent degree of robustness and to require zero risk of collision just means there'll never be any autonomous flight outside of danger areas (if considered acceptable). Furthermore, with good navigation, DAA and ATM capabilities, a drone could fly within a metre of another drone perfectly safely, but this would be unacceptable to a crewed aircraft.
 - c. comply with the operational limitations in designated geographical zones or airspace;
 - d. comply with the operator's procedures; and
 - e. detect and avoid locations where an emergency response effort is ongoing unless they have permission to do so from the responsible emergency response services; this will require the employment of technologies and provisions for:
 - i. the emergency services to create a temporary 'no fly zone' for unauthorised drones.
 - ii. rapidly notify drone operators via the equivalent of a Notice to Airman (NOTAM), and
 - iii. establish C2 protocols enabling authorised drones to enter the emergency response area.
- (4) 'Discontinuation' (of a flight) also needs to be defined. Is that fly safely elsewhere, or emergency land, or just climb out of the way? All of these can feature (normally independently to each other) in different current drone emergency safety procedures.

Consultation Question 37.

- 11.37 We seek views on what operational requirements should be applied to autonomous drone operations and drones that operate beyond visual line of sight in the specific and certified categories.

Paragraph 7.41

Consultation Answer 37.

- (1) Operational requirements typically look at the aircraft, the ATM system and any other (system) redundancy as independent issues. However, BVLOS drone operations require a much more systematic approach to ensure capture of system interdependencies. Operational requirements will include the UTM system, but there are some fundamentally different UTM systems under development. Drones will have quite distinct characteristics to other aircraft types including abilities to geofence itself, drone to drone communication, embedded decision-making, and optional Flight Termination capabilities. All of these will need to be considered when compiling a complete set of operational requirements.



- (2) BVLOS Specific Category operations are totally dependent on the operational environment. The most appropriate top-level requirement would be that such a drone operation should meet a target level of safety set by the Authority for the precise operational environment and operation in question.
- (3) Certified Category operations would be subject to the same certification requirements as their crewed equivalents (e.g. GA, Rotorcraft or Commercial) since the level of certification would be equivalent to their crewed equivalents (e.g. CS 23, CS 25).
- (4) It would be helpful to split this question into certification requirements and operational requirements. For example, an aircraft may be certified to a certain requirement (e.g. CS 23/25/27/29) but is permitted to do what defined by the operational regulations.

Note: The safety target is a combination of the certification level and the type of operations. Higher safety levels are required if there is a risk to 3rd parties. For example, BVLOS operations using an aircraft certified to a certain standard can be permitted over sparsely populated areas; but a higher standard of safety would be required if using the same aircraft over a city, where there is a greater risk to 3rd parties. A similar case is helicopter performance categories (PC 1, 2, 2e and 3) which are mainly determined by 3rd party risk and separate to Category A and B certification requirements.

Consultation Question 38.

- 11.38 We seek views on whether the current concept of a “remote pilot” is compatible with drone MSO. We also seek views on whether the remote pilots of drone MSO should continue to be subject to the same responsibilities as remote pilots for single drone operations.

Paragraph 7.52

Consultation Answer 38.

- (1) No. Refer to Answer 26.
- (2) The concept of a ‘Remote Pilot’ is not compatible with MSO. Instead, the concept of a ‘Supervisor’ should be used and should he/she should have the same responsibilities as a pilot of a single drone.

Consultation Question 39.

- 11.39 We seek views on whether there should be an upper limit to the number of drones for which an individual remote pilot is responsible.

Paragraph 7.53

Consultation Answer 39.

- (1) The upper limit to the number of drones for which an individual pilot is responsible will be determined by the complexity of the drone flights, numbers of drones involved, levels of automation and autonomy, and the resulting pilot workload.
- (2) MSO can be categorised into the following operations:
 - a. ‘Multiple Single Drone’ operations where the remote pilot is responsible for several drones operating individually with different flight plans.
 - b. ‘Drone Group’ operations where the remote pilot is responsible for a group of several drones operating and controlled individually but with coordinated flight plans, analogous to a formation of crewed aircraft.



- c. 'Swarm' operations where the large numbers of drones prohibit individual control by a remote pilot and dictate that the remote pilot must be responsible for the swarm as an entity and not individual drones.
- (3) As proposed in the answer to Question 27, provisions should be adopted to limit the number of drones controlled by a single remote pilot at any time based on operational risk (e.g. airspace complexity, air traffic density, ground risk, UAS operational capabilities etc.) at that time.
 - (4) 'Multiple Single Drone' and 'Drone Group' operations will be in many ways like VTOL operations and the numbers for which the remote pilot can be responsible should be based on the experience of ATC providers.
 - (5) Considering the 'Swarm' as an entity enables provisions to be adopted making a remote-pilot responsible for the swarm.
 - (6) Provisions should be made to stop single drone operators adding another drone to their operations to ensure they fall under the MSO regulations, which almost certainly makes operations less safe.
 - (7) One approach would be to define what is safe for MSOs, and then use that as a framework for all legislation and regulations for all drone users, including single drone operators.

Consultation Question 40.

- 11.40 We seek views as to what additional safeguards should be introduced for remote pilots responsible for multiple drones.

Paragraph 7.54

Consultation Answer 40.

- (1) As noted in the answer to Question 28, provisions should be adopted to limit the workload of remote pilots.
- (2) Again, there are parallels with the limiting the workload of aircraft Air Traffic Controllers and ATC workload related rules, procedures and processes could form the basis of such provisions.
- (3) If the wider drone legislative framework addresses all MSO operations without needing to specifically mention them, then it is probably focused correctly technologically and not overly burdensome.

Consultation Question 41.

- 11.41 We provisionally propose that use of flight data recorder systems or devices should be mandatory for autonomous drone operations.
Do you agree?

Paragraph 7.58



Consultation Answer 41.

- (1) Yes. The lack of robust drone incident and crash data is problematic for the industry, for insurers and for regulators. Provisions should be adopted to ensure flight data of autonomous drones is recorded.
- (2) Flight Data is readily available now and is typically recorded, but on ground systems (or the smart phones or other controllers that are used to operate drones). There shouldn't be a need for a flight data recorder on smaller drones under the control of CMUs and the SWaPC (Size, Weight and Power, and Cost) are likely to make this prohibitive.
- (3) Onboard recording will be required for drones conducting autonomous operations and this should be proportionate to the size / weight / complexity of the drone and category of operation being conducted.
- (4) Provisions should be made to ensure data needs to be kept for a certain period of time, say 24 hours as a guide / minimum, as any issues with that drone should be reported within that timeframe.
- (5) While it is of course hoped that accidents and incidents involving Autonomous drones will not occur, such flight recording devices will be critical for understanding the cause of the accidents and incidents in order to improve safety and improve technology. As noted at (3) subject to size / weight / complexity considerations (which go to the complexity of the digital flight data recorder and the number of parameters recorded), this will be particularly important for drones operating in circumstances where there is a risk of damage or injury to third parties (where a full range of parameters should be mandatory).
- (6) Consideration ought to be given to the parameters currently recorded on digital flight data recorder systems that need to be installed to determine if the current parameters recorded are suitable for Autonomous operations. In particular if there may be additional parameters exclusive to Autonomous operations that need to be recorded (for example computational outputs and flight commands generated by AI-technologies) or some parameters that ought to be deleted (for example pilot pressure/force applied to various flight controls).

Consultation Question 42.

- 11.42 Should the law permit a drone to transition between remotely piloted and autonomous flight during an operation?

Paragraph 7.60

Consultation Answer 42.

- (1) Yes.
- (2) As noted previously, there shouldn't be a transition time associated with this, nor necessarily seen as a different legal status at different points in the transition. Control by a remote pilot to fully automated autonomous operations is not a binary switch, but a continuum and it will be virtually impossible to define in the future where any drone is on this continuum at any point in time.
- (3) The law must permit a drone to transition between remotely piloted, automated flight, and autonomous flight during an operation. Such a transition does raise safety



concerns (regarding the pilots' reaction to the transition demand), and it has been highlighted by car insurers when the question was raised in the context of the autonomous cars' consultation. Still, aviation law should follow the example of autonomous cars that permit such transition for technological purposes and create a regulatory system that would motivate compliance. Prohibiting such a transition will delay the deployment of more advanced technologies.

- (4) In order to avoid unnecessary risks (as outlined in (3)), consideration needs to be given to operational parameters that need to be satisfied prior to and during transition in order to reduce safety risks.

Consultation Question 43.

11.43 We seek stakeholder views on any other issues with the current legal framework as it relates to operations involving autonomous drones.

Paragraph 7.62

Consultation Answer 43.

- (1) Automated legislation and safety cases should be developed alongside autonomy. The technology of drones will always outpace legislation, so instead technology could be used to track and update legislation and safety cases.
- (2) There is also a likely fundamental issue about whether a UTM/ATM process that controls a drone has primacy, or whether it is the drone itself. This will be a function of what type of ATM system is ultimately used to control the drones in our airspace. Whoever has primacy is likely to flavour the legal and regulatory approach.
- (3) Further work and consideration needs to be given to minimum insurance requirements for drone operations which are currently inappropriate. As matters stand, Regulation EC 785/2004 (Assimilated Law) provides minimum insurance levels for aircraft operations and applies equally to drone operations. However, this regulation is not appropriate for drone operations, and particularly not appropriate for drone operations near airports and/or overpopulated spaces.
- a. Regulation EC 785/2004 provides third party liability insurance minimums based on weight. Most drones will have a weight of less than 500kg, meaning minimum insurance is SDR 750,000 which is currently equivalent to c. GBP £780,000.
 - b. Drones operating near airfields have the capacity to bring down an aircraft if there is a direct collision between the drone and an airliner windscreen (see the 2017 report commissioned by the Military Aviation Authority, the British Airline Pilots Association and the Department of Transport considering the potential impact of a drone-aircraft collision). This report concludes that critical windscreen damage could occur for drones weighing greater than 4kg. Equally engine ingestion of a drone could result in an accident of an airliner if this occurred during a critical stage of flight. As commercial and Autonomous drone operations grow, it is likely that both the weight of drones and their operating speeds will increase.
 - c. In the event of an aircraft accident following a collision with a drone, under current law, an airline will potentially be able to limit its liability to passengers to SDR 128,821 SDR (c. £133,000) in circumstances where it can prove that

the accident was not due to the negligence or other wrongful act of omission of the carrier or its servants or agents or solely due to the negligence or other wrongful act or omission of a third party. In circumstances where a carrier has insufficient time to evade a small drone the airline may feasibly be able to argue this limitation. Passengers or the families or passengers killed in such an accident would be forced to pursue the drone operator for damages above this limit.

- d. To put the numbers in context:
 - i. An average airliner has a Combined Single Limit insurance policy of USD \$200m-\$500m covering bodily injury/property damage/personal injury to ensure they are sufficiently insured in the event of an aviation accident. On average airlines will hold a policy of \$300m (c. £235m)
 - ii. The value of fatal accident cases assessed under English law turn heavily on the financial loss of dependent family members. Fatal accidents involving dependent family members will frequently have a value in excess of £1,000,000. This can be substantially higher depending on the earning capacity of the deceased.
 - iii. By way of example, a Boeing 737-900 has a seating capacity of up to 220 passengers. A drone collision and a successful argument by an airline to limit their liability would potentially lead to a shortfall in insurance of c. £200,000,000. Against this potential shortfall, current regulations require just £780,000 insurance.
- e. Drone regulation has transitioned to recognising the importance of kinetic energy over weight for the purposes of drone certification, with kinetic energy being proportional to weight and speed (squared). A 20g drone travelling at the speed of a bullet will do the same damage as a bullet. When operating in populated spaces this is particularly dangerous. Average values of brain injury and serious spinal cord injury cases are almost always in excess of £1,000,000 and frequently in excess of £10,000,000. It is highly likely that any drone impacting a person and causing a brain injury or a spinal cord injury to an individual will result in a claim that exceeds available insurance by a significant margin.
- f. For larger drones operating in populated spaces, this shortfall is also highly likely to result in insufficient insurance to cover property related damage in the event of a loss of control of the drone and impact with the ground.
- g. Consequent to the above, it is essential that due regard is given to a new insurance regime in relation to drone (and RPAS/UAS/VTOL – see also response to question 51) which provides appropriate minimum insurance coverage proportional to kinetic energy and the operational air and ground risk (taking into consideration category of operation / air traffic density / population density etc.)

(4) Thought and consideration needs to be given for relevant limitation periods relating to claims in negligence and product liability particularly for Highly Automated and Autonomous aircraft. See comments at 44(3) in relation to passenger claims and 49(3) in relation to commercial claims. It may be that the LC may consider an amendment to the Limitation Act 1980 in the manner as s.11B relating to actions against insurers of Automated vehicles. Given the difficulties discussed at 44(3) in particular relating to the timing of the accident report publication and the confidential nature of the investigation, it may be prudent for that limitation period to commence from the date of the publication of the final accident report.



Consultation Question 44.

- 11.44 We provisionally consider that the current law governing air carrier liability for injury or death of passengers in the UK is adequate for the introduction of remotely piloted and autonomous operations.
Do you agree?

Paragraph 8.20

Consultation Answer 44.

- (1) Yes, for remotely piloted operations (subject to level of the Automated Systems). No for Autonomous operations.
- (2) Claims for personal injury/death for passengers travelling on remotely piloted and Autonomous aircraft will fall under the Montreal Convention which is exclusive and applies to domestic carriage by air for reward (by virtue of The Carriage by Air Acts (Application of Provisions) Order 2004 and/or Assimilated Law Regulation (EC) No 2027/97 as amended by Regulation (EC) 889/2002), as well most international carriage of passengers, baggage and cargo. Therefore, the position of the passenger and cargo owners/consignees and consignors for remotely piloted operations is generally protected by the current law and passengers will be able to claim against their own carriers. However, as the LC mentions in par 8.95, for remotely piloted operations involving Highly Automated Systems and Autonomous aircraft, the use of sophisticated AI technologies will affect potential claims against manufacturers under product liability laws. This will be relevant to the extent that passengers may need to pursue claims against manufacturers in circumstances operators are able to rely on limits of liability under Article 21(2) of the Montreal Convention (as domesticated). Specifically, where they are able to establish that the accident was not due to the negligence or other wrongful act of omission of the operator or its servants or agents or solely due to the negligence or other wrongful act or omission of a third party. It is foreseeable that in circumstances where AI technologies have computed an erroneous command output resulting in a crash an operator may seek to argue this limit. This will leave passengers forced to bring claims against manufacturers for amounts in excess of the limit of liability under Article 21(2) (SDR 128,821).
- (3) In such circumstances the current limitation periods for commencing a claim are also likely to be problematic. The Montreal Convention provides a two-year limitation period in circumstances where liability has traditionally been channelled through the carrier, is strict and unlikely to be limited. Given liability is strict, claims may be brought prior to any official accident investigation being concluded. For the reasons set out at paragraph (2), carriers are more likely to be able to limit their liability once Highly Automated and Autonomous aircraft are involved in the accident. A claim would need to be brought against the manufacturer within three years from the date of the accident. This is in conflict with the official investigation into the accident, undertaken by the Air Accident Investigation Branch (AAIB). Passengers are not part of the official investigation and in any event could not use confidential information disclosed as part of the investigation per s.26 of The Civil Aviation (Investigation of Air Accidents and Incidents) Regulations 2018. This means that passengers would need to wait until the conclusion and publishing of the final AAIB report before they are able to understand on what basis their claims can be brought. Investigations into the functionality of AI-technologies are likely to be complex and long. The recent experience of the Leicester City Football Club crash where the final report was produced nearly five years after the accident, is an example of the time that it can

take to conclude complex investigations. By that point, claims may be out of time and passengers at a severe disadvantage.

- (4) Consequently, once Highly Automated and Autonomous aircraft are transporting passengers, it is likely that the Montreal Convention (as domesticated) will no longer be fit for purpose.
- (5) It should of course be noted that it is likely that at such time that Highly Automated remotely piloted aircraft and Automated aircraft have been sufficiently developed for domestic passenger operations, it is probable that the same technology will be deployed on airliners for international operations and the Montreal Convention itself will no longer be fit for purpose. The process of creating a new international Convention governing liability of an air carrier (and others) as agreed by ICAO members is a slow and laborious process (the Montreal Convention took 8 years from the first meeting to discuss modernisation of the Warsaw regime at the 146th Council session of ICAO in November 1995 to the entry into force of the Montreal Convention in November 2003). Accordingly, we suggest that work begins at an international level as soon as possible to consider updating the Montreal Convention to take into consideration Highly Automated and Autonomous aircraft.
- (6) Furthermore, the following factors need to be given consideration:
 - a. In relation to remotely piloted operations (that are not Highly Automated), to avoid unnecessary litigation, it needs to be clarified that the scope of the Convention and Regulation covers remotely piloted aircraft;
 - b. While invariably case law will develop new interpretations of an “accident” under Article 17 in terms of remotely piloted aircraft operations; we do not recommend changing the wording of Article 17 to accommodate them, as it was the result of a sensitive balance of interests;

Consultation Question 45.

- 11.45 We provisionally consider that the current law governing liability for damage to cargo in the UK is adequate for the introduction of remotely piloted and autonomous operations.
Do you agree?

Paragraph 8.27

Consultation Answer 45.

- (1) Overall, we agree, but the term “cargo” is not defined in the Montreal Convention and the modified domestic regime with case law suggesting that the issuance of an Air Waybill is required: such practice, familiar as it is in aviation, is not necessarily common in carrying cargo by UAS, for example, would UAS operators carrying blood between hospitals required to issue AWBs? While it is possible that the exact requirements could be left to case law, as using UAS for carrying cargo is becoming more popular, we would recommend amending the domesticated version of the Montreal Convention as appropriate given the recommendation at our answer 45(5)(a).

Consultation Question 46.



- 11.46 We provisionally propose that liability for surface damage, in the case of UAS, should transfer to the lessee when the lease:
- (1) is for more than 14 days; and
 - (2) specifies the aircraft is to be operated under the responsibility of the lessee.
- Do you agree?

Paragraph 8.44

Consultation Answer 46.

- (1) Overall, we agree that using the term “owner” is outdated and that “operator” is preferred. It also creates discrepancies with the UAS Regulations, which focus on the role of operators and require their registration.
- (2) We consider that the language of s.76 of the Civil Aviation Act 1982 provides for liability where this is “...caused by an aircraft while in flight, taking off or landing, then unless the loss or damage was caused or contributed to by the negligence of the person by whom it was suffered, damages in respect of the loss or damage shall be recoverable without proof of negligence..”. It will therefore be important to ensure that the definition of “aircraft” within the 1982 Act encompasses UAS.
- (3) In respect of the suggestion at point (1) and (2), the LC's proposal is not unreasonable as it tries to “protect” a passive lessee, for example, a real estate agent employing a drone operator to inspect a property, with the operator providing the entire service. Of course, the counterargument is that having two potentially liable persons increases the protection of “innocent” bystanders.
- (4) However, we would comment that the 14-day threshold is outdated regarding modern practices. There is no legal or policy basis for imposing a 14-day requirement, and it arises solely from 1920s law (and the Rome Convention 1952 to which the UK is not a Party). Furthermore, we query whether using the parties’ agreement as a factor in determining whether the lessee has essentially immunity from third-party damage is advisable regarding transparency and certainty of law. Overall, we do not agree that any change to s.76 is required. The proviso that the liability should transfer to the lessee where this is specified under the lease agreement will result in difficulties in potential claimants identifying the correct defendant (as they will not have access to the liability provisions of the relevant lease) and may also result in the actionable defendant under the cause of action not having the requisite insurance in place to meet such liabilities. If the liability onus remains on the insured, the responsibility to maintain the correct and adequate insurance will be easier to regulate.

Consultation Question 47.

- 11.47 We provisionally propose 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.
- Do you agree?

Paragraph 8.62

Consultation Answer 47.

- (1) Yes.



- (2) With respect to aviation legislation that limits intrusion into the claimant's land, we agree with the suggestions for limiting intrusive operations by regulating flying altitude, data capture and frequency of flights and/or descents.
- (3) With respect to the concerns raised by the LC at 8.58, in respect of delivery drones, it is our understanding that such drones are only likely to become viable when they can be operated as Autonomous aircraft. Once they are Autonomous then there may be no need for transmission of camera and other sensor data and aviation legislation might require that computer vision algorithms are localised to the drone hardware such that the data is not transmitted. In such circumstances, concerns over breaches of privacy may fall away.
- (4) This area of law may also be covered by local bylaws. However, local authorities have limited knowledge in this area and there are examples where local bye-laws specifically ban drone operations of any kind.

Consultation Question 48.

- 11.48 We provisionally propose that there should be a review of product liability law (including the Consumer Protection Act 1987) to take account of the challenges of emerging technologies. The review should cover product liability as a whole, rather than be confined to aviation or automated vehicles.
Do you agree?

Paragraph 8.89

Consultation Answer 48.

- (1) Yes.
- (2) The extent to which AI technologies feature in a product has a direct effect on passenger claims (and claims made under the Consumer Protection Act 1987) with respect to the following issues:
 - a. the safe operation of flights since it will be more difficult to determine what went wrong in terms of AI product applications to ensure the same, or similar, failure is avoided in the future;
 - b. potential claims the passengers might have against the manufacturer under product liability laws.
 - c. difficulties airline insurers will face in potential subrogation claims against manufacturers.
- (3) We would predict a seismic shift from people-centric liability to product liability with the emergence of new technologies and in particular, Autonomous vehicles (including aircraft). This needs to be underpinned by robust and appropriate product liability legislation that takes account of these new risks, in consultation with the product liability insurance market.
- (4) Any sector-focused review will only cause confusion and unbalanced results. The absence of any such review impacts some of the questions raised in this consultation, especially Question 44 above, for which the relevant comments are included.
- (5) The LC will appreciate that the EU has reviewed product liability laws already and a new Directive for liability for defective products was approved by the European Parliament in March 2024. In addition, the EU has proposed an AI Liability Directive,



which is still being discussed, both forming part of the Commission's regulatory framework on AI in conjunction with the AI Act. Given changes that have already taken place in Europe, a failure to update product liability laws might leave the UK at a competitive disadvantage in consumer protection.

- (6) while the current laws regarding liability provide protection for passengers enable market mechanisms to reflect the comparative costs of defects on manufacturers and operators; the operation of uncrewed aircraft systems may hinder this balance. Regulation will therefore be required to reflect the costs imposed by failure in manufacture/programming, even where the actual cause of such failure is difficult to evidence. Clear boundaries, preferably not requiring proof of fault, are required for the responsibility each manufacturing participant (even more in cases of flights that are a mixture of remotely operated and Autonomous flights). A failure to amend product liability laws will lead to market failure in terms of costs imposed on operators compared to manufacturers arising from defects (in the sense of undesired outcomes from operations imposing costs on third parties).

Consultation Question 49.

- 11.49 We seek views as to whether the current law regarding liability for mid-air collisions is satisfactory in the case of collisions involving uncrewed aircraft systems.

Paragraph 8.97

Consultation Answer 49.

- (1) In relation to mid-air collisions between a UAS and an aircraft carrying passengers, the passengers of the commercial flight will have the opportunity to make claims against their carrier. It is also common for passengers to raise claims against manufacturers following a major loss, but the potential difficulty to prove what went wrong and establish fault, as identified by the LC in paragraph 8.95, will affect their right to successfully pursue such claims.
- (2) The claim against their carrier will be brought under the Montreal Convention (or the domesticated version of the Montreal Convention), while effectively imposing a strict liability on air carriers, permits air carriers to cap that liability when the damage is caused by the negligence of a third party, or where the damage was not caused by the negligence of the carrier. Where the mid-air collision is caused by the UAS, and for reasons outside the control of the carrier, the carrier may be able to limit its liability. Equally, in relation to any amounts above this limit, particularly in circumstances where the UAS was Highly Automated or Autonomous, it may prove more difficult for the passenger to evidence liability on the part of the manufacturer, so as to be able to recover damages in excess of limits from a party other than the carrier. See additionally, comments in responses 43(1)(b)-(e) and 44(2). See also comments in relation to timing difficulties at 44(3).
- (3) In relation to collisions between two UAS, as noted by the LC, those claims would need to be tortious claims brought under negligence theories. In relation to Highly Automated and Autonomous aircraft, establishing the reason for the impact would be difficult and likely only possible after the conclusion of the official investigation. As for passenger claims, and as noted at 44(3), there is a potential conflict between the time that it will take for a complex AAIB investigation to conclude in circumstances where there could be unforeseen computational outputs of AI-technology that may directly or indirectly affect flight control and the limitation period for bringing a claim of this nature. This is less of an issue than for claims involving personal injuries as the

limitation period is longer, but it would still reduce the time need to prepare any appropriate claim significantly.

Consultation Question 50.

- 11.50 We seek consultees' views on whether they expect any difficulties applying existing insurance requirements to uncrewed aircraft systems.

Paragraph 8.113

Consultation Answer 50.

- (1) As above at Q48, we expect much greater emphasis to be placed on product liability insurance. Insurers may be reluctant to underwrite risks on the basis that there is no claims data or experience, so the risk is purely speculative, and in the case of Highly Automated and Autonomous aircraft potentially catastrophic.
- (2) Legislators will need to work in consultation with the insurance industry (i) to ensure that they are comfortable insuring these risks at all and (ii) to ensure that the policy wordings are appropriate and do not contain wide reaching policy exclusions. Consideration may need to be given to making product liability cover compulsory in certain circumstances, with prescribed limits of liability and minimum standards of policy wordings that limit the ability for insurers to avoid cover. However, this would further limit the pool of insurers who are able and willing to underwrite these risks in an already difficulty and limited market.
- (3) As discussed in the response at 43(1), assimilated Regulation 785/2004 does not require an overhaul but needs significant amendments in the following areas:
 - a. mandatory (war and non-war) insurance for UAS that weigh less than 20kg and are used for recreational purposes is required as a "heavy" UAS operating in the A3 category due to a technical fault, human mistake, or terrorist interference could cause significant third-party damages (e.g. crash on moving cars or critical infrastructures). The Government's promise to change the mandatory insurance requirements for third-party risks by creating several categories below the current threshold of 750,000SDRs per flight by reference to "the overall risk of the flight operation, and take into account the level of injury or damage an aircraft could do, the size and maximum take-off mass of the aircraft, the flight path and complexity of the operation" is to be applauded, but we need to wait to see what the new categories will be before we comment on their usefulness;
 - b. an amendment of the term "flight" to accommodate rotary-wing UAS would be an improvement.
 - c. review whether war-risk insurance for novel aircraft must still be provided on "an aggregate" basis (following conventional aviation insurance practices) or be required on a "per event" basis.
- (4) There will be similar implications to subrogation claims from insurers against the manufacturer of the remotely piloted aircraft. The risk, as identified in paragraph 8.95, arising from the use of sophisticated systems will affect potential claims against manufacturers under product liability laws. If we acknowledge there will be difficulty to establish who is at fault to enable a fault-based distribution of the costs of defects, this will need to be taken into account by Underwriters with increased premiums imposed on carriers to reflect the reduced ability to recover outlay from at fault



parties. The outcome of this will be a distortion of the marketplace, with operators carrying more costs than should be reflected by their comparative fault, and ability to influence behaviour to avoid such deficiencies arising.

Consultation Question 51.

- 11.51 We provisionally propose that multiple simultaneous operations should be considered as the Government develops proposals for the insurance requirements applicable to uncrewed aircraft.
Do you agree?

Paragraph 8.114

Consultation Answer 51.

- (1) Yes
- (2) Regarding swarms (which in civil use, are often used for light show displays and are full of <250 gram drones), there have been a few incidents (mainly in China) of light show drones falling out of the sky³ and in one case due to jamming from a rival light show supplier⁴.

Consultation Question 52.

- 11.52 We provisionally consider that the current approach in the Air Navigation Order 2016 placing criminal liability on an operator is adequate for autonomous operations.
Do you agree?

Paragraph 9.39

Consultation Answer 52.

- (1) We agree in the most part. For the majority of offences under the ANO it is adequate to place criminal liability on an operator.
- (2) For Highly Automated and Autonomous aircraft, there are certain offences within the ANO where the breach may arise from programming code or errors in AI technologies rather than operational instructions. For example, art. 265B(5)(h)-(i) provides that a “relevant requirement” is that during the flight the remote pilot shall maintain a visual scan of the airspace surrounding the unmanned aircraft in order to avoid any risk of collision with any manned aircraft, that the remote pilot shall discontinue the flight if the operation poses a risk of other aircraft, people, animals, environment or property, and shall comply with the operational limitations in geographical zones designated in accordance with Article 15. Those are operational provisions which arise only during flight and not during planning (excepting that an operator must plan not to breach a geographical limitation). If a Highly Automated or Autonomous aircraft were to breach these provisions, there would be a distinct probability that the breach arose from an erroneous computational output from AI technologies or otherwise a defect within the programming code of the flight commands for the Highly Automated and Autonomous aircraft.
- (3) We recommend that in relation to Highly Automated and Autonomous aircraft, a careful review of the ANO should be undertaken to identify which failures may arise

³ <https://www.independent.co.uk/tv/lifestyle/china-drone-crash-zoo-show-b2394312.html>

⁴ <https://www.newsflare.com/video/457082/dozens-of-drones-fall-from-sky-during-light-show-in-china>

from issues with the product itself (and in particular AI technologies governing how it operates) rather than operational instructions entered into the aircraft prior to departure.

- (4) Care will need to be given to the distinction between a failure in the code / AI technologies resulting in a breach of the ANO arising from ordinary negligence versus gross negligence, wilful misconduct, or recklessness. Such circumstances could foreseeably arise in the programming of a Highly Automated and Autonomous system. Reference is made to the criminal investigation of Boeing following failures in relation to the Automated system (MCAS system) it implemented in Boeing Max aircraft resulting in two crashes in 2018 and 2019.
- (5) There is a practical issue of who prosecutes these issues. There is anecdotal evidence that the National Police Air Service (NPAS) has stated that it wasn't a police matter to deal with drone incursions in restricted airspace; rather it was the CAA's issue. However, the CAA has limited resource to deal with this. Provision should be made to clarify what agency / agencies are responsible for prosecutions involving the criminal use of drones.

Consultation Question 53.

- 11.53 We provisionally consider that the “reasonable care” defence in article 265(3) of the Air Navigation Order 2016 applies adequately for “direct contraventions” under Article 265(5) to (8) involving autonomous operations.
Do you agree?

Paragraph 9.45

Consultation Answer 53.

- (1) We agree.
- (2) With drone and ATM systems potentially functioning based on machine learning or AI, the “reasonable care” argument may be a challenge, but this is a wider legal issue regarding corporate liability for any AI system.

Consultation Question 54.

- 11.54 We seek views on whether for autonomous operations the reasonable care defence should be applicable to the vicarious liability created in article 265(1) of the ANO.

Paragraph 9.46

Consultation Answer 54.

- (1) We agree that the reasonable care defence would be more suitable to vicarious liability created pursuant to article 265(1) and is more accurately able to reflect the interaction between operator and Autonomous aircraft.
- (2) As noted in Answer 53, with drone and ATM systems potentially functioning based on machine learning or AI, the “reasonable care” argument may be a challenge, but this is a wider legal issue regarding corporate liability for any AI system.

Consultation Question 55.



- 11.55 We provisionally propose that a remote pilot of an uncrewed aircraft operating in the certified category should be treated as a pilot-in-command for the purposes of criminal liability pursuant to article 265(1) of the Air Navigation Order 2016.
Do you agree?

Paragraph 9.61

Consultation Answer 55.

- (1) Yes, subject to the caveat proposed at consultation answer 9.
- (2) Note: It may not be clear when a remote pilot is actually in charge of a drone as the level of autonomy on any flight is likely to be high and changeable throughout flight, and this could lead to many complications and contradictions.

Consultation Question 56.

- 11.56 We ask for consultees' views on the criminal liability of pilots (or remote pilots) when an aircraft operating autonomously returns control to the pilot or vice-versa. In particular, should a pilot (or remote pilot) only become criminally liable for the piloting of the aircraft at the end of a transition period?

Paragraph 9.62

Consultation Answer 56.

- (1) Yes, subject to the comments at consultation answer 42.
- (2) Care will need to ensure that the transition demand is suitably clear and compelling for criminal liability to follow the transition period.
- (3) As noted previously, the term 'transition period' should not be used. The remote pilot is either in charge or not at any point in time.
- (4) If remotely piloted flights are treated (legally) differently from autonomous flights, and it appears the autonomous flights hold an individual operator to a lower degree of accountability, then the market will rapidly gravitate to a hybrid of remote pilot / autonomous flight – and claim that all flights are autonomous. This may be an unintended and undesirable side-effect of having such legislation.

Consultation Question 57.

- 11.57 We provisionally propose that the pilot-in-command of aircraft in a multiple simultaneous operation should be criminally liable for breach of operating requirements in the same way as a pilot-in-command of a single aircraft would be.
Do you agree?

Paragraph 9.63

Consultation Answer 57.

- (1) We agree.
- (2) As noted previously, MSOs will be supervised rather than piloted, and the Supervisor should be held liable.



- (3) Furthermore, provision should be made to ensure that the criminal liabilities for breaching MSO regulations are not less onerous than for breaching single drone regulations.

Consultation Question 58.

- 11.58 We invite consultees' views on whether the Air Traffic Management and Unmanned Aircraft Act 2021 operates satisfactorily in the case of highly automated and autonomous flight.

Paragraph 9.69

Consultation Answer 58.

- (1) Consideration needs to be given to the practicalities of communication between police officers/prison authorities and Highly Automated and Autonomous aircraft. In particular, consideration to the practical observation at consultation answer 6(3).
- (2) Provision should be made to clarify what agency / agencies are responsible for prosecutions involving the misuse of drones.

Consultation Question 59.

- 11.59 We invite views on how operator responsibilities for dangerous goods might need to be adapted in the case of autonomous operations.

Paragraph 9.85

Consultation Answer 59.

- (1) Drones can carry "dangerous goods" in a manner that other aircraft cannot easily do. For example, drones without a human on board, can fly routes that avoid urban areas, over water, and over uninhabited areas. This would be a pragmatic way of getting many dangerous goods off roads, rail, and crewed aircraft. Accordingly, legislation shouldn't stymie this use-case, which is likely to be compelling and commercially viable. Instead, it should provide the framework for increased use of drones.
- (2) Provision should be made to ensure that 'dangerous goods operations' by drones are conducted in a safe risk-based manner whether they be autonomous operations or not.
- (3) A Highly Automated and Autonomous aircraft should be required to disclose that it is carrying dangerous goods to ATS and relevant services. See consultation answer 6(3) in relation to the practical considerations of communicating this information.
- (4) For risk assessment purposes, it would seem prudent that the Highly Automated and Autonomous aircraft communicate that it is carrying dangerous goods to an ATS system as soon as it is interacting with the ATS rather than delaying until there is an emergency. This is because (a) the emergency may be catastrophic and instantaneous such that later communication is possible (for example a mid-air collision), (b) because this could be managed by way of a relatively minor code included within the data sent to ATS and (c) because this information may be relevant to ATS in traffic management.



Consultation Question 60.

- 11.60 We ask for consultees' views about whether the offence of hijacking in domestic law should be updated to:
- (1) include the unauthorised seizure or control of autonomous or remotely piloted aircraft by technological means or by persons not on board the aircraft; and
 - (2) expand the period in which hijacking can occur from the period when an autonomous or remotely piloted aircraft is "in flight" to the period when it is "in service."

Paragraph 9.107

Consultation Answer 60.

- (1) Yes, to both.
- (2) It is essential to update the offence of hijacking in domestic law to reflect that Autonomous or remotely piloted aircraft might be seized or controlled by technological means or by persons not on board the aircraft; cyber attacks against UAS (and aviation in general) are increasing in volume and indicate that a clearly defined offence is required to deal with situations where terrorists remotely take control of one (or several) UAS, (crewed or uncrewed) VTOL(s) or remote control centre.
- (3) Also, the definition of "in flight" needs to be i) expanded to "in service" to provide continuous cover during the operation of these aircraft; it is plausible that terrorists might attempt to remotely take control and operate such aircraft, especially UAS, while they are on the ground to be used for attacking other targets (the size of conventional aircraft makes this type of hijacking more difficult); ii) the definition of "in flight" requires adjustment to reflect the new ways of operating such aircraft, especially UAS, that do not have external doors

Consultation Question 61.

- 11.61 We also ask consultees for views on whether any offences against the aircraft other than hijacking need to be updated to account for increased autonomy in aviation.

Paragraph 9.109

Consultation Answer 61

- (1) Yes.
- (2) Offences should include:
 - a. interfering with the Command and Control of remotely piloted and Autonomous aircraft.
 - b. interfering with the communications of remotely piloted and Autonomous aircraft.
 - c. interfering with Control and Monitoring Units of remotely piloted and Autonomous aircraft
- (3) Note: Any takeover or diversion of an autonomous aircraft (by spoofing, jamming etc) is likely to be hard to trace to those doing it. A criminal gang or state actor is likely to ensure their actions are undiscoverable. Accordingly introducing an offence of 'permitting illegal interactions with any UAS or VTOL,' which would cover IT system operators and telecom providers as well as ATM operators, would force them to put in place security systems to try and prevent such events.

Consultation Question 62.

- 11.62 We invite consultees to tell us if they have views on, or have experience or data to indicate, the likely costs and benefits of our provisional proposals in relation to VTOLs.

Paragraph 10.15

Consultation Answer 62.

- (1) There are several novel configuration VTOL Capable Aircraft (VCA) types being developed by industry with certification planned for some within the next few years that will enable them to enter commercial passenger carrying service.
- (2) Successful entry into service is vital if both VCA and VCA operations are to remain commercially viable. If initial aircraft or operations do not meet customer expectations, or more significantly, their safety is questioned by the public and/or regulator, the result will be significant loss of confidence, not only for the specific operation but for the VCA industry as whole.
- (3) It is therefore vital that aircraft and operational safety both in the air and on the ground are prioritised over other considerations.
- (4) While there will be costs (i.e. money and resources) to industry and the regulator to implement many of the provisions being proposed, they will pale into insignificance compared to the potential costs of failing to do so; specifically if the public do not embrace or lose confidence in the emergent VCA industry then it will not be successful, won't generate the expected economic benefits to the country, and reduce the appetite for financial institution investment in next-generation platforms and systems.
- (5) However, this not to say that the costs of implementing the provisions should go unchecked. If implementing the provisions imposes a significant financial and human resource burden on industry and the regulator, then both will suffer.
- (6) Industry and regulator therefore need to be involved during the development of the provisions to ensure aircraft and operations are both safe and commercially viable.
- (7) This consultation will be successful if it results in sensible legislation that accelerates progress in the VCA industry, as well as unlocking further equity investment.
- (8) However, this consultation will take several years to enter legislation and the VTOL industry will have to take legal risk(s) in these matters ahead of that. If a test case goes against the industry before then, it could easily kill off an Operator, OEM and damage the wider industry. Already the VCA market is struggling to get Type Certified and equity investors are pulling out. Accordingly, this consultation should recommend Government to embrace its findings with urgency to reduce such risks to industry.

Consultation Question 63.

- 11.63 We invite consultees to tell us if they have views on, or have experience or data to indicate, the likely costs and benefits of our provisional proposals in relation to drones.

Paragraph 10.16

Consultation Answer 63.

- (1) While the VCAs under development are sized to carry 4 to 6 passengers and are therefore similar in size and weight, the same cannot be said for commercial drones.
- (2) Drones affected by the proposed provisions will include fixed wing, rotary wing, and VTOL configurations and their weights will range from several kilograms (e.g. a relatively small 'last mile' logistics drone) to circa 2 to 3 tonnes (e.g. a large 'middle-mile' regional logistics drone).
- (3) Although larger drones are technically viable, these are likely to be optionally piloted variants of crewed helicopters, and passenger transport aircraft.
- (4) As with VCA, successful entry into mainstream commercial aviation service is vital if both drone and drone operations are to remain commercially viable. If initial aircraft or operations do not meet customer expectations, or more significantly, their safety is questioned by the public and/or regulator, the result will be significant loss of confidence, not only for the specific operation but for the large commercial drone industry as whole.
- (9) It is therefore vital that safety of both specific category and certified category drones and their associated operations is proportionate to operational risk but is still prioritised over other considerations.
- (10) While there will be costs to industry and the regulator to implement many of the provisions being proposed for drones, these too will pale into insignificance compared to the potential costs of failing to do so; specifically, if the public do not embrace or lose confidence in the emergent large drone industry, as noted above for VCA.
- (11) However, this not to say that the costs of implementing the provisions should go unchecked. If implementing the provisions imposes a significant financial and human resource burden on industry and the regulator, then both will suffer.
- (12) Industry and regulator therefore need to be involved during the development of the provisions to ensure large drones and operations are both safe and commercially viable.
- (13) As noted in the previous answer, this consultation will be successful if it results in sensible legislation that accelerates progress in the drone industry, as well as unlocking further equity investment.
- (14) However, this consultation will take several years to enter legislation and the drone industry will have to take legal risk(s) in these matters ahead of that. If a test case goes against the industry before then, it could easily kill off an Operator, OEM and damage the wider drone industry. Already several drone operating companies have gone into administration and equity investment is challenging for start-ups. Accordingly, this consultation should recommend Government to embrace its findings with urgency to reduce such risks to industry.

Consultation Question 64.



- 11.64 We invite consultees to tell us if they believe or have evidence or data to suggest that any of our provisional proposals could result in advantages or disadvantages to certain groups or based on particular characteristics (with particular attention to age, disability, transgender identity, marriage and civil partnership, pregnancy and maternity, race, religion or belief, sex or gender, and sexual orientation).

Paragraph 10.19

Consultation Answer 64.

- (1) Within the particular characteristics noted, there is no evidence to suggest that any of the provisional proposals could result in advantages or disadvantages to certain groups of people.

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Contact

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RESPONSE TO LAW COMMISSION CONSULTATION ON AVIATION AUTONOMY

(Law Commission Consultation Paper 261)

Any personal email addresses and phone numbers have been excluded from this document.

Unanswered questions have been deleted from this document.

About you

What is the name of your organisation?

Royal Mail

Drones

Consultation Question 34

We provisionally propose that a remote pilot for drones should continue to be defined as “a natural person responsible for safely conducting the flight of an unmanned aircraft by operating its flight controls, either manually or, when the unmanned aircraft flies automatically, by monitoring its course and remaining able to intervene and change its course at any time”. Do you agree?

No

Please expand on your answer below

There are some remote drone use cases in which a natural person would not serve any purpose, for example tethered drones and those operating in unpopulated environments.

Consultation Question 35

We seek views on whether some low-risk autonomous drone operations or drone operations conducted beyond visual line of sight might be accommodated in the open category. In particular:

- (1) whether there are any such use cases which might be suitable for the open category; and
- (2) if so, what conditions should be attached to these use cases if operated in the open category.

Please share your views below

This could be accommodated in certain circumstances. For example, suitable use cases could include flying over controlled ground or private property, using highly

automated aircraft with limited remote pilot functionality. A risk assessment should be required for the open category.

Consultation Question 36

We provisionally propose that for autonomous operations in the specific category, a UAS 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 manned 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.

Do you agree? (tick all that you agree with)

Please expand on your answer below

We agree on safety grounds.

Consultation Question 37

We seek views on what operational requirements should be applied to autonomous drone operations and drones that operate beyond visual line of sight in the specific and certified categories.

Please share your views below

Operational procedure should be determined as part of a safety case application. This should provide evidence to the regulator that their operation, whether it be autonomous, highly automated or manual, is safe. Regulations and guidance material can help direct operators.

Consultation Question 38

We seek views on whether the current concept of a "remote pilot" is compatible with drone MSO. We also seek views on whether the remote pilots of drone MSO should

continue to be subject to the same responsibilities as remote pilots for single drone operations.

Please share your views below

The current concept is compatible with drone MSO, because the functions remain the same, but any safety claims should be substantiated.

Consultation Question 39

We seek views on whether there should be an upper limit to the number of drones for which an individual remote pilot is responsible.

Please share your views below

We do not believe there should be an upper limit on the number of drones an individual remote pilot can be responsible for. Instead, operators should prove how many they are able to safely pilot.

Consultation Question 40

We seek views as to what additional safeguards should be introduced for remote pilots responsible for multiple drones.

Please share your views below

If a safety case proves it is safe to do so, a remote pilot should be permitted to operate multiple drones at once. Performance-based requirements should be applied.

Consultation Question 41

We provisionally propose that use of flight data recorder systems or devices should be mandatory for autonomous drone operations. Do you agree?

Yes

Please expand on your answer below

We agree with the provisional proposal, but operators of smaller drones should be able to store data on the ground to avoid them becoming overburdened by hardware.

Consultation Question 42

Should the law permit a drone to transition between remotely piloted and autonomous flight during an operation?

Yes

Please expand on your answer below

This should be permitted if the aircraft operator ensures that the operation complies with relevant legislation and regulations.

Consultation Question 43

We seek stakeholder views on any other issues with the current legal framework as it relates to operations involving autonomous drones.

Please share our views below

We have no other issues to raise at this time.

RESPONSE TO LAW COMMISSION CONSULTATION ON AVIATION AUTONOMY

(Law Commission Consultation Paper 261)

Please note that this consultation response has been reproduced from information entered on the Citizen Space online portal.

Any personal email addresses and phone numbers have been excluded from this document.

Unanswered questions have been deleted from this document.

About you

What is the name of your organisation?

Sceye

Airworthiness and certification

Consultation Question 1

We seek views on how current airworthiness and certification regulation might need to be adapted or developed in light of highly automated and autonomous aircraft. In particular, should provisions be adopted which allow for:

1. the certification of optionally piloted and uncrewed or unoccupied versions of conventional aircraft (hybrid versions); and
2. the separate certification of command units?

Please share your views below

We recognize the efforts of the UK, and particularly the Civil Aviation Authority (CAA), in supporting the development of highly automated aviation technologies and highly support the terminology of 'unoccupied' which we believe deserves special consideration, due to the uniquely different risk considerations from it's 'occupied' counterparts.

Despite efforts to date, we believe that the current regulatory tools are not sufficiently risk-proportionate for larger 'unoccupied' aircraft. While we welcome the forthcoming UK adoption of JARUS' SORA v2.5 as an important step towards a proportionate and operation-centric risk assessment methodology a truly risk-based and operation-centric approach remains lacking for larger 'unoccupied' aircraft.

We submit that a type-certification paradigm does not provide an adequate risk-based approach for large 'unoccupied' aircraft like High-Altitude-Platform-Systems (HAPS):

1 / The type-certification approach considers the severity of an aircraft system failure in absolute (on a scale from negligible to catastrophic). However, the severity of 'unoccupied' aircraft failures cannot be determined independently of operational-specific context such as the population density. Indeed, HAPS may be used for high-failure probability missions such as hurricane probing, because they are unoccupied. Therefore, the current UK framework which limits the 'specific' category to aircraft under 3 meters, is not sufficiently risk proportionate for large lighter-than-air HAPS platforms like Sceye operating in very low-risk environments (such as high-seas).

2 / Additionally, a truly risk-based framework should account for a time-weighted accumulation of risk to exposed 3rd parties. It should distinguish between transient overflight of populated areas from persistent loitering over-population and must account for the duration exposure of 3rd parties at risk. This is particularly relevant for HAPS which can remain airborne for months. During a single flight they may overfly dozens of countries, loiter over oceans, rapidly transit over cities, and loiter over sparsely populated areas. A type-certification framework is not capable of accounting for such dynamically changing risk.

3/ Finally, a truly risk-based approach must account for the scale of the operation. Many HAPS are designed to operate as fleets, providing services such as telecommunication. By design, a type-certification framework considers the probabilities of failure at an individual aircraft level, failing to account for the risk of the system operated over populations. The risk of a system that uses small but numerous persistent HAPS may significantly exceed the risk of a system that uses fewer, larger HAPS with a slightly higher probability of failure. As a result, a type-certification approach may inadvertently promote the design of HAPS systems that, in aggregate are less-safe.

The HAPS Alliance published a paper advocating for more risk-proportionate metrics for HAPS (and unoccupied aircraft) :https://hapsalliance.org/wp-content/uploads/formidable/12/Acceptable_Levels_of_Risk_for_HAPS_2024.pdf

The above factors make a traditional certification an inappropriate framework for HAPS and more generally for 'unoccupied' aircraft. We would urge the UK CAA to consider expanding risk-based operation-specific assessments to larger 'unoccupied' aircraft and consider factors such as overall system risk, time-weighted risk exposure, etc.

Rules of the air

Consultation Question 4

We seek views on how highly automated and autonomous aircraft should act in emergency scenarios. In particular:

1. should highly automated and autonomous aircraft be given the freedom to operate outside the rules of the air in emergency circumstances; or

2. should a comprehensive set of rules be developed for highly automated and autonomous aircraft in emergency situations.

Please share your views below

Arguably, the discretion given to the Pilot-In-Command to disregard the rules in an emergency scenario is an acknowledgment that the environment is highly complex and that the number of possible scenarios is sufficiently large, that no set of rules, however comprehensive they are, can realistically fully encapsulate all possibilities.

A main strength of Machine Learning algorithms is their ability to learn and generalize outside of anticipated or previously seen scenarios - a skill for which we currently require pilot decisions. After completing the learning process, a set of pre-established behaviors is defined for every single possible combination of inputs (via weights and biases of the model). The resulting number of pre-encoded possible scenarios is gigantic, in a way that is unmanageable by conventional programming techniques. For example, in a machine vision algorithm with a small 16x16 pixel image input, the number of pre-defined scenarios (1.55×10^{231}) far exceeds the number of atoms in the universe.

In line with our belief that safety must remain the absolute priority, we believe that for systems to exist without the need of human supervision, we absolutely **MUST** allow algorithms to disregard the rules of the air, when necessary to maintain safety. The alternative would either imply that rules are more important than safety.

Consultation Question 6

We seek consultees' views on whether the rules of the air relating to communication should be adapted for remotely piloted and autonomous aircraft.

Please share your views below

As the Law Commission points out, the rules of the air currently require the "two-way communication between aircraft and stations or locations on the surface of the earth" under the assumption that there is a pilot on board of the aircraft who can communicate by voice. However, this framework is outdated and unsuitable for highly automated uncrewed aircraft systems (UAS). Additionally, the system cost of routing voice data over C2 links to be broadcasted by an aircraft potentially over high-seas several thousands of miles away is highly inefficient.

Most High Altitude Platform Systems (HAPS) such as Sceye intend to be operated at scale using digital cooperative separation services, similar to that used in UTM.

Communication rules must evolve to support digital, automated, and non-voice- or human-signal-based interactions. Establishing electronic conspicuity in UK airspace will be a vital cornerstone of this undertaking. All HAPS (uncrewed and unoccupied aircraft) are already transmitting data from multiple sensors via telemetry links (this may include multiple GNSS receivers, barometer, inertial, etc.) - We would encourage regulations to consider alternative means to the traditional surveillance

approach, including the possibility for operators to feed position telemetry data over ground networks. This could alleviate the need for the UK to invest in significant surveillance infrastructure.

Consultation Question 7

We ask for consultees' views on how the rules of the air might be adapted or developed for remotely piloted or autonomous flight

Please share your views below

Rapid iteration has been a fundamental enabler to developing advanced flight vehicles capable of operating in a difficult and poorly characterized environment.

A continuous iterative process enabled the HAPS manufacturers in the lighter-than-air community to safely develop advanced flight vehicles capable of operating at the edge of physics, in a difficult and poorly characterized environment, and to provide critical new services that were previously not possible - such as emergency connectivity services provided in the wake of Hurricane Maria. The agile and progressive, approach proved instrumental to maintaining safety as it provides the means to quickly assimilate learnings, making improvements in operational performance at a rate that would not be possible under a more traditional systems engineering model.

We do anticipate that the need for agile iteration will continue for the foreseeable future through commercial operations. It will likely be strengthened by the ongoing development of novel human-automation teaming and airspace integration concepts, the advancement of machine learning, modeling, and simulation capabilities, and the agility imposed by the cyber-security race against bad actors.

We firmly believe that much of the innovation and safety improvements described above would have been impossible without the ability to iterate quickly within the active safety management of SMS processes implemented by the industry.

We therefore recommend that the UK CAA adopts a flexible, and progressive-risk approach that can safely enable highly-automated HAPS in the Airspace, focusing on risk-based and operation-centric framework. A progressive approach would enable commercial integration starting in very low-risk environments (such as over the seas) at low operational volume, and gradually increasing risk exposure (population and volume) as the risk levels are proven to be acceptable.

To facilitate this endeavor, we encourage the CAA to develop "safe testing zones", exclusively reserved for unoccupied aircraft, in which various remotely piloted and autonomous aircraft can mingle, test scenarios, and fail without endangering anyone.

Drones

Consultation Question 34

We provisionally propose that a remote pilot for drones should continue to be defined as “a natural person responsible for safely conducting the flight of an unmanned aircraft by operating its flight controls, either manually or, when the unmanned aircraft flies automatically, by monitoring its course and remaining able to intervene and change its course at any time”. Do you agree?

No

Please expand on your answer below

Sceye acknowledges that some operational concepts may still require remote pilots. However, as automation progresses and uncrewed operations expand, the need for remote pilots is expected to significantly diminish.

At altitude, HAPS will be operated more like a fleet of satellites, or an airborne infrastructure.

As the tactical tasks currently performed by remote pilots become automated, we foresee a shift in human roles. Rather than ‘remote pilots’ tactically controlling and monitoring aircraft, we anticipate the emergence of ‘system management organizations’, comprised of various specialized roles, that strategically manage and configure automated systems of systems. For HAPS, these may include weather experts, engineer experts, etc. These organizations will handle off-nominals on an exception basis. This evolution mirrors the paradigm shift in human roles seen in other industries due to automation, and Google Loon (a defunct project) successfully demonstrated the approach with over 2 million flight hours flown over 100 countries.

Therefore, a future-proof regulatory framework must accommodate this shift from remote piloting to managed automation by structured organizations, and roles that may be system-specific. Emphasis should be placed on the responsibilities of operators rather than individual remote pilots, with a focus on the operator’s Safety Management processes instead of individual role definition and certifications. A more appropriate definition, replacing the traditional notion of a remote pilot could, for example, describe a person, or group of people, or an automated system that is responsible for ensuring the safety and regulatory compliance of a flight.

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

Consultation Question 36

We provisionally propose that for autonomous operations in the specific category, a UAS 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 manned 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.

Do you agree? (tick all that you agree with)

Please expand on your answer below

We support the transition of responsibility from the pilot to the operator. However, we believe that the requirement to discontinue a flight that “may pose a risk to other aircraft, people, animals, environment or property” is excessive in light of more risk-appropriate strategies.

It must be noted that the discontinuation of a HAPS flight may create more risk than its continuation.

We submit that this requirement provides a highly prescriptive and stringent action for a wide range of possible risks. It may not be appropriate to discontinue a flight to mitigate the risk to a bird or a small UAS if such discontinuation would create an unreasonable risk to ground populations or passenger-carrying aircraft, and if more risk-proportionate mitigations are available.

Consultation Question 37

We seek views on what operational requirements should be applied to autonomous drone operations and drones that operate beyond visual line of sight in the specific and certified categories.

Please share your views below

Automation increase in uncrewed aircraft should not be tied to additional requirements. Indeed, Sceye's experience shows that added automation has helped alleviate human errors and increase safety levels. This experience is shared by Loon which operated over 2 million flight hours.

As mentioned in question #1 we believe that the current regulatory framework for large 'unoccupied' aircraft is not sufficiently risk proportionate, and that alternate

approval paths to type-certification are crucially needed. The HAPS community would strongly benefit from expanding the risk-based requirements that are currently only accessible to smaller unoccupied aircraft, and for some of the work performed at ICAO SASP for HAPS to be more widely adopted.

Consultation Question 38

We seek views on whether the current concept of a “remote pilot” is compatible with drone MSO. We also seek views on whether the remote pilots of drone MSO should continue to be subject to the same responsibilities as remote pilots for single drone operations.

Please share your views below

In our response to question #34, we outlined that distinguishing between the traditional concept of a ‘remotely piloted aircraft’ associated with the role of ‘remote pilot’ from the concepts of ‘managed automated aircraft’ associated with a ‘system management organization’ may become a necessary distinction.

In a ‘remotely piloted’ aircraft concept that relies on tactical control and supervision of aircraft by the remote pilot, the cognitive workload increases proportionately to the number of aircraft supervised. Under this model, a maximum number of aircraft under supervision may make sense.

However, HAPS operations at altitude are managed very differently - as most tactical functions are automated, the human responsibilities evolve to that of strategic system management - a concept that we call ‘managed automated aircraft’. Under this model, humans respond to exceptions, manage system-wide configurations, and constraints resulting in the personnel’s cognitive workload being independent of the number of aircraft managed. For example, the Loon flight-operation personnel did input geographic restrictions to the system which were automatically disseminated and enforced by all aircraft, or set internet coverage objectives that automatically resulted in the appropriate number of HAPS to be dispatched to the target.

As we look forward, many of the tasks currently performed by a remote pilot will be re-distributed to various automated systems (such as ETM/ECHO). Additionally, we anticipate that the organizations responsible for the safe management of the system in the ‘managed automation concept’ may involve multiple specialty roles and subject matter experts. For example in the case of Loon, this included on-call weather specialists, software engineers, mechanical engineers, etc.

In such a model, the ratio of pilot:aircraft no longer is appropriate and the number of aircraft has no implications on the cognitive workload of the personnel managing the system. Therefore, the long-term outlook requires a thorough reevaluation of the role of the remote pilot, shifting more responsibilities to operators, their organizational system management, and their advanced systems.

Consultation Question 39

We seek views on whether there should be an upper limit to the number of drones for which an individual remote pilot is responsible.

Please share your views below

Sceye does not consider that it would be necessary or helpful to impose an upper limit to the number of HAPS that an individual remote pilot is responsible for. As we have outlined in our response to question #38, UAS systems with higher levels of automation are managed strategically at the system level, with no clear relation between fleet size and personnel workload. Loon's experience demonstrates that a large fleet of HAPS can be safely managed with a limited number of humans. It also demonstrated that the diversity of expertise within the organization that manages the system is more important than the sheer number of people. As such, Loon relied on an 'on-call' system of subject experts and system designers, that would not be actively managing the system but could be called for remote assistance on very rare occasions. As operations scale up it is crucial to ensure the economic viability of most HAPS use cases. Central to this is reducing the regulatory burden that mandates a large remote pilot workforce, which would negatively impact the ability of most HAPS operators to provide life-saving services such as disaster recovery, telecommunication, and wildfire assistance.

Consultation Question 42

Should the law permit a drone to transition between remotely piloted and autonomous flight during an operation?

Yes

Please expand on your answer below

Many HAPS intend to ascend through controlled airspace as remotely piloted aircraft. Once at altitude, they would be managed as a holistic system using "managed automated aircraft" concepts.

Consultation Question 43

We seek stakeholder views on any other issues with the current legal framework as it relates to operations involving autonomous drones.

Please share our views below

High Altitude Operations (HAO) - Typically around FL600, offers a uniquely low-risk environment for developing highly automated operations, due to the extremely low airspace density, and potential sustained operations over high-seas by unoccupied long-duration platforms such as HAPS.

This creates an ideal environment for a low-risk regulatory sandbox in which highly automated systems can be deployed and innovative concepts can be tested, with no safety implications.

RESPONSE TO LAW COMMISSION CONSULTATION ON AVIATION AUTONOMY

(Law Commission Consultation Paper 261)

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Unanswered questions have been deleted from this document.

About you

What is the name of your organisation?

Skybound Rescuer

Airworthiness and certification

Consultation Question 1

We seek views on how current airworthiness and certification regulation might need to be adapted or developed in light of highly automated and autonomous aircraft. In particular, should provisions be adopted which allow for:

1. the certification of optionally piloted and uncrewed or unoccupied versions of conventional aircraft (hybrid versions); and
2. the separate certification of command units?

Please share your views below

Chris Boosey:

Assuming that they are referring to General Aviation when they talk about 'current airworthiness & certification regulation', my views would be that a totally new set of airworthiness & certification regulations need to be created rather than seeing it as current ones being adapted or developed to suit. Whilst there will be some similarities that can be carried across I would imagine there are some significant differences. I would say though that all components of the aviation system, whether piloted or autonomous, meet stringent safety standards. This approach would help integrate the new technologies smoothly & safely while maintaining public trust which will also be an important factor.

George Howe:

I would agree with Chris' comments above, I do not believe that adapting existing legislation would be appropriate in regards UA technology. It's not feasible or necessary for a drone like those in the Mavic series, to require the same acceptable failure rate and manufacturing regulations as for instance a Boeing 777. This will only serve to damage the burgeoning UA industry in this country, put us at odds with other nations around the world with more relaxed regulations and price-out many smaller drone manufacturers, resulting in a monopoly. In my opinion new legislation should be drawn-up that would differentiate between different UA technologies and use-cases, i.e hobbyist aircraft, payload delivery craft, passenger craft etc. It would be understandable to have a different level of airworthiness certification for a UA carrying passengers to one carrying a parcel, or surveying with a camera.

Consultation Question 3

We seek views on whether current regulatory tools to support the development of highly automated and autonomous aviation technologies are adequate.

Please share your views below

Chris Boosey

Based on past dealings with the CAA etc, I would say not. Things have taken far too long to progress when compared to the US and Europe. We should be much further ahead than we are and I would imagine more support will be required in order to develop the mentioned technologies.

Some points to consider though:

Specific criteria for software reliability, cybersecurity and real-time data communication systems used.

Additionally, there would be a need to address the interoperability of these systems with existing air traffic management frameworks and include rigorous testing protocols for autonomous decision-making capabilities. Ensuring these standards will be crucial for the safe integration of these platforms.

Regulations should evolve to include continuous monitoring and updating of standards as technology advances, given things proceed at such a pace. There should also be a focus on international harmonisation to ensure consistent safety and operational standards across different countries, along with shared learnings. It currently feels like the UK is far behind.

George Howe

Perhaps special permissions/deregulation could be granted by the CAA to organisations with appropriate measures in place and a track record for safety, in

order to act as an operational test-bed for the CAA when considering new technologies and regulations, i.e allowing some organisations to utilise ballistic parachutes as an additional safety measure for their operations, to provide the CAA with valuable data around their use, with the liability resting with the organisation in question.

Rules of the air

Consultation Question 4

We seek views on how highly automated and autonomous aircraft should act in emergency scenarios. In particular:

1. should highly automated and autonomous aircraft be given the freedom to operate outside the rules of the air in emergency circumstances; or
2. should a comprehensive set of rules be developed for highly automated and autonomous aircraft in emergency situations.

Please share your views below

Chris Boosey

Similar to what George mentioned above; a comprehensive set of rules should be developed specifically for emergency situations rather than complete freedom to operate wherever and whenever. These rules should be designed to handle a wide range of potential emergencies and should be regularly updated based on incident reports and especially technological advancements. Allowing autonomous systems to operate outside established rules could create unpredictable and potentially dangerous scenarios however in many situations I feel the positives would outweigh the negatives. To prove this, all you need to do is look at the stats/response times etc we have at Skybound.

Consultation Question 5

We seek consultee views about what challenges remotely piloting an aircraft in an emergency scenario presents and how these might be addressed

Please share your views below

Chris Boosey:

Challenges could include things such as:

- Delayed response times due to communication lags
- Potential cybersecurity threats

- Remote pilot's limited situational awareness compared to being onboard an piloted aircraft.

To address these issues, it is essential to have secure communication systems, possible advanced training programs for remote pilots (when using RPA for emergency scenarios), and also consider enhanced situational awareness tools that provide comprehensive real-time data about the aircraft and its surrounding environment.

Consultation Question 6

We seek consultees' views on whether the rules of the air relating to communication should be adapted for remotely piloted and autonomous aircraft.

Please share your views below

Chris Boosey:

It is my understanding that there are five main types of communication used in Aviation: verbal, nonverbal, written, written and graphics, and human-machine and machine-machine communications. Verbal communication or speech being the most common communication medium used which should therefore be considered as the communication to be used in an emergency scenario.

Establishing secure, redundant communication channels is important to ensure constant connectivity between the aircraft and the remote pilot and/or ground control station/command centre. Clear protocols should also be defined for situations where communication is lost, ensuring the autonomous systems can safely handle the situation.

Consultation Question 7

We ask for consultees' views on how the rules of the air might be adapted or developed for remotely piloted or autonomous flight

Please share your views below

Chris Boosey

Things to consider:

- Defining airspace usage protocols
- Collision avoidance procedures
- Integrating systems with existing manned aviation operation

The main focus should be on maintaining safety, efficiency & visibility within increasingly mixed-traffic airspaces.

VTOLs

Consultation Question 8

We provisionally propose that a person overseeing a VTOL flying automatically, who monitors its course and is able to intervene and change its course at any time should continue to be classified as a “remote pilot”. Do you agree?

Yes

Please expand on your answer below

Chris Boosey

In my eyes, it is logical to classify a person who oversees a VTOL flying automatically and can intervene as a “remote pilot”. This classification ensures that the responsibility and accountability for the aircraft's operation remain clear, supporting safety and regulatory compliance.

Consultation Question 9

We provisionally propose 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. Do you agree?

Other

Please expand on your answer below

Chris Boosey

Unable to find further information relating to ‘commander of an operation’ within the UK Air Operations Regulation PDF. This is required in order to fully understand the question.

George Howe

This is unclear, the term ‘commander’ is not defined in the UK Air Operations Regulation 965/2012, are they referring to ‘pilot in command’? If the RP is to share the responsibilities of ‘commander of an operation’ this role should be clearly defined in law.

Consultation Question 10

We provisionally propose 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.

Do you agree? (Tick all that you agree with)

Please expand on your answer below

Chris Boosey

All of these should be covered off by the remote pilot as they are fundamental for maintaining safety standards in VTOL operations.

George Howe

To 'future-proof' such legislation, perhaps the definition could be extended to a 'trained person(s)' on behalf of the RP. This would cover UA operations where the pilot may be in a remote control centre and not physically present with the aircraft to perform pre-flight inspections of the airframe & payload. This responsibility could be therefore extended to ground-crew at a UA heliport for instance.

Consultation Question 11

We invite views as to whether there are additional operational responsibilities that a remote VTOL pilot should be required to fulfil.

Please share your views below

Chris Boosey

Additional responsibilities could include:

- Monitoring weather conditions
- Maintaining comms with ATCs (if required)
- Continuous education/training to stay updated with the latest safety protocols (given things will be moving so fast (technological advancements should also be included)

Consultation Question 12

We provisionally propose that the remote pilot-in-command should be responsible for, amongst other things, ensuring passengers are:

1. given a safety briefing; and
2. seated and wear seat belts during take-off and landing

Do you agree?

Yes

Please expand on your answer below

Chris Boosey

Yes, the remote pilot-in-command should 100% be responsible for these tasks to ensure passenger safety. Providing safety briefings and ensuring passengers are seated and belted during critical phases of flight are, in my opinion, standard safety measures that should be upheld in VTOL operations.

George Howe

Could also be delegated to ground crews who can then hand control of the UA to the RP in a 'ready to fly' state, confirming the above measures have been completed. This would tie-in with use-cases where the RP is not necessarily based at the same site the UA is launching from, i.e a remote control centre as opposed to a passenger drone helipad.

Consultation Question 13

We provisionally propose that air operators (rather than the remote pilot-in-command) should be responsible for preventing passengers from boarding:

1. who appear drunk or under the influence of drugs; or
2. whose carriage would, in the view of the operator's employees, endanger the safety of the aircraft or other passengers.

Do you agree?

Yes

Please expand on your answer below

Chris Boosey

Operators could have the infrastructure and personnel in place to assess and manage passenger behaviour before boarding, ensuring safety is maintained. This would not necessarily need to be placed onto the remote pilot. Similar to how things work in manned aviation.

George Howe

Agreed, this should be the responsibility of everyone working on behalf of the operator to ensure safety at all stages of the operation.

Consultation Question 14

We provisionally propose that the remote pilot-in-command should have the power to take reasonable measures, including restraint of passengers, as set out in section 94 of the Civil Aviation Act 1982. Do you agree?

Yes

Please expand on your answer below

Chris Boosey

Yes, I feel the remote pilot should have this power in order to ensure the safety and security of the flight is maintained, along with the safety for those other passengers on board. This power would allow for immediate action to be taken in case of a disruptive passenger.

Consultation Question 15

We provisionally propose that a person on board a VTOL aircraft (other than a crew member) should be able to take reasonable measures to protect the safety of the aircraft or of persons or property on board. Do you agree?

Yes

Please expand on your answer below

George Howe

I agree, although persons in this circumstance are afforded these rights anyway under S3(1) of the Criminal Law Act 1967 and under Common Law. Under Common law anyone has the right to defend themselves and their property using 'reasonable force', likewise under the CLA "A person may use such force as is reasonable in the circumstances in the prevention of crime, or in effecting or assisting in the lawful arrest of offenders or suspected offenders or of persons unlawfully at large". The key would be to afford persons taking such reasonable steps legal protection, by ensuring that there are relevant and clearly defined offences for compromising the safety of the aircraft/other aircraft/property and persons on board/causing disruption on board, so that should they need to take such action they would be safe in the knowledge that they legally can.

Chris Boosey

I agree, my only concern here is with the 'protect the safety of the aircraft' thought, Bearing in mind that the person on board will likely not have the knowledge required here so it would really depend on the circumstances to define what reasonable measures could be taken I do think it needs to be clearly defined as it could prove crucial in an emergency situation where immediate action is required.

Consultation Question 16

We seek views on whether the powers of crew on board a VTOL aircraft should be broadened to reflect those of the pilot-in-command under the Civil Aviation Act 1982 to:

1. take reasonable measures to protect the safety of the aircraft or persons or property on board;
2. maintain good order and discipline; or
3. enable the crew to disembark or deliver a person.

Please share your views below

George Howe

I would agree, this should reflect the powers afforded to crew in conventional air and nautical travel.

Chris Boosey

Agreed. This would ensure that crew members can act decisively in maintaining safety, order and discipline and have the ability to handle situations that may require the removal or restraint of disruptive individuals. All safe in the knowledge that no repercussions could come back to them. Again, it would need to be clearly defined so as not to risk people being worried about reacting to situations.

Consultation Question 17

We provisionally propose that passengers should be able to contact a member of crew at all times during an operation. Do you agree?

Yes

Please expand on your answer below

George Howe

I would agree, there should be capability to contact someone able to assume control of the craft in the event of emergency, thus aiding in mitigating risk around UA operations.

Chris Boosey

I believe that this would be essential for addressing any immediate concerns or emergencies that could arise during the flight. It would also give passengers a sense of calm knowing they can contact a crew member at any time.

Consultation Question 18

We provisionally propose 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. Do you agree?

Yes

Please expand on your answer below

George Howe

I agree, this would help professionalise the industry, improve safety standards, increase public confidence and bring the industry in-line with all other modes of transport, such as rail, road and conventional air travel.

Chris Boosey

100%. This is critical for ensuring the highest levels of safety and professionalism.

Consultation Question 19

We provisionally propose that it should be a criminal offence for a person to act as the remote pilot of a VTOL when the level of alcohol in their blood, breath or urine is over a prescribed limit. Do you agree?

Yes

Please expand on your answer below

George Howe

Yes, as per my comments to the last question. This provides clear guidance to pilots and operators as to what is acceptable and provides a measurable standard by which authorities/investigators can prosecute and complete 'back-calculations' in the event an offender were to use the defence that they became intoxicated following the flight.

Chris Boosey

100%. Alcohol impairs judgements, reaction times etc which are critical for the operation of any aircraft. This also aligns with existing regulations for manned aircraft so will maintain clear and enforceable standards across both types of aviation environments. As mentioned above, this is critical for ensuring the highest levels of safety and professionalism.

Consultation Question 20

We provisionally propose that the remote pilot should be subject to the reporting obligations currently applicable to pilots under the Air Operations Regulation. Do you agree?

Yes

Please expand on your answer below

Chris Boosey

Exactly as mentioned above, aligning with existing regulations for manned aircraft will maintain clear and enforceable standards across both types of aviation environments. Again, this is critical for ensuring the highest levels of safety and professionalism. It will promote accountability and transparency ensuring all hazards are appropriately documented fostering a strong culture of safety and responsibility.

Consultation Question 21

We provisionally propose that a remotely piloted VTOL should be required to be capable of detecting and recording information relating to accidents and near accidents for the purposes of reporting it. Do you agree?

Yes

Please expand on your answer below

Chris Boosey

Agreed! Exactly the same requirements as in GA. This will aid with ongoing enhancement of safety measures, give accurate incident data to help determine liability/accountability etc, will align with existing regulatory compliance and provide public confidence which is essential for widespread adoption.

Consultation Question 22

We provisionally propose that licences should be required for remote VTOL pilots. So far as appropriate, these should follow the classes and ratings adopted for crewed VTOLs. Do you agree?

Yes

Please expand on your answer below

Chris Boosey

This will maintain consistency across the industry as well as a high level of competency whether remote or crewed. Licensing pilots will ensure they have the necessary skills, knowledge and training to operate these advanced aircrafts safely. Also touching on the public reference again, it helps build public trust knowing that pilots are held to rigorous standards that match those of crewed pilots.

Consultation Question 23

We provisionally propose that operators of remotely piloted VTOL should be certified.
Do you agree?

Yes

Please expand on your answer below

Chris Boosey

This will ensure the pilots are proficient in using the technologies involved in remotely piloting VTOLs.

Consultation Question 24

We provisionally propose that operators of remotely piloted VTOLs should continue to be required to:

- ☒ (1) have the means necessary for the scale and scope of operations planned;
- ☒ (2) use only suitably qualified and trained personnel;
- ☒ (3) implement a management system to ensure safety;
- ☒ (4) ensure operations only take place in accordance with the operations manual;
- ☒ (5) establish procedures to minimise the consequences to safe flight operations of disruptive passenger behaviour;
- ☒ (6) develop and maintain security programmes suitable for the aircraft and type of operation;
- ☒ (7) have a management system to prevent fatigue.
- ☒ (8) ensure the continuing airworthiness of the aircraft; and.
- ☒ (9) establish procedures for any reasonably foreseeable emergency situation.

Do you agree? (tick all that you agree with)

Please expand on your answer below

Chris Boosey

I believe all of the above are essential to maintain safety, efficiency & to minimise human error.

Consultation Question 25

We seek views as to whether there are additional responsibilities that operators of remotely piloted VTOLs should need to fulfil.

Please share your views below

Chris Boosey

Repeat of question 11 albeit these are solely operational responsibilities.

Additional responsibilities could include:

- Monitoring weather conditions
- Maintaining comms with ATCs (if required)
- Continuous education/training to stay updated with the latest safety protocols (given things will be moving so fast (technological advancements should also be included)

Consultation Question 26

We seek views as to whether the law should permit remote pilots to act as pilot-in-command for more than one VTOL at the same time.

Please share your views below

Chris Boosey

This is a hard one and really depends on whether stringent conditions and safeguards are in place. Currently I would say no given that the VTOL is still a passenger/cargo carrying aircraft just like a piloted aircraft. In my eyes this would be unsafe until technological advancements could enable the remote pilot to manage multiple VTOLs simultaneously.

If we are talking about smaller VTOL aircraft then perhaps but this should only be allowed under strict conditions that ensure the safety and reliability of the operations.

Consultation Question 27

We seek views as to whether there should be an upper limit to the number of VTOLs for which a remote pilot can act as pilot-in-command at the same time.

Please share your views below

Chris Boosey

If operating smaller VTOLs then Yes, This upper limit should be determined based on thorough considerations around safety, workload management and technological

capabilities. For larger VTOLs (passenger/cargo carrying) then my answer to question 26 applies.

Consultation Question 28

We seek views as to what additional safeguards should be introduced for remote pilots piloting multiple VTOLs.

Please share your views below

Chris Boosey
Things to be considered in my eyes would be:
Highly advanced automation and collision avoidance systems
Equip remote pilots with situational awareness tools such as augmented reality or heads up displays.
Redundancy in communications channels between RPs and RPA.

Consultation Question 29

We seek views as to whether there should be a role for a person supervising the flight of an autonomous passenger-carrying VTOL and acting as a point of contact in relation to it. What powers or responsibilities should such a person have?

Please share your views below

Chris Boosey
Yes. Perhaps shared responsibility between the remote pilot and the role of air operators that has previously been mentioned. Suggestions of things to be considered:
Oversight & monitoring of the flight
Emergency Response
Communications Liaison - Perhaps between, ATC, ground personnel etc
Passenger Assistance

George Howe
Ensuring the safety and airworthiness of the airframe and payload (should the RP be based at a different site to the UA itself)
Ensuring the safety of the takeoff/landing area.

Consultation Question 30

Should the law permit an uncrewed VTOL to transition between remotely piloted and autonomous flight during an operation?

Other

Please expand on your answer below

Chris Boosey

This would offer numerous benefits in terms of operational flexibility, risk mitigation, resource optimisation and safety. However, such transitions should be accompanied by stringent regulatory oversight, comprehensive training, technological integration and continuous monitoring to ensure safe and efficient operations

George Howe

This would provide an added layer of safety to autonomous operations as this would enable a human pilot to assume control in the event of an emergency.

Consultation Question 31

We seek views as to whether initial airworthiness standards for uncrewed VTOLs should include accessibility standards for persons with disabilities and reduced mobility.

Please share your views below

Chris Boosey

Including accessibility standards in initial airworthiness regulations is essential to ensure equal access to air travel for individuals with disabilities and reduced mobility. By prioritising inclusivity in VTOL design and operations, stakeholders can foster a more equitable and accessible aviation ecosystem for the future.

George Howe

Yes, this would further legitimise this industry and bring this technology in-line with accessibility requirements that exist for all other public transport. This also aids in improving safety, with measures in place to safely remove injured, disabled or incapacitated passengers from the aircraft.

Consultation Question 32

We seek views as to whether the CAA should be able to include accessibility standards within the licences granted to uncrewed VTOL operators.

Please expand on your answer below

Chris Boosey

I believe this is crucial for promoting inclusivity. By incorporating accessibility into licensing requirements, the CAA can contribute to a more equitable and accessible aviation environment for all passengers.

Drones

Consultation Question 34

We provisionally propose that a remote pilot for drones should continue to be defined as “a natural person responsible for safely conducting the flight of an unmanned aircraft by operating its flight controls, either manually or, when the unmanned aircraft flies automatically, by monitoring its course and remaining able to intervene and change its course at any time”. Do you agree?

Yes

Please expand on your answer below

Chris Boosey

No expansion necessary, in my opinion this is a no brainer and the presence of a human operator capable of intervening at any point ensures that there is always a safety net to manage unexpected situations or system failures. Also good that this covers both manual and automated operations.

Consultation Question 35

We seek views on whether some low risk autonomous drone operations or drone operations conducted beyond visual line of sight might be accommodated in the open category. In particular:

- (1) whether there are any such use cases which might be suitable for the open category; and
- (2) if so, what conditions should be attached to these use cases if operated in the open category.

Please share your views below

Chris Boosey

Agree that this could be done in certain situations if safe to do so.

Example Use Cases:

- Agricultural Monitoring - In sparsely populated areas only where the risk to people and property is minimal.
- Environmental Surveys - in isolated regions.
- Infrastructure Inspection: Pipelines, power lines, railway tracks etc in uninhabited or low-traffic areas where manual inspection would be riskier and more challenging.

- Delivery Services in Rural Areas: Low-risk delivery services (i.e. light payload) in rural or sparsely populated regions where there is little risk of encountering people or manned aircraft.

Conditions/Considerations:

- Altitude Restrictions
- Geographical Zones - restricted to guaranteed low risk areas
- Sense and Avoid Technology
- Geo-Fencing

Consultation Question 36

We provisionally propose that for autonomous operations in the specific category, a UAS 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 manned 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.

Do you agree? (tick all that you agree with)

Please expand on your answer below

Chris Boosey

All no brainers in my opinion and will ensure safe operations:

Adhering to all authorised limitations and conditions is critical for maintaining safety and regulatory compliance. Assuming it includes the obvious things like altitude restrictions, flight durations, UAS capabilities and specific operational parameters set by the CAA.

I would say it is imperative that autonomous UAS are equipped with some form of sense-and-avoid technologies to prevent collisions with manned aircraft and other obstacles (this could include ADSB with manual/autonomous deconfliction). The

ability to discontinue a flight when it poses a risk would be a fundamental safety feature that could prevent accidents occurring.

Adhering to operational limitations within specific geographical zones or airspace would include respecting no-fly zones, restricted areas and temporary flight restrictions, which would all be essential for safe airspace management.

Following the established procedures of the operator would be paramount to ensure safe operations.

And finally, avoiding areas where emergency response efforts are ongoing (unless explicit permission is obtained from the responsible emergency services) would ensure that the UAS operations do not interfere with critical emergency activities and contribute to overall safety and effectiveness of emergency responses.

Consultation Question 37

We seek views on what operational requirements should be applied to autonomous drone operations and drones that operate beyond visual line of sight in the specific and certified categories.

Please share your views below

Chris Boosey

Things to consider:

- Advanced Sense-and-Avoid Systems
- Multiple Redundant Safety Systems
- Real-Time Monitoring and Communication
- Geofencing and No-Fly Zones to physically prevent entry
- Flight Path Authorisation and Management with real-time dynamic adjustment capabilities (for emergency situations/changing airspace conditions)
- Standard Operating Procedures full laid out
- Specific Operator Certification and Training
- Pilot-in-Command Designation (regardless of the flight being autonomous)
- Flight Data Recording (i.e. black box like in manned aviation to record telemetry data etc)
- Emergency Response Procedures

Consultation Question 38

We seek views on whether the current concept of a “remote pilot” is compatible with drone MSO. We also seek views on whether the remote pilots of drone MSO should continue to be subject to the same responsibilities as remote pilots for single drone operations.

Please share your views below

Chris Boosey

I would say yes, provided there are adaptations to account for the complexities and challenges unique to operating multiple UAS at a time. The remote pilot's role would need to be expanded to include the ability to oversee and manage multiple drones simultaneously, which could require things like enhanced training and certification specific to operating multiple drones at a time.

Remote pilots would need to have the advanced situational awareness tools to monitor the status and position of each drone at any given time. Things like; real-time telemetry, automated alerts and the potential integration of AI to assist in decision-making. The control interfaces used by remote pilots would also need to be designed to handle multiple drones efficiently with features that allow for quick switching between individual drone views and consolidated fleet management dashboards.

With regards to the responsibilities, I would say there would need to be adaptation to have more emphasis on safety management along with more detailed flight plans (to include contingencies).

Consultation Question 39

We seek views on whether there should be an upper limit to the number of drones for which an individual remote pilot is responsible.

Please share your views below

George Howe

I believe that there should, however context is key. For example when utilising ‘swarm drones’ the RP can safely, using technology, operate a master drone coordinating with a series of ‘slave’ drones. The types of UA used for such purposes are often sub-250g aircraft and therefore present a lower risk than say an RP based in a control room responsible for multiple passenger-carrying UAs. This could present dilemmas such as 2 separate emergencies involving 2 of the UAs the RP is responsible for, occurring at the same time requiring the RP to assume control. In such a circumstance the RP could not safely assume control of both.

Chris Boosey

My initial thoughts around this would be as follows:

There are inherent human limitations regarding attention span, cognitive load and reaction time. Managing too many drones simultaneously could lead to oversights, slower response times and increased risk of accidents. Also, in emergency situations, the Remote Pilot must be able to quickly and effectively manage each drone so having too many drones under the control of a single pilot could compromise the ability to respond appropriately to unforeseen events.

So in conclusion, yes there should be an upper limit and I think this would depend on a few factors such as the type of task, pilot experience (flight hours, environments flown etc), area of operation and what technological support is offered by the specific platform being flown (AI support to reduce pilot thinking time/workload).

Consultation Question 40

We seek views as to what additional safeguards should be introduced for remote pilots responsible for multiple drones.

Please share your views below

Chris Boosey

Enhanced Training and possible certification

Advanced Technological Systems (i.e. automated monitoring/AI assistance)

Operational Limits/Maximum Drone Limit/Operational Time Limits

Monitoring and Supervision/Supervisory Roles/Periodic Audits

Robust Communication Links

Emergency Communication Protocols

Fatigue Management Plans

George Howe

Double-crewing/redundancy, (having more than one pilot available to assume control in the event of an emergency). Systems where control can be handed to another available RP.

Consultation Question 41

We provisionally propose that use of flight data recorder systems or devices should be mandatory for autonomous drone operations. Do you agree?

Yes

Please expand on your answer below

Chris Boosey

100% yes. This will act like a black box as used in manned aviation providing valuable data, especially in the event of an accident. This data would be crucial in

understanding the cause of any failure and aid in improving flight safety. I would imagine there will also be some legal implication here for evidence and liability etc.

Consultation Question 42

Should the law permit a drone to transition between remotely piloted and autonomous flight during an operation?

Yes

Please expand on your answer below

Chris Boosey

This would be an added form of redundancy which could be relied upon in an emergency scenario. It could also be that the RP could take over in more complex environments.

Civil liability and insurance

Consultation Question 44

We provisionally consider that the current law governing air carrier liability for injury or death of passengers in the UK is adequate for the introduction of remotely piloted and autonomous operations. Do you agree?

Other

Please expand on your answer below

Chris Boosey

Not familiar with this but I would be surprised if it doesn't require some form of adaptation albeit minor I'm sure.

Consultation Question 45

We provisionally consider that the current law governing liability for damage to cargo in the UK is adequate for the introduction of remotely piloted and autonomous operations. Do you agree?

Other

Please expand on your answer below

Chris Boosey

Again, not familiar with this but I would be surprised if it doesn't require some form of adaptation.

Consultation Question 46

We provisionally propose that liability for surface damage, in the case of UAS, should transfer to the lessee when the lease:

- (1) is for more than 14 days; and
- (2) specifies the aircraft is to be operated under the responsibility of the lessee.

Do you agree?

Yes

Please expand on your answer below

Chris Boosey

This gives clear accountability/responsibility to the lessee and makes sense given they would assume operational control of the UAS and be therefore responsible for the overall safety, maintenance etc of the UAS.

I believe this approach aligns with practices in other industries where liability typically transfers to the lessee and 14 days is a good threshold for establishing the split between short term and long term.

Consultation Question 47

We provisionally propose 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. Do you agree?

Other

Please expand on your answer below

George Howe

I believe that the conditions of exemption should be subject to review but that inspiration should be drawn from how S76 deals with this matter when it comes to general aviation. General aviation is not regarded as trespassing or causing 'private nuisance' if it flies over land 'at a height above the ground which, having regard to wind, weather, and all the circumstances of the case, is reasonable'. This allows for a common-sense approach to be applied in civil court where it can be decided, on review of all the facts, whether the flight was deemed reasonable. This approach should apply to UAS, i.e flying a sub-250g drone outside of someone's window or flying across their land with no purpose at low-altitude may not be considered reasonable, (especially given, unlike most conventional aircraft, a UA is equipped with a camera), however flying a UA over land at a reasonable altitude as part of a transit to its destination or as part of its tasking such as delivering cargo or

passengers WOULD be considered reasonable, just as an airliner flying overhead would be.

Consultation Question 48

We provisionally propose that there should be a review product liability law (including the Consumer Protection Act 1987) to take account of the challenges of emerging technologies. The review should cover product liability as a whole, rather than be confined to aviation or automated vehicles. Do you agree?

Yes

Please expand on your answer below

George Howe

I agree with a review. The UK has been falling behind other nations around the world due to over-regulation as a result of out-dated legislation that, at the time of it's inception, would not have accounted for the leaps in technology we've experienced to date, ranging from UA technology, to driverless cars to the emergence of AI. Product liability law should be reviewed and re-written to continue to protect consumers, whilst also breaking-down barriers to allow the UK tech industry to thrive.

Consultation Question 49

We seek views as to whether the current law regarding liability for mid-air collisions is satisfactory in the case of collisions involving uncrewed aircraft systems.

Please share your views below

George Howe

The current law should be reviewed and tailored to include the increasing propagation of UA into the airspace. Liability regards autonomous operations is a complex issue and should be clearly set-out in legislation. Liability regards a mid-air collision involving a UAS differ to a mid-air collision solely involving conventional aircraft as ATC might not necessarily be involved in the flight operation or even a Pilot.

Consultation Question 50

We seek consultees' views on whether they expect any difficulties applying existing insurance requirements to uncrewed aircraft systems.

Please share your views below

George Howe

There will likely be broad variation in the types of autonomous piloting software

used, insurance companies may wish to assess these systems on a case by case basis before deciding on whether to insure.

Consultation Question 51

We provisionally propose that multiple simultaneous operations should be considered as the Government develops proposals for the insurance requirements applicable to uncrewed aircraft. Do you agree?

Yes

Please expand on your answer below

George Howe
Operators of UA being used in simultaneous operations and those at risk from such operations would all benefit from such craft being insured.

Criminal liability

Consultation Question 52

We provisionally consider that the current approach in the Air Navigation Order 2016 placing criminal liability on an operator is adequate for autonomous operations.

Do you agree?

Yes

Please expand on your answer below

George Howe
Yes - This covers circumstances whereby a remote pilot might not be involved in the flight of a UA thus future-proofing this legislation for fully autonomous flights.

Consultation Question 53

We provisionally consider that the “reasonable care” defence in article 265(3) of the Air Navigation Order 2016 applies adequately for “direct contraventions” under Article 265(5) to (8) involving autonomous operations. Do you agree?

Yes

Please expand on your answer below

George Howe
Yes - The ‘reasonable care’ defence applies adequately given that it is inherently

flexible, shifting the burden of proof to the operator to prove they have taken all reasonable precautions to mitigate any of the 'direct contraventions'.

Consultation Question 54

We seek views on whether for autonomous operations the reasonable care defence should be applicable to the vicarious liability created in article 265(1) of the ANO.

Please share your views below

George Howe

I believe that the reasonable care defence should apply, much in the same way it does to airlines when it comes to 'vicarious liability'. If operators of autonomous systems can demonstrate that they have taken all reasonable precautions and due diligence, including thorough testing, maintenance, staff training, operational procedures, regular inspections, the immediate addressing of any known issues and adherence to industry standards, they should be able to use the 'reasonable care' defence, as this would incentivise operators to maintain high standards and drive continuous improvement in autonomous technology.

Consultation Question 55

We provisionally propose that a remote pilot of an uncrewed aircraft operating in the certified category should be treated as a pilot-in-command for the purposes of criminal liability pursuant to article 265(1) of the Air Navigation Order 2016. Do you agree?

Yes

Please expand on your answer below

George Howe

Yes, but consideration should be made for the unique nature of UA, whereby control could be handed-off to another pilot or even automated systems.

Consultation Question 56

We ask for consultees' views on the criminal liability of pilots (or remote pilots) when an aircraft operating autonomously returns control to the pilot or vice-versa. In particular, should a pilot (or remote pilot) only become criminally liable for the piloting of the aircraft at the end of a transition period?

Please share your views below

George Howe

My view would be that the remote pilot should hold criminal liability for as long as

they have direct control of the aircraft. At the point in which control of the aircraft returns to automated systems, the liability should then shift to the operator as the party that has commissioned the use of these systems to control the UA.

Consultation Question 57

We provisionally propose that the pilot-in-command of aircraft in a multiple simultaneous operation should be criminally liable for breach of operating requirements in the same way as a pilot in command of a single aircraft would be. Do you agree?

Yes

Please expand on your answer below

George Howe

The Pilot should bear the same operating requirements when operating with slave aircraft tied to their master UA, the Pilot should still bear responsibility to ensure they are fit and licensed to fly etc, although liability should rest with the Operator if the breach was as a result of issues arising with automated systems implemented by them. Regards aircraft unworthiness, as the Pilot may not necessarily be present when the aircraft was readied, (working remotely from a control centre), this liability should rest with the responsible ground crew that confirmed to the Pilot the aircraft was safe and ready for flight.

Consultation Question 58

We invite consultees' views on whether the Air Traffic Management and Unmanned Aircraft Act 2021 operates satisfactorily in the case of highly automated and autonomous flight.

Please share your views below

George Howe

The act includes Police powers to stop and search individuals suspected of committing drone-related offences. As we begin to see wider use of cargo and passenger carrying UA, coupled with increased automation, it would be wise to also add powers to search UA, especially as there may not always be an individual operating the craft. This could also include search/seizure powers at UA heliports.

Furthermore, whilst the Police can find operator details by looking-up the operator ID on a UA, it may be more difficult to identify the Pilot in extended BVLOS circumstances, where the pilot could be anywhere in the country or the world. Some operators may be uncooperative or intentionally hinder investigation into a pilot. Currently under the Air Navigation Order 2016, operators must keep detailed flight logs with details of pilots that must be available to authorities on demand. To streamline this process, perhaps powers similar to S172 of the Road Traffic Act could be added to the Air Traffic Management and Unmanned Aircraft Act 2021,

requiring the Operator, on receipt of a letter from Police, to furnish them with details of the Pilot at the requested time/date, within 28 days or face a monetary fine and referral to the CAA for breach of their obligations under the ANO 2016.

Consultation Question 59

We invite views on how operator responsibilities for dangerous goods might need to be adapted in light of autonomous operations.

Please share your views below

George Howe

I believe this should be brought in-line with general-aviation, both to ensure such goods are transported to the highest of safety standards, but also to allow operators to transport such goods provided these standards are met, thus increasing the scope of drone operations in the UK. This in-turn also aids public confidence in drones being used for such purposes. Some considerations might include capping how many other aircraft an RP may be responsible for whilst monitoring a flight carrying dangerous cargo, or stipulating some mandatory safety features/redundancies the UA should be equipped with, i.e ballistic parachutes. Maximum volumes of various types of hazardous goods per flight could also be stipulated to further mitigate risk.

Consultation Question 60

We ask for consultees' views about whether the offence of hijacking in domestic law should be updated to:

1. include the unauthorised seizure or control of autonomous or remotely piloted aircraft by technological means or by persons not on board the aircraft; and
2. expand the period in which hijacking can occur from the period when an autonomous or remotely piloted aircraft is "in flight" to the period when it is "in service".

Please share your views below

George Howe

I agree, as drones become larger and more common-place in the UK's airspace there will be an increased likelihood they will become a target for terrorism, hostile state actors and other nefarious parties. Such changes to domestic law will ensure the security of the flight has been considered at all stages of the operation, with penalties in place for anyone that attempts to target a UA in this manner.

Consultation Question 61

We also ask consultees for views on whether any offences against the aircraft other than hijacking need to be updated to account for increased autonomy in aviation.

Please share your views below

George Howe

Consideration should be made to make disruption of optics and sensors a criminal offence, much in the way shining a laser at an aircraft is an offence.

An offence could also be created for distracting/disrupting a remote pilot.

Legislation mirroring that of 'vehicle interference' (S9, Criminal Attempts Act 1981), could also be created, making it an offence to interfere with the UA or anything carried in or on it. This would serve to protect any cargo the UA could be carrying as well as parts. Other offences mirroring those which apply to motor vehicles could also be created, such as TWOC (Taking Without Owners Consent - S12(1) Theft Act 1968), preventing the taking of a UA, without the owner's consent, for his or another's use, or allowing themselves to be carried in or on it, this covers circumstances whereby someone has assumed control of a UA, piloting it or allowing themselves to be a passenger, without the consent of the owner, but without the intent to 'permanently deprive' them of the UA as set-out in the legal definition of Theft (S1(1) Theft Act 1968). Currently TWOC covers 'conveyances' which includes conventional aircraft, the definition of 'conveyance' could perhaps be expanded to include UA to prevent any legal challenge.

Skyports Response to UK Law Commission Consultation on Aviation Autonomy

ABOUT SKYPORTS

Skyports is the leading enabler of air taxi and drone services, providing the critical link between the ground and sky. Skyports has two divisions; Skyports Infrastructure, the global leader in vertiport infrastructure, which designs, builds, owns and operates vertiports for air taxi operations; and Skyports Drone Services, the world's leading uncrewed airline operating a broad range of best-in-class drone operations.

Headquartered in London, UK, Skyports has projects operating in Asia, Africa, Australia, Europe, Middle East and North America.

Find out more at: www.skyports.net and www.skyportsdroneservices.com

ABOUT SKYPORTS' RESPONSE

Skyports has focused responses to question in sections of the consultation on which it has the most knowledge, expertise and experience, namely:

- Chapter 4: Airworthiness and Certification
- Chapter 5: Rules of the Air
- Chapter 6: VTOL
- Chapter 7: Drones

Our focus on these areas was suggested and agreed with the Law Commission on a Teams call.

Skyports is a member of a number of trade and industry bodies, which may also be submitting responses, for example: ADS, ARPAS UK, AUVSI and GAMA. Where possible, our responses will be aligned but there may be differences.

If the Law Commission wishes to discuss any aspect of our response, please do not hesitate to get in touch.

Simon Whalley FRAeS
Chief Regulatory Officer
Skyports
E: [REDACTED]

CHAPTER 4: AIRWORTHINESS AND CERTIFICATION

Consultation Question 1.

We seek views on how current airworthiness and certification regulation might need to be adapted or developed in light of highly automated and autonomous aircraft. In particular, should provisions be adopted which allow for:

(1) the certification of optionally piloted and uncrewed or unoccupied versions of conventional aircraft (hybrid versions); and

(2) the separate certification of command units?

Skyports response: Perhaps. Type-certified commercial air transport aircraft are already highly automated, which assists pilots during various phases of flight. For example:

- Autopilot: Autopilot systems can control the aircraft's trajectory during climb, cruise and descent, which manages the aircraft's speed, altitude and heading, often based on inputs from the flight management system (FMS);
- FMS: The FMS integrates multiple aircraft systems to manage the flight plan, optimising the flight path and providing guidance for autopilot and autothrottle systems;
- Autothrottle: The system automatically adjusts the aircraft's throttle settings to maintain the desired speed, reducing pilot workload during the various stages of flight;
- Electronic Flight Instrument System (EFIS): EFIS provides pilots with digital displays of critical flight information, including attitude, altitude, airspeed and navigation data, integrating multiple sources of data to provide enhanced situational awareness;
- Fly-by-Wire: Fly-by-Wire technology replaces traditional manual controls with an electronic interface whereby pilot inputs are converted into electronic signals transmitted by wires, which are then interpreted by flight control computers to adjust control surfaces;
- Automatic Landing Systems: Aircraft can perform automatic landings, including during low-visibility conditions, using Instrument Landing Systems (ILS) and other navigation aids;
- Traffic Collision Avoidance Systems (TCAS): TCAS monitors the airspace around an aircraft for other transponders and provides guidance to pilots to avoid mid-air collisions;
- Weather Radar Systems: Advance weather radar systems provide pilots with real-time information about weather conditions, helping them to navigate around severe weather; and
- Ground Proximity Warning System (GPWS) and Enhanced Ground Proximity Warning System (EGPWS): These systems alert pilots if an aircraft is at risk of controlled flight into terrain (CFIT) providing warnings to avoid accidents.

Aircraft type-certification specialists should already be sufficiently capable of certifying a UAS with high levels of automation based on their experience of high-automation in commercial air transport aircraft. However, they would need to become sufficiently familiar with UAS technology.

Where additional research and subsequent airworthiness and certification regulation would likely be required is if the UAS were fully autonomous.

UAS is a system which incorporates both the unmanned aircraft (UA) and the control unit (CU), and both are essential components of UAS operations. Since the pilot will not be on board the aircraft, whereby the cockpit (a certified element of the aircraft) is replaced by the CU, then the CU would need to be certified in line with the UA. Whether this requires a separate certification regime would likely be revealed by a gap analysis of current airworthiness and certification regulation and assessment of its fitness for purpose. Where possible, the competent authority should avoid creating additional regulation to minimise complexity.

Consultation Question 2.

We welcome views on what changes to the certification system might be necessary to enable higher automation and autonomy in aviation.

Skyports response: Airworthiness and certification regulations will likely need to evolve in some areas relative to the higher levels of automation and autonomy involved in UA to ensure safety, reliability and integration with traditional aspects of aircraft design. For example:

- Autonomous systems and Artificial Intelligence (AI):
 - Specific safety standards and certification for AI and machine learning algorithms employed in autonomous systems; and
 - Validation and verification processes to ensure that autonomous systems can effectively and safely manage the widest range of nominal and off-nominal operational scenarios.
- Human-Machine Interface (HMI): Standards for the design and evaluation of HMI for pilots to effectively monitor and interact with highly automated systems;
- Data and Cyber Security: Standards to certify data links between the UA and CU to prevent unauthorised access and that the link provides sufficient accuracy and reliability;
- Testing: Standards to enable the testing of autonomous aircraft as part of the certification process;
- Sensors and Communication Systems:
 - Standards for accuracy, reliability and maintenance of sensors in autonomous aircraft; and
 - Standards for communication protocols between aircraft and other aircraft (automated and crewed) and ground systems.

Consultation Question 3.

We seek views on whether current regulatory tools to support the development of highly automated and autonomous aviation technologies are adequate.

Skyports response: Consistent with responses to earlier questions, a gap analysis should reveal where current regulatory frameworks for the development of these technologies are adequate. As Skyports is not an aircraft manufacturer, we are not best placed to comment. The Law Commission is encouraged to consult with aircraft OEMs.

CHAPTER 5: RULES OF THE AIR

Consultation Question 4.

We seek views on how highly automated and autonomous aircraft should act in emergency scenarios. In particular:

- (1) should highly automated and autonomous aircraft be given the freedom to operate outside the rules of the air in emergency circumstances; or**
- (2) should a comprehensive set of rules be developed for highly automated and autonomous aircraft in emergency situations.**

Skyports response:

(1) Highly automated and autonomous systems should be able to operate outside the rules of the air if the pilot or system determines that a course of action may provide a safer outcome. Generally, automated and autonomous systems should be afforded the same freedoms and responsibilities that pilots of crewed aircraft have today.

(2) Some emergency scenarios may only be relevant to highly automated and autonomous systems; where they are, a separate set of rules would be advisable, so long as they were safely integrated into the existing aviation system and the crewed aircraft pilots were able to understand, be aware of and recognise such an emergency scenario to avoid making the outcome worse.

Consultation Question 5.

We seek consultee views about what challenges remotely piloting an aircraft in an emergency scenario presents and how these might be addressed.

Skyports response: Highly automated aircraft – with the remote pilot on the loop rather than in the loop – provide remote pilots with limited options to respond to an emergency. When the aircraft identifies an emergency scenario occurring, the aircraft will automatically execute a range of pre-programme responses in order to bring the emergency to a safe conclusion. The remote pilot will always have some level of control of the emergency and could decide to execute the over-ride functions they have available; however, manual intervention (not manual control) of the system outside the pre-programmed automated responses would have the potential of exacerbating a deteriorated situation, especially when the aircraft is beyond their visual line of sight. Report pilot training would be the most important factor in ensuring the safe management and operation of highly automated operations.

Consultation Question 6.

We seek consultees' views on whether the rules of the air relating to communication should be adapted for remotely piloted and autonomous aircraft.

For highly automated remotely piloted aircraft, existing rules governing communication are adequate but may not be necessary depending on the safety case.

For autonomous aircraft, rules of the air are likely to require amendment. For example:

- Autonomous aircraft would need to be able to monitor and communicate using VHF frequencies, which may not be possible; and
- Communications data link using text rather than voice communications may need to be approved for all nominal and off-nominal scenarios.

Consultation Question 7.

We ask for consultees' views on how the rules of the air might be adapted or developed for remotely piloted or autonomous flight.

Skyports response: No comment.

CHAPTER 6: VTOLS

Consultation Question 8.

We provisionally propose that a person overseeing a VTOL flying automatically, who monitors its course and is able to intervene and change its course at any time should continue to be classified as a "remote pilot"

Skyports response: The question is unclear. It is not clear whether the VTOL is flying automatically with a pilot on board the aircraft or not on board the aircraft. Our response would be different depending on the scenario. Assuming the VTOL is uncrewed and being operated remotely, then the person should be classified as a remote pilot. However, assuming the flight is BVLOS of the remote pilot, we do not think it would be safe to change course at any time. Instead, the automatic system is likely only to afford the remote pilot a small number of manual override actions – and deviating course is unlikely to be one of them due to the risks.

If the aircraft is still crewed but is flying automatically, then we do not agree that the individual should be a remote pilot.

Consultation Question 9.

We provisionally propose 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.

Do you agree?

Skyports response: Yes, however due to the likely location of a remote pilot in a remote operations centre (ROC), tasks will be delegated as they are today for UAS.

Consultation Question 10.

We provisionally propose 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.**

Do you agree?

Skyports response: Yes, however due to the likely location of a remote pilot in a remote operations centre (ROC), tasks will be delegated as they are today for UAS.

Consultation Question 11.

We seek views as to whether there are additional operational responsibilities that a remote VTOL pilot should be required to fulfil.

Skyports response: None at this present time.

Consultation Question 12.

We provisionally propose that the remote pilot-in-command should be responsible for, amongst other things, ensuring passengers are:

- (1) given a safety briefing; and**
- (2) seated and wear seat belts during take-off and landing.**

Do you agree?

Skyports response: Yes, however due to the likely location of a remote pilot in a remote operations centre (ROC), tasks will be delegated as they are today for UAS.

Consultation Question 13.

We provisionally propose that air operators (rather than the remote pilot-in command) should be responsible for preventing passengers from boarding:

- (1) who appear drunk or under the influence of drugs; or**
- (2) whose carriage would, in the view of the operator's employees, endanger the safety of the aircraft or other passengers.**

Do you agree?

Skyports response: The remote pilot would still need to make the final decision whether the aircraft was safe to take off, regardless of the circumstances. Responsibility for executing these tasks could be delegated to the air operator or other ground staff on behalf of the remote pilot.

Consultation Question 14.

We provisionally propose that the remote pilot-in-command 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.

Do you agree?

Skyports response: Yes, in theory; however, it is unclear how this would work in practice if there were no crew on board the aircraft to restrain the individual on the remote pilot's behalf, unless, of course, the restraint can be made remotely using technology.

Consultation Question 15.

We provisionally propose that a person on board a VTOL aircraft (other than a crew member) should be able to take reasonable measures to protect the safety of the aircraft or of persons or property on board.

Do you agree?

Skyports response: Yes, so long as the action has been approved by the remote pilot, unless in the most extreme circumstances where this may not be possible.

Consultation Question 16.

We seek views on whether the powers of crew on board a VTOL aircraft should be broadened to reflect those of the pilot-in-command under the Civil Aviation

Act 1982 to:

(1) take reasonable measures to protect the safety of the aircraft or persons or property on board;

(2) maintain good order and discipline; or

(3) enable the crew to disembark or deliver a person.

Skyports response: Yes, these responsibilities/powers could be delegated; however, the remote pilot would still be in overall charge of the flight and decisions based on its continuation, unless in the most extreme circumstances where this may not be possible.

Consultation Question 17.

We provisionally propose that passengers should be able to contact a member of crew at all times during an operation.

Do you agree?

Skyports response: Yes; although, it must be recognised that a member of the crew may not be on board the aircraft. However, depending on the location of the aircraft contact with the remote pilot or member of the crew may not be possible, i.e. VHF would not be possible, LTE coverage may be poor and satellite communication coverage may not be available. To comply, aircraft operators would need to ensure that sufficient communications coverage of sufficient high quality is available throughout the flight.

Consultation Question 18.

We provisionally propose 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.

Do you agree?

Skyports response: Yes; however, the offence should be extended to other members of the crew to whom responsibility for some aspects of the aircraft operation have been delegated.

Consultation Question 19.

We provisionally propose that it should be a criminal offence for a person to act as the remote pilot of a VTOL when the level of alcohol in their blood, breath or urine is over a prescribed limit.

Do you agree?

Skyports response: Yes; however, the offence should be extended to other members of the crew to whom responsibility for some aspects of the aircraft operation have been delegated.

Consultation Question 20.

We provisionally propose that the remote pilot should be subject to the reporting obligations currently applicable to pilots under the Air Operations Regulation.

Do you agree?

Skyports response: Yes; however, the obligations may need to be extended to other members of the crew to whom responsibility for some aspects of the aircraft operation have been delegated.

Consultation Question 21.

We provisionally propose that a remotely piloted VTOL should be required to be capable of detecting and recording information relating to accidents and near accidents for the purposes of reporting it.

Do you agree?

Skyports response: Yes; however, the requirements may need to be extended to other members of the crew to whom responsibility for some aspects of the aircraft operation have been delegated.

Consultation Question 22.

We provisionally propose that licences should be required for remote VTOL pilots.

So far as appropriate, these should follow the classes and ratings adopted for crewed VTOLs.

Do you agree?

Skyports response: While we agree that remote VTOL pilots' licences will be required, the skills and competences required to fly a highly automated aircraft remotely will be different to those of an aircraft flown by the pilot on board the aircraft where manual intervention is possible. The UK CAA has been considering remote pilot competences and the feedback we have provided is that there are too many unnecessary requirements based on traditional aviation that should be removed.

Consultation Question 23.

We provisionally propose that operators of remotely piloted VTOLs should be certified.

Do you agree?

Skyports response: To some extent; however, we would caution against assuming that the certification requirements should be the same as an AOC for crewed aviation. The Light Unmanned Certificate, enabled through Regulation 2019/947 for UAS, for example is a type of AOC purely for UAS operated in the Specific Category. The concept could be adapted for Certified Category operations rather than just adopt the full AOC requirements and depending on the type of operations.

Consultation Question 24.

We provisionally propose that operators of remotely piloted VTOLs should continue to be required to:

- (1) have the means necessary for the scale and scope of operations planned;**
- (2) use only suitably qualified and trained personnel;**
- (3) implement a management system to ensure safety;**
- (4) ensure operations only take place in accordance with the operations manual;**
- (5) establish procedures to minimise the consequences to safe flight operations of disruptive passenger behaviour;**
- (6) develop and maintain security programmes suitable for the aircraft and type of operation;**

- (7) have a management system to prevent fatigue;**
- (8) ensure the continuing airworthiness of the aircraft; and**
- (9) establish procedures for any reasonably foreseeable emergency situation.**

Do you agree?

Skyports response: Yes.

Consultation Question 25.

We seek views as to whether there are additional responsibilities that operators of remotely piloted VTOLs should need to fulfil.

Skyports response: Not at this time.

Consultation Question 26.

We seek views as to whether the law should permit remote pilots to act as pilot-in-command for more than one VTOL at the same time.

Skyports response: Yes, so long as the aircraft technology supports one-to-many, the remote pilot and crew are adequately trained and that there are procedures.

Consultation Question 27.

We seek views on whether there should be an upper limit to the number of VTOLs for which a remote pilot can act as pilot-in-command at the same time.

Skyports response: No. It should be for the VTOL operator to demonstrate with a safety case how it intends to safely operate the number of VTOL aircraft to a single remote pilot.

Consultation Question 28.

We seek views as to what additional safeguards should be introduced for remote pilots piloting multiple VTOLs.

Skyports response: See our response to Question 27, a safety case should be used to approve whether a remote pilot can operate more than one VTOL at the same time. Considerations for a regulator will be: technology used, human factors, HMI, emergency procedures, especially in the event of a degrading situation where more than one VTOL suffers an emergency at the same time. Performance-based requirements should be used instead of conservative approaches.

Consultation Question 29.

We seek views as to whether there should be a role for a person supervising the flight of an autonomous passenger-carrying VTOL and acting as a point of contact in relation to it. What powers or responsibilities should such a person have?

Skyports response: Yes. While the role of a remote pilot would be effectively redundant, there must be someone who is legally accountable for the flight, perhaps the VTOL aircraft operator.

Consultation Question 30.

Should the law permit an uncrewed VTOL to transition between remotely piloted and autonomous flight during an operation?

Skyports response: Yes, so long as the aircraft operator ensures that the operation is in line with relevant legislation and regulation at all times.

Consultation Question 31.

We seek views as to whether initial airworthiness standards for uncrewed VTOLs should include accessibility standards for persons with disabilities and reduced mobility.

Skyports response: Standards should be the same for all passenger carrying aircraft.

Consultation Question 32.

We seek views as to whether the CAA should be able to include accessibility standards within the licences granted to uncrewed VTOL operators.

Skyports response: Accessibility standards (excluding those governed by initial airworthiness standards) are governed by existing legislation and standards, which should apply to VTOL operators. VTOL operators should not be subject to any different legislation.

Consultation Question 33.

We seek consultees' views on any other issues with the current legal framework as it relates to operations involving remotely piloted and autonomous VTOLs.

Skyports response: Not at this time.

CHAPTER 5: DRONES

Consultation Question 34.

We provisionally propose that a remote pilot for drones should continue to be defined as “a natural person responsible for safely conducting the flight of an unmanned aircraft by operating its flight controls, either manually or, when the unmanned aircraft flies automatically, by monitoring its course and remaining able to intervene and change its course at any time”.

Do you agree?

Skyports response: No, for example, in tethered operations the drone cannot go anywhere so the need for a remote pilot would provide little if no safety benefit. There may also be instances where an operation involving a small drone in an unpopulated/low risk environment would not benefit safety wise from a remote pilot on hand to execute these functions.

Consultation Question 35.

We seek views on whether some low risk autonomous drone operations or drone operations conducted beyond visual line of sight might be accommodated in the open category. In particular:

(1) whether there are any such use cases which might be suitable for the open category; and

(2) if so, what conditions should be attached to these use cases if operated in the open category.

Skyports response: Perhaps, such as BVLOS flight wholly over private property and in low risk, controlled-ground environments with a highly automated aircraft with limited remote pilot functionality. The regulator would be required to develop the risk assessment behind the Open Category for BVLOS flights and so it is more of a question of whether they have the capacity to do this and whether there is a risk assessment that would substantiate a move to BVLOS in the Open Category.

Consultation Question 36.

We provisionally propose that for autonomous operations in the specific category, a UAS 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.

Do you agree?

Skyports response: Generally speaking, yes.

Consultation Question 37.

We seek views on what operational requirements should be applied to autonomous drone operations and drones that operate beyond visual line of sight in the specific and certified categories.

Skyports response: We do not understand the question. Drones can already operate in the Specific Category based on an approved safety case. Operational procedure should be left to the operator/applicant to determine as part of their safety case application that justifies to the regulator that their operation, whether it be autonomous, highly automated or manual, is safe. Regulations and guidance material can help direct operators.

Consultation Question 38.

We seek views on whether the current concept of a “remote pilot” is compatible with drone MSO. We also seek views on whether the remote pilots of drone MSO should continue to be subject to the same responsibilities as remote pilots for single drone operations.

Skyports response: The concept would still be a remote pilot for a drone MSO as they will still execute the same functions; however, autonomous may not involve the remote pilot doing any ‘flying’ In this case, the emphasis will be on the technology to substantiate safety claims.

Consultation Question 39.

We seek views on whether there should be an upper limit to the number of drones for which an individual remote pilot is responsible.

Skyports response: No. It should be for the drone operator to demonstrate with a safety case how it intends to safely operate the number of VTOL aircraft to a single remote pilot.

Consultation Question 40.

We seek views as to what additional safeguards should be introduced for remote pilots responsible for multiple drones.

Skyports response: See our response to Question 27, a safety case should be used to approve whether a remote pilot can operate more than one drone at the same time. Considerations for a regulator will be: technology used, human factors, HMI, emergency procedures, especially in the event of a degrading situation where more than one drone suffers an emergency at the same time. Performance-based requirements should be used instead of conservative approaches.

Consultation Question 41.

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

Do you agree?

Skyports response: Yes, although give the small size of some drones, the data should be permitted to be stored on the ground to avoid overburdening the aircraft with hardware.

Consultation Question 42.

Should the law permit a drone to transition between remotely piloted and autonomous flight during an operation?

Skyports response: Yes, so long as the aircraft operator ensures that the operation is in line with relevant legislation and regulation at all times.

Consultation Question 43.

We seek stakeholder views on any other issues with the current legal framework as it relates to operations involving autonomous drones.

Skyports response: Not at this time.

RESPONSE TO LAW COMMISSION CONSULTATION ON AVIATION AUTONOMY

(Law Commission Consultation Paper 261)

Please note that this consultation response has been reproduced from information entered on the Citizen Space online portal.

Any personal email addresses and phone numbers have been excluded from this document.

Unanswered questions have been deleted from this document.

About you

What is the name of your organisation?

SLINK-TECH Ltd

Airworthiness and certification

Consultation Question 1

We seek views on how current airworthiness and certification regulation might need to be adapted or developed in light of highly automated and autonomous aircraft. In particular, should provisions be adopted which allow for:

1. the certification of optionally piloted and uncrewed or unoccupied versions of conventional aircraft (hybrid versions); and
2. the separate certification of command units?

Please share your views below

We believe provisions should be adopted to allow for the separate certification of command units. Our business is developing a ground command unit, to aid autonomous flight (in the take off and landing stages at vertiports/hubs/etc.) and this would need to be certified separately to the aircraft using it. The aim is for our system to talk with various aircraft (drones + eVTOL) to command them to land, therefore this separate certification is of great benefit.

Rules of the air

Consultation Question 4

We seek views on how highly automated and autonomous aircraft should act in emergency scenarios. In particular:

1. should highly automated and autonomous aircraft be given the freedom to operate outside the rules of the air in emergency circumstances; or

2. should a comprehensive set of rules be developed for highly automated and autonomous aircraft in emergency situations.

Please share your views below

Yes, there should be a comprehensive set of rules developed for highly automated and autonomous aircraft in emergency situations. We believe emergency points/safe spaces should be created for emergency landings. Areas with low population density should be able to accommodate these spaces, it is in high population density areas where great considerations need to be made. Perhaps split these areas and address separately?

VTOLs

Consultation Question 8

We provisionally propose that a person overseeing a VTOL flying automatically, who monitors its course and is able to intervene and change its course at any time should continue to be classified as a “remote pilot”. Do you agree?

Yes

Please expand on your answer below

Consultation Question 12

We provisionally propose that the remote pilot-in-command should be responsible for, amongst other things, ensuring passengers are:

1. given a safety briefing; and
2. seated and wear seat belts during take-off and landing

Do you agree?

Other

Please expand on your answer below

Safety briefing: A safety briefing should always be provided to passengers choosing to fly. How this is served needs to be considered (it can be given verbally/through video feed or sent in advance of the flight for passengers to read). Information within the VTOL perhaps if no crew on board?

Seated and wearing seatbelts: If a vehicle is uncrewed, it should be the passengers responsibility, (perhaps with video feeds etc. for command centre/operator to view remotely), especially as during landing it cannot be checked by ground personnel and a remote pilot would have no control over enforcing this on the passengers in a

vehicle due to land.

We're not sure how a remote pilot-in-command could ensure passengers are seated and wearing a seat belt during t/o and landing if they are based off site (only so much a verbal/video feed communication can provide).

Consultation Question 13

We provisionally propose that air operators (rather than the remote pilot-in-command) should be responsible for preventing passengers from boarding:

1. who appear drunk or under the influence of drugs; or
2. whose carriage would, in the view of the operator's employees, endanger the safety of the aircraft or other passengers.

Do you agree?

Yes

Please expand on your answer below

This means that during every VTOL flight there would need to be staff on the ground to assess passengers boarding (not a fully autonomous journey). Are their automated means to check this prior to passengers boarding?

Consultation Question 14

We provisionally propose that the remote pilot-in-command should have the power to take reasonable measures, including restraint of passengers, as set out in section 94 of the Civil Aviation Act 1982. Do you agree?

Yes

Consultation Question 15

We provisionally propose that a person on board a VTOL aircraft (other than a crew member) should be able to take reasonable measures to protect the safety of the aircraft or of persons or property on board. Do you agree?

Yes

Please expand on your answer below

VTOLs reaching the market first are looking to be quite small in capacity (~2-4 seats), indicating it's highly likely passengers would know one another. Regardless of this, a passenger should be able to take reasonable measures to protect their safety whilst on board the aircraft. To be a fully autonomous flight would indicate no crew members on board the flight - perhaps a means to communicate with ground operators/remote pilot if this is required?

Consultation Question 17

We provisionally propose that passengers should be able to contact a member of crew at all times during an operation. Do you agree?

Yes

Consultation Question 18

We provisionally propose 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. Do you agree?

Yes

Consultation Question 19

We provisionally propose that it should be a criminal offence for a person to act as the remote pilot of a VTOL when the level of alcohol in their blood, breath or urine is over a prescribed limit. Do you agree?

Yes

Consultation Question 24

We provisionally propose that operators of remotely piloted VTOLs should continue to be required to:

- ☒ (1) have the means necessary for the scale and scope of operations planned;
- ☒ (2) use only suitably qualified and trained personnel;
- ☒ (3) implement a management system to ensure safety;
- ☒ (4) ensure operations only take place in accordance with the operations manual;
- ☒ (5) establish procedures to minimise the consequences to safe flight operations of disruptive passenger behaviour;
- ☒ (6) develop and maintain security programmes suitable for the aircraft and type of operation;
- ☒ (7) have a management system to prevent fatigue.
- ☒ (8) ensure the continuing airworthiness of the aircraft; and.
- ☒ (9) establish procedures for any reasonably foreseeable emergency situation.

Do you agree? (tick all that you agree with)

Consultation Question 26

We seek views as to whether the law should permit remote pilots to act as pilot-in-command for more than one VTOL at the same time.

Please share your views below

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

Drones

Consultation Question 36

We provisionally propose that for autonomous operations in the specific category, a UAS 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 manned 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.

Consultation Question 41

We provisionally propose that use of flight data recorder systems or devices should be mandatory for autonomous drone operations. Do you agree?

Yes

Consultation Question 42

Should the law permit a drone to transition between remotely piloted and autonomous flight during an operation?

Yes

Professor Alison Young
Connor Champ
Henni Ouahes
Ethan George
Eleanor Bennett
Law Commission

28 June 2024

By email to:
aviationautonomy@lawcommission.gov.uk

Peter Neenan

Dear Law Commission,

AVIATION AUTONOMY: LAW COMMISSION CONSULTATION RESPONSE

I write further to the Consultation response provided by the Royal Aeronautical Society (RAeS) on 24 June 2024 ('the RAeS Response'). As you are aware, I am the current Chair of the Air Law Group for the RAeS and was heavily involved in preparing the response. There is little value in repeating that response, so I would endorse the responses to all questions including the general comments and amended definitions (which I use below), but provide below further comments in relation to consultation questions 43, 44, and 48 as those questions closely align with the work that Stewarts undertakes representing crew, passengers and families of those fatally injured following aviation accidents in the UK and around the world.

Consultation Question 43

11.43 We seek stakeholder views on any other issues with the current legal framework as it relates to operations involving autonomous drones.

Consultation Answer 43

As set out in the RAeS Response, a serious area for concern is the minimum insurance requirements under assimilated Regulation EC 785/2004. We have set out in detail in the RAeS Response the issues around this regulation including:

- (a) The low weight of drones and consequent low minimum insurance level, set against the capacity of a low weight drone to have a significant amount of kinetic energy and cause a significant amount of damage resulting in claims that are well in excess of any minimum insurance requirement. I set out in the RAeS Response the implication in the example of an airliner being downed by a drone or a drone causing brain or spinal cord injury.
- (b) That this same concern applies to VTOL operations (and other AAM) and the importance of factoring in the operational air and ground risk (taking into consideration category of operation / air traffic density / population density etc.)

STEWARTS

I would add two additional comments:

- (a) In relation to eVTOL and other electric AAM, a key design driver is weight. The weight of the aircraft has a huge bearing on the flight time for an electric powered aircraft. During the discussions I was involved in on the President's Briefing Paper (sent to you with the RAeS Response), the technical experts involved in eVTOL design and development expressed to me that such is the importance of weight as a design driver, that the design strip out any possible weight that can be removed, including for example the division between a pilot and passenger (which has its own safety implications). What that means practically for the purposes of Regulation EC 785/2004 is that the design driver is pushing weight down on these aircraft which is in turn resulting in less insurance for aircraft which are intended to operate in a more dangerous, congested and populated area than other forms of transport, most likely often carrying high net worth individuals all of which is likely to result in higher value claims. This is something that drastically has to be addressed.
- (b) Notwithstanding the comments about the application of Regulation EC 785/2004 to future flight operations, please note that in our experience at Stewarts, Regulation EC 785/2004 has frequently produced minimum insurance levels that are inadequate even for conventional general aviation, particularly in relation to lighter aircraft such as microlights. As stated in the RAeS, average values of brain injury and serious spinal cord injury cases are almost always in excess of £1,000,000 and frequently in excess of £10,000,000, whereas insurance for lighter aircraft is often only £1,000,000, leaving injured individuals under compensated.

Consultation Question 44

- 11.44 We provisionally consider that the current law governing air carrier liability for injury or death of passengers in the UK is adequate for the introduction of remotely piloted and autonomous operations.
Do you agree?

Consultation Answer 44

As set out in the RAeS Response, the current law governing air carrier liability may be adequate for the short term future, but will certainly not be in the event of Highly Automated and Autonomous aircraft. We have set out in detail in the RAeS Response the issues around the application of the Montreal Convention to Highly Automated and Autonomous aviation, including:

- (a) The likelihood that operators will rely on Article 21(2) to limit their liability under the Montreal Convention in circumstances where the failure was caused by a command generated by an artificial intelligence system;
- (b) The issues regarding the limitation period in those circumstances given the likelihood that an investigation will not be concluded. As set out in my response to question 48, one way of dealing with the issue concerning the likelihood of a product claim against a manufacturer of the artificial intelligence system (and other issues that arise from the product liability regulations discussed at 48) is

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to extend the limitation period in relation to aviation to only commence upon publication of an official accident investigation report.

- (c) That once Highly Automated and Autonomous aircraft are transporting passengers, the Montreal Convention (whether domesticated or applying to international transport) is likely to no longer be fit for purpose.

I would add two additional comments:

- (a) Notwithstanding what is said above about the fitness for purpose of the Montreal Convention in respect of Highly Automated and Autonomous aircraft, it is arguable that the Montreal Convention is showing signs of failing even now. Under the JARUS definition of automation (0 Manual Operation, 1 Assisted operation, 2 Task reduction, 3 Supervised Automation, 4 Manage by Exception, and 5 Full Automation), a Highly Automated or Autonomous aircraft is likely to be level 4 or 5. The most sophisticated aircraft we have currently are at level 2. However, even at level 2, the Montreal Convention may no longer be suitable. By way of example, the recent Boeing Max litigation arose out of the defect in the design of MCAS system installed by Boeing on those aircraft. That system was designed to make adjustment to the flight surfaces to accommodate the engine position and tendency of the aircraft to pitch up (due to that position) without the involvement or knowledge of the crew. Indeed, crews were specifically not told about that system in order to avoid retraining requirements. That is by definition a level 2 system.

Following the crash of the Boeing 737 Max aircraft in Indonesia and Ethiopia, litigation was solely commenced against Boeing despite the possibility of bringing claims against the operator under the Montreal Convention. There were reasons to do this based upon the greater damages available to passengers in the US than damages that would be available locally, but *had* passengers attempted to bring proceedings against the operator locally, they may very well have faced an Article 21(2) argument. That will happen more and more with greater levels of automation, even below level 4 and 5.

- (b) The beauty of the Montreal Convention (and its domesticated version) is that it provides for strict liability to 128,821 SDR and a presumption of unlimited liability (with a reversed burden of proof) in circumstances where a pilot has traditionally been at fault in 85% of aviation accidents. The strict liability regime allows liability to be channelled through carriers meaning (a) that the accident investigation has no bearing on the liability claims (as the carriers are strictly liable) so no less likelihood of impacting a just safety culture, and (b) that this presumption of liability allows insurers to accurately model their exposure and charge premiums accordingly. That breaks down in circumstances where pilots are no longer invariably at fault.

In my view, any replacement liability framework for Highly Automated and Autonomous aircraft needs to deal with the following factors:

- i. Highly Automated and Autonomous aircraft will be operating in a completely different automated ecosystem where failure may be attributable to a variety of different elements within that system that

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may begin with the AI generating commands, but include all of the components within the aircraft which will have their own automated functionality, aircraft-aircraft communications, aircraft-ground communications and any decisions that are commands that are generated at an operator level.

- ii. If a liability regime is introduced for aviation that is carved out of the general product liability regime (as discussed at question 48) and attempts to govern liability in relation to multiple potential parties (as discussed at (i)), I would strongly favour a strict liability regime, potentially with a reversed burden of proof, but one which is not focused on operator liability (i.e. liability being limited only in circumstances where a defendant proves that there was no negligent or wrongful act or omission by any company or individual involved in the design, manufacture or operation of the aircraft). Given the complexities of proving a failure in artificial intelligence coding, a strict liability regime would ensure that this difficulty could be avoided AND issues of the limitation period could be avoided AND issues over the need to seek evidence and/or proprietary code from a manufacturer could be avoided AND it would reinforce a just safety culture. A joint insurance policy between potentially exposed parties could be negotiated as a responsive policy to any accident.
- iii. The Montreal Convention provides five jurisdictions where a claim may be brought. It is an exclusive regime so a claim may not be brought in a jurisdiction outside of those five options. Those jurisdictions revolve heavily around the ticketing arrangements and the home base of the operator. Jurisdiction is a key factor for families as there are grossly different approaches to compensation around the world. These jurisdictions become hugely relevant to international transport. For domestic legislation they are less relevant because the UK government does not have the power to confer jurisdiction in a claim abroad. Accordingly, for any new liability regime that might be introduced in relation to domestic journeys, I would favour that the regime is not exclusive, giving families and passengers the option of utilising a clear simple strict liability regime in the UK, or if they prefer to pursue their in another jurisdiction where liability will be contested and more difficult, they are given that freedom to choose.

Consultation Question 48.

- 11.48 We provisionally propose that there should be a review of product liability law (including the Consumer Protection Act 1987) to take account of the challenges of emerging technologies. The review should cover product liability as a whole, rather than be confined to aviation or automated vehicles.
Do you agree?

Consultation Answer 48

There are several elements to this answer, which I address individually below:

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As stated in the RAeS response, the LC will be aware that the EU has reviewed product liability laws and produced a new Directive for liability for defective products ('**the EU PLD**'). In addition, the EU has proposed an AI Liability Directive, which is still being discussed, both forming part of the Commission's regulatory framework on AI in conjunction with the AI Act. Given changes that have already taken place in Europe, a failure to update product liability laws might leave the UK at a competitive disadvantage in consumer protection.

While I would advocate for the UK to review product liability laws, in the event that the UK decides to mirror the updates proposed by the EU, I wanted to raise some comments on the approach taken by the EU in so far as it relates to aviation generally, and particularly Highly Automated and Autonomous aviation:

- i. I agree with the broad principles of the EU approach in the context of a broad EU directive on product liability, namely updating the rules to reflect products in the digital age and associated risks, easing the burden on defectiveness and introducing rebuttable presumptions particularly in circumstances involving "excessive difficulties " due to "technical or scientific complexity". However, I don't believe that the way that this is structured will be practically useful, particularly in aviation generally and even more so in Autonomous aviation.
- ii. Article 8 of the EU PLD will create a practical issue in the context of aviation. Article 8 provides courts with the power to order a defendant (manufacturer) to disclose relevant evidence at its disposal provided an injured person has presented facts and evidence sufficient to support the plausibility of the claim for compensation.

As you will appreciate, following any accident or serious incident, the Air Accident Investigation Branch will open an investigation into the circumstances of the accident pursuant to the Chicago Convention 1944, Annex 13 ('**Annex 13**'), retained Regulation (EU) No. 996/2010 ('**the EU Regulation**') and the Civil Aviation (Investigation of Air Accidents and Incidents) Regulations 2018 ('**the 2018 Regulation**').

The purpose of that investigation is "the prevention of accidents and incidents, without the apportionment of blame or liability" (s. 8 of the 2018 Regulation; Article 1.1 of the EU Regulation; the para. 3.1 Annex 13). Families and passengers are excluded from the investigation (Article 10 of the EU Regulation), but manufacturers are frequently involved in the investigation process both through an accredited representative appointed for the state of design and/or manufacture and/or because of the need to help interpret information obtained during the investigation.

At Article 13 of the EU Regulation, provision is made for the Investigators to take custody of the aircraft. Pursuant to 13(1) no person shall take samples from the wreckage. The EU Regulation states explicitly at Article 14(2) that certain sensitive safety information shall not be made available or used for purposes other than the safety investigation, this includes flight data recordings (cockpit voice recordings and digital flight data recordings).

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The wreckage, together with the CVR and DFDR constitute the key information that an injured person would need to prove a defect with the aircraft (potentially together with code in relation to an Autonomous system). This information may only be disclosed following an order from a court under s.25(4) of the 2018 Regulation / Article 14(3) of the EU Regulation.

Historically, such orders are extremely difficult to obtain. As set out in *HM Senior Coroner for West Sussex v Chief Constable of Sussex* [2022] EWHC 215 (QB) at paragraph 107-108:

- 107 *The concrete question for us to answer is whether we are satisfied, pursuant to Regulation 25(5) of the 2018 UK Regulations, that the benefits of the disclosure sought would outweigh the adverse domestic and international impact which the disclosure might have on the safety investigation or any future safety investigation.*
- 108 *There are two sides to this balancing exercise (a harm issue and a benefit issue) which are both fact specific:*
- (i) First, the harm or detriment that would be caused through disclosure, and the harm, in particular, to the AAIB's ability to improve safety through future investigations; and*
 - (ii) Second, what the benefit would be from disclosure*

In relation to the harm or detriment, the court set out at paragraph 112 the reasons for concluding that disclosure would result in harm to the investigation, relying on the evidence of Mr Firth, Principal Inspector of the AAIB:

- 112 *The particular reasons for this protection and the potential adverse impact on future domestic and international safety investigations are set out in the statement of Mr Firth. He has "significant concerns about the effect of disclosure of the material at issue on the work of the AAIB" and considers that "disclosure of protected materials in circumstances where there is no benefit to be gained and where disclosure is not strictly necessary would have a serious adverse impact on the AAIB's ability to effectively investigate future accidents and incidents, both domestically and abroad". Those concerns include in particular:*
- (i) The regime in respect of protected material exists to encourage all those involved in air accidents or incidents, wherever in the World they take place, to cooperate freely, openly and willingly with air accident investigations being conducted within the regime, so that the air accident investigator can obtain best evidence, and therefore be put in the strongest possible position to prevent future accidents. There is therefore a strong public interest in air accident investigations being conducted under conditions of confidentiality;*
 - (ii) The voluntary goodwill and trust on which the AAIB depends is important for the following four main reasons: (i) The AAIB has no powers to compel individuals or organisations to act on their recommendations and relies on its reputation for thorough and impartial investigation to influence. (ii) The AAIB has, over its more*

than 100-year history, built a reputation for impartiality, confidentiality and independence throughout the aviation community worldwide, and it is this reputation that has consistently enabled the AAIB to successfully carry out its work and be viewed as a global leader in air accident investigation. (iii) The investigation of accidents and serious incidents requires full and frank cooperation on the part of all those able to assist the investigation. There is a public policy interest in ensuring maximum willingness of persons to co-operate with an AAIB investigation and ensuring that they do not withhold information or evidence which may inform the investigation. If protected materials were frequently disclosed to other parties for purposes other than the safety investigation, there is the possibility that it would deter some people able to assist in an investigation from doing so in the future. This would in turn impede the AAIB's effectiveness and jeopardise aviation safety. (iv) Although the AAIB has the power to summons witnesses to answer any question or produce any evidence under regulation 12 of the 2018 Regulations, in practice it is only rarely that the AAIB needs to rely on that power and a gentle reminder of the AAIB's powers is currently sufficient to secure cooperation. If protected materials were disclosed in a wider range of circumstances, co-operation in future may be less forthcoming.

The court concluded at paragraph 119-120:

- 119 *We note that Mr Firth makes the additional point that the risk to future safety investigations would be still greater if it is thought that the High Court will disclose protected material, simply because that material has been requested by a Coroner- i.e. in the absence of a determination that she needed to investigate for herself because there was credible evidence that the AAIB's investigation was incomplete, flawed or deficient. The perception of how loosely protected this material is by the UK would be very damaging, if it was granted simply in circumstances where a Coroner wants to assess, on a speculative basis, the cause of an accident for herself. This is a powerful point.*
- 120 *We also consider there is force in the AAIB's submissions as to the potentially vast numbers of persons to whom the materials might be disclosed if released for use by the Coroner. They are right to have concerns over the possibility of disclosure of what is sensitive material on such a wide scale. We accept that should it become known to the civil aviation community in the UK and internationally that sensitive material provided to the AAIB which is protected was being disseminated in this way, then the AAIB's capacity to investigate future accidents, both in the UK and worldwide, and thereby prevent future deaths through safety learning, would be compromised.*

In the circumstances:

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- (a) Any application for disclosure under Article 8 of the EU PLD will need to be made alongside (or in reference to) permission to disclose information under s.25(4) of the 2018 Regulation / Article 14(3) of the EU Regulation;
- (b) Given the 3 year limitation period of the claim against the manufacturer under Article 14 of the EU PLD, such an application may have to come before completion of the AAIB investigation (for example the final report from the recent Leicester City Football Club helicopter crash of G-VSKP was published nearly 5 years post accident, after an applicable limitation for a claim against a manufacturer had expired).
- (c) If making the application prior to the completion of the accident investigation, it will be challenging for an injured person to present "facts and evidence sufficient to support the plausibility of the claim for compensation" in circumstances where they are excluded from the investigation. Even if they are able to do so, permission is unlikely to be granted given the "harm or detriment that would be caused through disclosure, and the harm, in particular, to the AAIB's ability to improve safety through future investigations".
- (d) In those circumstances no order for disclosure would be given under Article 8, which prevents a Claimant from relying on the presumption of defectiveness under Article 9(2)(a), as the defendant has not failed to comply with any obligation to disclose.

In my view there are three possible solutions to this issue:

- (a) An amendment to the limitation period under any new product liability regulation to ensure that the three year limitation period does not begin to run until the conclusion of any official investigation into the causes of the accident or incident;
- (b) An amendment to the way in which evidence is stored by the AAIB and accessible to the public. In the US, the AAIB's equivalent, the National Transportation Safety Board (NTSB) places evidence that they have obtained on online accident dockets ([Search Docket - Docket Management System \(ntsb.gov\)](#)). Access to the evidence that has been obtained in the investigation would enable an injured person to be able to present facts and evidence sufficient to support the plausibility of the claim for compensation, without the injured person intervening in the safety investigation. Given the stated sole purpose of the investigation is the prevention of accidents and incidents, without the apportionment of blame or liability, it would be reasonable for injured persons to be able to conduct their own investigation, without influencing the safety investigation, that *does* have the purpose of apportioning blame or liability;
- (c) That aviation is carved out of the entire framework for any new product liability regulation. In these circumstances, an alternative proposal could be made perhaps more in line with the strict liability provisions under the Automated and Electric Vehicles Act 2018. This may necessitate a more complicated liability framework than under the Automated and Electric

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Vehicles Act that accommodates the novel nature and changeability of the end-to-end aviation supply chain (including systems and services in the air and on the ground) in a highly automated ecosystem, which does not undermine a just safety culture and enables people to feel empowered. This is discussed further in response to question 44.

- iii. The practical application of the presumption of defectiveness within Article 9 of the EU PLD appears to be problematic. In particular:
 - (a) In relation to Article 9(2)(a), please see comments at (ii). This is unlikely to be a provision which can be used by a claimant;
 - (b) In relation to Article 9(2)(b), in aviation, manufacture of products is heavily regulated. While there might be extreme cases where a manufacturer has not followed certification specifications, EASA Regulations (or the AI Act in relation to aviation autonomy), more commonly, the defect will arise in the manufacture, production or design of the item, rather than a breach of a mandatory safety requirement;
 - (c) In relation to Article 9(2)(c), it is unclear when this provision will be useful. On the face of it, if the damage was caused by an "obvious malfunction" during "normal use or under normal circumstances", the claimant will be able to easily prove defectiveness without relying on a presumption. If the presumption is to be applied then how would one define "obvious malfunction" that is not so obvious that a presumption is unnecessary?
 - (d) In relation to Article 9(4), this will clearly become very relevant to autonomous aviation where code relating to Highly Automated and Autonomous aircraft functions will be extremely complex, and clearly inaccessible to the majority of the public. More generally, aviation is in itself a highly technical area and in my experience, claimants rarely understand the technicality of the failure leading to an accident. However, it is unclear from Article 9(4) against whom the "excessive difficulties" is being measured, presumably not the Claimant's understanding but that of an appointed expert. Article 9(4) provides a power "contest the existence of excessive difficulties". This seems problematic in practice with the potential to result in hearings to determine if a claimant could have found an expert who could have understood the complexity of the failure.
- iv. The same conflict with the EU Regulation, the 2018 Regulation and Annex 13, described at (ii) exists in the AI Liability Directive at Article 3 for the purposes of ordering disclosure of evidence and the presumption of non-compliance. In the absence of a failure to disclose evidence (an order for which may not be possible to obtain for the reasons given at (ii)), a claimant is required to prove a defendant's non-compliance with a relevant duty of care. This would be extremely onerous in relation to Highly Automated and Autonomous aircraft AI systems, which by their nature will require code far beyond existing artificial intelligence coding architecture. A Highly Automated and Autonomous will require artificial general intelligence to safely function, meaning a complexity of coding that we

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cannot yet foresee. Given the complexity of such coding architecture it is unlikely that anyone able to understand such code would be available as an expert.

- v. Article 4(1) of the AI Liability Directive applies to all AI systems including high-risk AI systems. The article provides a presumption of causation only in circumstances where a claimant can prove (a) that there was a non-compliance of a duty of care (which will be difficult for the reasons given at (iv)) AND (b) it can be considered reasonably likely that “the **fault** has influenced the output produced by the AI system or the failure of the AI system to produce an output” AND (c) the claimant has demonstrated that the output produced by the AI system or the failure of the AI system to produce an output gave rise to the damage. In relation to (b), even on existing artificial intelligence coding architecture this would be problematic. The identification of a fault pre-supposes that there is a specific line of irregular code. While that might be true in some case, far more likely is an inadequately trained AI system either because of insufficient iterations in the training of the AI or inadequate training data (whether that because of insufficient variability in the input data or any other reason) that it was trained upon to enable it to adapt to real-world situations. Neither of these constitute a “fault” in the ordinary meaning of the word and there is no definition within the AI Liability Directive or the AI Act to impose a broader interpretation.
- vi. Article 4(2) of the AI Liability Directive shall apply to Highly Automated and Autonomous aircraft as they fall within the definition of high-risk AI systems. That provision provides at 4(2)(c) that fault is presumed in circumstances where the AI system was not designed and developed in a way that allows for an effective oversight by national persons during the period in which the AI system is in use pursuant to Article 14 of the AI Act. However, as you note at paragraph 2.5-2.8 of your consultation document, JARUS defines 5 levels of automation: 0 Manual Operation, 1 Assisted operation, 2 Task reduction, 3 Supervised Automation, 4 Manage by Exception, and 5 Full Automation. As you note at 2.9, an Automated System would be a system falling in category 3-5 (where the machine is “in control”). A Highly Automated System could therefore be defined as one falling in category 4 or above. Highly Automated and Autonomous aircraft are therefore by definition not supervised by a human.
- vii. The same consideration as set out at (v) applies in respect of Article 4(3)(a) for a claim of damages against a user of a high-risk AI system, namely that a user of a high-risk AI system (which would include an airline/operator under Article 3(4) of the AI Act) did not comply with its obligations to use or monitor the AI system pursuant to Article 29 of the AI Act. Article 29(4) of the AI Act provides an explicit obligation to monitor the operation of a high-risk AI system. This is inapplicable to a Highly Automated or Autonomous System that is functioning at JARUS level 4 or 5, as those systems are by definition not monitored. Furthermore, in relation to Article 4(3)(b), in practice the exposure of an AI system to input data which is not relevant will have no bearing on claims against a Highly Automated or Autonomous aircraft operator. The input data would be the flight data and intended flight profile data, flight surface positions, aircraft speed, attitude, altitude and position data, computer vision data, any ATC instructions or aircraft-aircraft communications. Any defect would likely arise on the computation of that data not the input data itself. To the extent that input data itself was

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faulty (e.g. from a defective sensor), such data would not be in the “control” of the operator (and in any event would not fall under the definition of “not relevant”) sufficient to activate Article 4(3)(b).

- viii. Article 4(4) allows a defendant to challenge a presumption of fault in circumstances where they have not provided disclosure. A defendant may challenge this where the defendant “demonstrates sufficient evidence and expertise is reasonably accessible”. Again, this is likely to turn into a battle over availability and expertise of experts rather than an analysis of the underlying issue.

I hope that the above comments provide some additional considerations to take into account during the review process. If you would like to discuss any element of the issues and concerns described above, I am available for further discussion.

Yours sincerely



**Peter Neenan
Stewarts**

RESPONSE TO LAW COMMISSION CONSULTATION ON AVIATION AUTONOMY

(Law Commission Consultation Paper 261)

Please note that this consultation response has been reproduced from information entered on the Citizen Space online portal.

Any personal email addresses and phone numbers have been excluded from this document.

Unanswered questions have been deleted from this document.

About you

What is your name?

Thomas Levermore

Drones

Consultation Question 34

We provisionally propose that a remote pilot for drones should continue to be defined as “a natural person responsible for safely conducting the flight of an unmanned aircraft by operating its flight controls, either manually or, when the unmanned aircraft flies automatically, by monitoring its course and remaining able to intervene and change its course at any time”. Do you agree?

Yes

Please expand on your answer below

Yes in principle although the phrase "remaining able to intervene ... at any time" needs clarifying in the context of multiple simultaneous operations (see answer to Q38).

Consultation Question 36

We provisionally propose that for autonomous operations in the specific category, a UAS 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 manned 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.

Consultation Question 38

We seek views on whether the current concept of a "remote pilot" is compatible with drone MSO. We also seek views on whether the remote pilots of drone MSO should continue to be subject to the same responsibilities as remote pilots for single drone operations.

Please share your views below

The definition of "remote pilot" needs clarification as to whether the remote pilot is expected to intervene "at any time" in which case multiple simultaneous operations may not be compatible with that definition because someone responsible for drone MSO may not be able to intervene "at any time" if they are focused on another drone at the time.

Consultation Question 39

We seek views on whether there should be an upper limit to the number of drones for which an individual remote pilot is responsible.

Please share your views below

A single upper limit across all situations is not appropriate, depending on factors including the capabilities of the UAS and the operational context, the limit would be different.

Consultation Question 41

We provisionally propose that use of flight data recorder systems or devices should be mandatory for autonomous drone operations. Do you agree?

Yes

Please expand on your answer below

In principle yes but the requirements for flight data recorder systems or devices should be appropriate for the context of autonomous drone operations. For example

small UAS, different data fields and levels of detail, as well as hardware implementations may be appropriate which aren't appropriate for larger aircraft.

Consultation Question 42

Should the law permit a drone to transition between remotely piloted and autonomous flight during an operation?

Yes

Please expand on your answer below

Yes, in theory but the transition of responsibility should be clearly defined.

Criminal liability

Consultation Question 59

We invite views on how operator responsibilities for dangerous goods might need to be adapted in light of autonomous operations.

Please share your views below

The carriage of dangerous goods by drone is crucial to unlocking some of the use cases for medical deliveries by drone that could benefit society. The operator being responsible for informing air traffic services in the event of an emergency seems the more feasible approach than requiring an onboard system to automatically perform this task.

RESPONSE TO LAW COMMISSION CONSULTATION ON AVIATION AUTONOMY

(Law Commission Consultation Paper 261)

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Unanswered questions have been deleted from this document.

About you

What is the name of your organisation?

Thurling Aero Consulting

Airworthiness and certification

Consultation Question 1

We seek views on how current airworthiness and certification regulation might need to be adapted or developed in light of highly automated and autonomous aircraft. In particular, should provisions be adopted which allow for:

1. the certification of optionally piloted and uncrewed or unoccupied versions of conventional aircraft (hybrid versions); and
2. the separate certification of command units?

Please share your views below

1. Yes, provisions should be adopted. Section 4.43 in "Future Challenges" mentioned that there were no specifications for UAS in the certified category, but some have been proposed. We would like to bring to the Commission's attention some JARUS work done defining what might be appropriate performance-based certification standards for both UAS, in general (http://67.217.59.217/jarus/wp-content/uploads/2023/06/jar_13_doc_CS_UAS-1.pdf), and High Altitude Platform Systems (HAPS), in particular (soon to be published). Also, in that same section 4.43, the statement "...to enable autonomous flight aircraft will have to rely on complex AI technologies which may make certification of the aircraft difficult" is a bit too definitive. While "complex AI" is indeed difficult to certify using conventional methods, there are active projects trying to do so using new techniques. Also, the assumption that "autonomous flight aircraft will have to rely on complex AI technologies" is not always true. Global Hawk was designed to be essentially autonomous and it contains no complex AI functions in the flight management system. Many sUAS exhibit autonomous flight in various flight phases and they do not all depend on complex AI. It is fair to say that autonomy may use complex AI,

but not that it must. Autonomy should be viewed as a system property and AI as an implementation choice.

2. EASA uses the term "control and monitoring unit" (CMU) in place of "Command Unit". We suggest that the UK adopt this as well. The word "command" implies a much more active role for the humans involved in control and monitoring highly automated and/or autonomous aircraft. Although both EASA and ICAO allow for the separate certification of CMUs or remote pilot stations (ICAO), doing so in practice may be difficult due to how dependent an appropriate set of CMU requirements is on the individual concept of operation. Creating a "one-size-fits-all" set of requirements will over prescribe in most areas while under prescribing on others.

Rules of the air

Consultation Question 6

We seek consultees' views on whether the rules of the air relating to communication should be adapted for remotely piloted and autonomous aircraft.

Please share your views below

We suggest that a ground-based communications capability for RPIC to controller communications be adopted where appropriate. Current RPAS often employ a VHF relay strategy in which the RPIC's voice is rebroadcast from a VHF radio carried on the aircraft. This approach wastes C2 link bandwidth and also requires a heavy and power-hungry radio on the UA. There are better ways to achieve the same capability by using ground-to-ground communications, e.g. voice over IP.

Consultation Question 7

We ask for consultees' views on how the rules of the air might be adapted or developed for remotely piloted or autonomous flight

Please share your views below

We suggest the Commission review the JARUS Whitepaper on Considerations for Automation of the Airspace Environment recently published and available at <http://jarus-rpas.org/wp-content/uploads/2024/02/JARUS-Whitepaper-Automation-of-the-Airspace-Environment-v1.0.pdf>

This document was produced by essentially the same team as the Methodology for Evaluation of Automation on UAS Operations which the Commission has referenced extensively.

Drones

Consultation Question 34

We provisionally propose that a remote pilot for drones should continue to be defined as “a natural person responsible for safely conducting the flight of an unmanned aircraft by operating its flight controls, either manually or, when the unmanned aircraft flies automatically, by monitoring its course and remaining able to intervene and change its course at any time”. Do you agree?

Other

Please expand on your answer below

We agree that what you define here is indeed a "remote pilot", but disagree that all drones will require a "remote pilot" in all phases of flight. There are many concepts of operation (e.g. HAPS on station in the stratosphere) which may be safely carried out without the ability to be "able to intervene and change its course at any time". The crew responsible for safe operations may manage a fleet of UAS strategically, and less "tactically" than is implied when we say "able to intervene and change its course at any time".

Consultation Question 36

We provisionally propose that for autonomous operations in the specific category, a UAS 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 manned 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.

Consultation Question 38

We seek views on whether the current concept of a “remote pilot” is compatible with drone MSO. We also seek views on whether the remote pilots of drone MSO should continue to be subject to the same responsibilities as remote pilots for single drone operations.

Please share your views below

We assume that the Management of Multiple Simultaneous UA Flight Operations (MSO) requires the support of systems performing automated and/or autonomous functions. However, we foresee a human role that might be called "remote pilot" since current rules of the air allow only the pilot in command to exercise emergency authority.

We also suggest that the Commission review the JARUS CS-UAS, Annex B – Management of Multiple Simultaneous UA Flight Operations MSO at <http://jarus-rpas.org/wp-content/uploads/2024/03/CS-UAS-Annex-B-MSO-Issue-1.0.pdf>

Consultation Question 39

We seek views on whether there should be an upper limit to the number of drones for which an individual remote pilot is responsible.

Please share your views below

There should be no set limit. Any upper limit should be defined by an analysis of the Operator's concept of operations and the number of interventions or exceptions that the vehicles under MSO require the human team to address. Clearly, MSO using highly automated aircraft which rarely require human interventions could be safely accomplished with a smaller crew. This analysis should include contingencies and edge cases - including those caused by external events, e.g. cyber attack, GNSS outage due to solar flare, etc.

Consultation Question 40

We seek views as to what additional safeguards should be introduced for remote pilots responsible for multiple drones.

Please share your views below

There will need to be new training and licensing requirements to match the tasks required of pilots responsible for this new type of operation.

Consultation Question 41

We provisionally propose that use of flight data recorder systems or devices should be mandatory for autonomous drone operations. Do you agree?

Yes

Consultation Question 42

Should the law permit a drone to transition between remotely piloted and autonomous flight during an operation?

Yes

Please expand on your answer below

One popular concept for operating High Altitude Platform Systems involves ascent and descent as essentially an RPAS and transitioning to become part of an autonomous fleet on station in the stratosphere.

Civil liability and insurance

Consultation Question 51

We provisionally propose that multiple simultaneous operations should be considered as the Government develops proposals for the insurance requirements applicable to uncrewed aircraft. Do you agree?

Yes

Criminal liability

Consultation Question 55

We provisionally propose that a remote pilot of an uncrewed aircraft operating in the certified category should be treated as a pilot-in-command for the purposes of criminal liability pursuant to article 265(1) of the Air Navigation Order 2016. Do you agree?

Yes

Consultation Question 57

We provisionally propose that the pilot-in-command of aircraft in a multiple simultaneous operation should be criminally liable for breach of operating requirements in the same way as a pilot in command of a single aircraft would be. Do you agree?

Other

Please expand on your answer below

We assume that the Management of Multiple Simultaneous UA Flight Operations (MSO) requires the support of systems performing automated and/or autonomous functions. Since the RPIC will be dependent on these automated systems, the designers of such systems must also bare some liability. So, the Operator, RPIC, and manufacturer(s) would all end up sharing liability.

Consultation Question 60

We ask for consultees' views about whether the offence of hijacking in domestic law should be updated to:

1. include the unauthorised seizure or control of autonomous or remotely piloted aircraft by technological means or by persons not on board the aircraft; and
2. expand the period in which hijacking can occur from the period when an autonomous or remotely piloted aircraft is “in flight” to the period when it is “in service”.

Please share your views below

We would agree with both points. Yes, the definitions need to be updated.

RESPONSE TO LAW COMMISSION CONSULTATION ON AVIATION AUTONOMY

(Law Commission Consultation Paper 261)

Any personal email addresses and phone numbers have been excluded from this document.

Unanswered questions have been deleted from this document.

About you

What is the name of your organisation?

UKRI Future Flight Challenge

Airworthiness and certification

Consultation Question 1

We seek views on how current airworthiness and certification regulation might need to be adapted or developed in light of highly automated and autonomous aircraft. In particular, should provisions be adopted which allow for:

1. the certification of optionally piloted and uncrewed or unoccupied versions of conventional aircraft (hybrid versions); and
2. the separate certification of command units?

Please share your views below

There is currently no clear information on the 'applicable requirements' for airworthiness for 'certified' category UAS, these will need defining. There are also no current clear requirements for certifying passenger carrying aircraft under existing crewed aviation regulation for if the aircraft has the potential to be operated without a pilot on board.

Many VTOL are being designed with high automation and/or autonomy in mind, but they are likely to be certified first as per crewed aviation and under SC-VTOL, it is unclear how they will need to be certified when they remove the function of the on-board pilot. Even if the 'applicable requirements' are defined for certified category UAS, how a transition between these two sets of regulation would be carried out is currently unclear. EASA seems to have given some consideration to this for initial airworthiness (as an opinion) where the system is a hybrid for control, but nothing has been identified in UK regulation.

The above would be true also for any conventional aircraft that are currently piloted and move to being uncrewed or optionally uncrewed. Therefore, further development is needed in this area of regulation.

Consultation Question 2

We welcome views on what changes to the certification system might be necessary to enable higher automation and autonomy in aviation.

Please share your views below

Whilst it is not 'certification' regulation, currently CAP722 requires that all UAS systems perform deterministically, this will limit the technology that can be used in UAS. As the technology develops further for highly automated and autonomous aircraft (or systems within them) there is likely to be a point in time where developers want to use non-deterministic performance. The issue this presents in being able to understand the events leading to any accidents is a major barrier, that is an underlying reason for the current prescription of deterministic performance, but this is likely to be an area that needs to be better understood and solutions to the barrier identified, alongside supporting regulation.

The use of AI and ML in development and operation of autonomous systems is a challenge for certifying systems. There is work that is ongoing through the Trusted Autonomous Systems hub that is looking at the challenges of creating trustworthy systems more holistically, and they have transport as an area of interest, but we are not aware of any specific work to look at certification in aviation. It would, however, make sense to explore the challenges posed in aviation alongside the challenges posed in other areas where physical and cyber safety are as much of a significant challenge as they are in aviation as the solution to how to 'certify' the code and datasets will likely be something that spans different sectors.

A UAS may currently be supplied with limited capabilities and other companies provide systems that are compatible with the UAS which provide additional functionality to make systems on, or the whole UAS, autonomous or highly automated. It is not clear how these additional system add-ons will be regulated, are they considered as part of the aircraft flight worthiness or part of the operational aspects? Currently every application within the specified category is a bespoke application unless its operation falls within PDRA01 so the capability of the aircraft and its systems is detailed in a bespoke way. When UK SORA is adopted, these additional systems may provide mitigations to air risk or ground risk or could potentially be seen as creating additional risk if they are designed for efficiency rather than safety mitigation/improvement.

Consultation Question 3

We seek views on whether current regulatory tools to support the development of highly automated and autonomous aviation technologies are adequate.

Please share your views below

The 'tools' being referred to here are specifically Permit to Fly, E conditions and Regulatory Sandboxes. These provide some opportunity to fly aircraft under development and also, in the case of sandboxes, to explore areas of regulation. For crewed aircraft the Permit to Fly is a clear and well-established tool as this process has been used for a variety of aircraft over a long period of time.

For developing uncrewed aircraft, there is much less clarity. Not all uncrewed aircraft have to be certified, but all specific category operations are subject to approval of a very detailed and specific Operational Safety Case (OSC). The timescales for approval of OSCs are such that the underlying technology can be developing at a much faster rate than the approvals can allow for (i.e. by the time you can fly a system it may be obsolete). There have been recent updates to allow for some variations to be permissible without having to update the OSC, so some of this issue has been resolved but nonetheless it is not straightforward getting OSC approval.

Whilst the document talks about regulatory sandboxes and highlights some examples where these have been created, they do require significant resource support from the CAA so they are not something that can simply be requested by industry and quickly enabled by CAA, the ones that have been established are where CAA identifies that they have a desire to establish a sandbox. So, there would only be a sandbox created where the CAA are sufficiently interest in how regulation needs to adapt and can provide the resource to support it. It is not yet a fully established routine for the CAA to also share relevant findings from sandboxes with industry and therefore some element of re-inventing the wheel is possible.

These are general points, not just specific to highly automated or autonomous uncrewed aircraft developments. Unless the CAA decide to establish a regulatory sandbox around autonomous systems then there is unlikely to be adequate routes to test these system developments with regards to how they can be approved.

There is also work being undertaken by CAA on what test and trial site capability is needed, this may address some aspects of testing for highly automated or autonomous vehicles by providing specific test areas and hence reducing ground and air risk vs flying in other locations without restrictions in place. Such sites would work for early testing but doesn't always allow for fully integrated testing in a fully representative range of operating conditions (e.g. over populated areas). It is unclear whether new sites would be created as part of this or just more information for developers of what facilities are available and where. This work needs to be driven to conclusion as it has been ongoing for over 1 year.

There is a general sense across industry that more needs to be done to support drone operators and provide some momentum to this industry. The current processes do not appear to be wholly fit for purpose not able to be scaled to support the predicted use of drones in the coming 5 years. There is also, disappointingly, little regard within current regulations and processes for the safety benefits from approving drone use i.e. reducing need for humans to undertake risky inspection tasks or supporting NHS or Police activities.

Rules of the air

Consultation Question 4

We seek views on how highly automated and autonomous aircraft should act in emergency scenarios. In particular:

1. should highly automated and autonomous aircraft be given the freedom to operate outside the rules of the air in emergency circumstances; or
2. should a comprehensive set of rules be developed for highly automated and autonomous aircraft in emergency situations.

Please share your views below

Automated systems in existence today in UAS have default options that can be applied in different situations – return to home, land, or hold still (hover). These are not exhaustive but show how thought is already being given to how to programme automated systems to deal with the unexpected.

It is challenging to develop a set of comprehensive rules that could meet every eventuality, but then it is also challenging to create a system that is able to determine a suitable course of action in any emergency situation, especially since the adaptive AI that would be most able to make some complex decisions based on previous experiences is the most challenging to certify. Given the difficulties of both approaches, the best approach may be to create as comprehensive a set of rules as is pragmatic/practicable, and then allow the freedom to operate outside of the rules of the air in emergency situations that are not adequately covered by those developed rules. Deriving such a set of rules will likely need significant inputs from all airspace users and will either need to be driven by the regulator directly or by a rule making committee that proposes a solution to the regulator and they can adopt or adapt as they deem fit. It would also be sensible to look at what approaches to this issue are being taken internationally as this is not unique to the UK, as well as what approaches are being taken with autonomous cars and ships.

Increasingly uncrewed systems will be used as responders in emergency situations e.g. drone swarms being used for fire detection and firefighting. Some consideration should therefore be given to how these systems would perform in these scenarios and how they would themselves operate with non-emergency air users.

Consultation Question 5

We seek consultee views about what challenges remotely piloting an aircraft in an emergency scenario presents and how these might be addressed

Please share your views below

Remotely piloting an aircraft does present specific challenges in situational awareness and or/control when communication links are lost. This is also true for

any autonomous system which relies on communication links to receive required inputs as it is likely that only large UAVs will be carrying all their detect and avoid equipment. Even those well-equipped vehicles though may rely on information from ground-based systems.

To ensure that the aircraft can safely operate and make decisions on how to proceed when communications links or any inputs are lost the systems must be designed with redundancy in mind. This is a common principle within aerospace but not all designers of highly automated or autonomous vehicles will have experience from aerospace. Any regulation or standards on the technology should make such redundancy required for any critical systems.

If there is another reason for an 'emergency' beyond failure or loss of critical comms systems, such as mechanical failure, then the remote pilot may be less well equipped to use other senses in a way that an onboard pilot for crewed aviation would. However, it is also conversely possible that there are scenarios when a remote pilot has more information to enable a response to an arising situation than an onboard pilot would as they potentially have multiple sources of information (e.g. 360-degree camera coverage). The challenge is in using these information sources well. In the same way that pilots train to deal with emergencies for crewed aviation, remote pilots should be trained to deal with emergencies so that they can react in the best manner possible if an emergency arises. This would come under the remote pilot competency work that CAA have started, to define the training requirements for remote pilots. There is also a need to consider specifically how to train remote pilots for 1: many supervision as there is the possibility of needing to address more than one emergency simultaneously. The more routine remote pilot operations become, the greater the risk that the remote pilot is unable to appropriately respond in an emergency as they become less likely to occur, this needs to be considered as part of operating procedures and levels of refresher training.

We should also consider situations where acting as a remote pilot is less safe than allowing the aircraft to continue under its own AI control. Reliance on ultra-low latency datalink and challenges in remotely controlling a degraded aircraft can make this a difficult task. In the case of the Starship automated ground delivery system, there is a preference for continuing onboard, automated control rather than relying on remote assistance.

VTOLs

Consultation Question 8

We provisionally propose that a person overseeing a VTOL flying automatically, who monitors its course and is able to intervene and change its course at any time should continue to be classified as a "remote pilot". Do you agree?

Yes

Please expand on your answer below

The rationale presented in the consultation makes sense as the term ‘remote pilot’ already exists in legislation, noting that it is only applicable when that means that the human deemed a remote pilot is able to intervene in the control of the flight.

Note that the BSI FLEX 1903 document, after extensive industry and public consultation, contains the following:

3.1.118 remote pilot

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

[SOURCE: UK Regulation (EU) 2018/1139, modified “unmanned” changes to “uncrewed” [34]

3.1.119 remote pilot in command (RPIC)

person, nominated by the uncrewed aircraft system (UAS) (3.1.137) operator, responsible for the safe conduct of the flight of an uncrewed aircraft (UA) (3.1.134) by operating its flight controls, either manually or, when the unmanned aircraft flies automatically, by monitoring its course and remaining able to intervene and change the course at any time

[SOURCE: JARUS, SORA 2.5 Annex I (Glossary of Terms) [33]

3.1.117 remote crew member

member of the crew that performs duties essential to the safety of flight, whose duties and responsibilities have been assigned by the UAS operator

NOTE The remote crew can include the remote pilot in command (RPIC) (3.1.119), airspace observer (3.1.9), maintenance staff, launch and recovery system operators

[SOURCE: JARUS, SORA 2.5 Annex I (Glossary of Terms) [33]

Consultation Question 9

We provisionally propose 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. Do you agree?

Yes

Please expand on your answer below

The rationale presented in the consultation makes sense, since it is responsibility for ensuring checks, tasks etc are carried out rather than having to necessarily personally complete them all that applies.

Consultation Question 10

We provisionally propose 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.

Do you agree? (Tick all that you agree with)

Please expand on your answer below

It would seem sensible to have one person responsible for all of these for a flight and hence for that to be the remote pilot.

Consultation Question 12

We provisionally propose that the remote pilot-in-command should be responsible for, amongst other things, ensuring passengers are:

1. given a safety briefing; and
2. seated and wear seat belts during take-off and landing

Do you agree?

Yes

Please expand on your answer below

Yes, they should be responsible for this, with the actual tasks carried out by ground crew and actively confirmed to the remote pilot where applicable. There is some challenge in enforcing the wearing of seat belts after take-off as there is no physical crew onboard the aircraft, this would require the ability of the remote pilot (or other operational crew) to be able to communicate with the passengers to request compliance but ultimately enforcement would prove harder than on crewed aircraft.

Therefore, the legal requirement and penalties for passengers to not endanger the safety of the aircraft, passengers or cargo should be made very clear on uncrewed aircraft.

Consultation Question 13

We provisionally propose that air operators (rather than the remote pilot-in-command) should be responsible for preventing passengers from boarding:

1. who appear drunk or under the influence of drugs; or
2. whose carriage would, in the view of the operator's employees, endanger the safety of the aircraft or other passengers.

Do you agree?

Yes

Please expand on your answer below

Yes, however, the remote pilot should always be able to refuse to carry passengers should they feel that someone who has boarded would pose such a threat, so whilst air operators are responsible, the remote pilot should retain the power to over-ride if they are not satisfied.

Consultation Question 14

We provisionally propose that the remote pilot-in-command should have the power to take reasonable measures, including restraint of passengers, as set out in section 94 of the Civil Aviation Act 1982. Do you agree?

Yes

Consultation Question 15

We provisionally propose that a person on board a VTOL aircraft (other than a crew member) should be able to take reasonable measures to protect the safety of the aircraft or of persons or property on board. Do you agree?

Yes

Consultation Question 16

We seek views on whether the powers of crew on board a VTOL aircraft should be broadened to reflect those of the pilot-in-command under the Civil Aviation Act 1982 to:

1. take reasonable measures to protect the safety of the aircraft or persons or property on board;
2. maintain good order and discipline; or
3. enable the crew to disembark or deliver a person.

Please share your views below

It is not currently generally envisaged that there will be on board crew for remote piloted or autonomous passenger carrying VTOL, however if there were to be crew on board, then they should be granted such powers. By considering this at this stage, it does allow for future proofing. It is feasible that the size of uncrewed aircraft reach a point in the future where sufficient passengers are carried that make this sensible. It also could allow provision for transition arrangements to support public adoption whereby they have crew but not pilot on board. There would be little point in having a crew on board that have no powers.

Consultation Question 17

We provisionally propose that passengers should be able to contact a member of crew at all times during an operation. Do you agree?

Yes

Please expand on your answer below

This is likely to be very important for public adoption of such services. There should be methods to check that the system is functioning and of adequate quality to enable effective communication, this should also be required to be in a form that enables accessibility and therefore it may be that multiple methods of communication are available. Such information should be included in the safety briefing, which again should be in accessible formats.

Consultation Question 18

We provisionally propose 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. Do you agree?

Yes

Consultation Question 19

We provisionally propose that it should be a criminal offence for a person to act as the remote pilot of a VTOL when the level of alcohol in their blood, breath or urine is over a prescribed limit. Do you agree?

Yes

Consultation Question 20

We provisionally propose that the remote pilot should be subject to the reporting obligations currently applicable to pilots under the Air Operations Regulation. Do you agree?

Yes

Please expand on your answer below

If an ACAS system triggers an avoidance manoeuvre it should be indicated to the remote pilot and hence, they would be able to report it. For bird strike it is possibly more complex as there would be a need for the aircraft or remote pilot to detect this occurrence and it is unclear how that could be enabled. That may require further discussions as to practicability with aircraft manufacturers. The decision on whether it has caused significant damage may need to be made with help of ground crew to inspect the vehicle. This therefore needs to be considered as part of operations to enable the remote pilot to fulfil the obligations. However, it does seem sensible that whatever the solutions employed to enable the responsibility that it does sit with the remote pilot to be responsible.

Similarly, the flight recorders may need to be checked by ground crew and confirmed to the remote pilot, as per other pre-flight checks.

Consultation Question 21

We provisionally propose that a remotely piloted VTOL should be required to be capable of detecting and recording information relating to accidents and near accidents for the purposes of reporting it. Do you agree?

Yes

Consultation Question 22

We provisionally propose that licences should be required for remote VTOL pilots. So far as appropriate, these should follow the classes and ratings adopted for crewed VTOLs. Do you agree?

Yes

Consultation Question 23

We provisionally propose that operators of remotely piloted VTOL should be certified. Do you agree?

Yes

Please expand on your answer below

This will be a key element in public adoption of services, it would also seem wholly illogical to have operators of crewed aircraft having to be certified but not operators of uncrewed where they are performing the same operations (i.e passenger

carrying). Having a visible manner on the aircraft for customers to see that it is operated by certified operators and licensed remote pilots would be a reassuring measure.

However, (and this may be better addressed in chapter 7 questions/responses) the whole scope of the 'certified' UAS category needs to be reviewed to ensure that any non-passenger carrying aircraft are regulated in a proportionate way as it may be that the other reasons for being certified that are not due to carrying passengers would be overly regulated due to them being in the same category as passenger carrying UAS.

Consultation Question 24

We provisionally propose that operators of remotely piloted VTOLs should continue to be required to:

- ☒ (1) have the means necessary for the scale and scope of operations planned;
- ☒ (2) use only suitably qualified and trained personnel;
- ☒ (3) implement a management system to ensure safety;
- ☒ (4) ensure operations only take place in accordance with the operations manual;
- ☒ (5) establish procedures to minimise the consequences to safe flight operations of disruptive passenger behaviour;
- ☒ (6) develop and maintain security programmes suitable for the aircraft and type of operation;
- ☒ (7) have a management system to prevent fatigue.
- ☒ (8) ensure the continuing airworthiness of the aircraft; and.
- ☒ (9) establish procedures for any reasonably foreseeable emergency situation.

Do you agree? (tick all that you agree with)

Please expand on your answer below

Yes to all the above, recognising that the security programmes in question in item 6 will need to include physical and cyber security for the remote pilot operations.

Consultation Question 25

We seek views as to whether there are additional responsibilities that operators of remotely piloted VTOLs should need to fulfil.

Please share your views below

Operating with a remote pilot places a greater need on the communication systems used between the pilot and the aircraft and ground control station operation. Whilst the installation, ongoing provision and maintenance of these systems can be encompassed by the above, it may be sensible to investigate making specific requirements around these as the knowledge, infrastructure, services and competency for these are distinctly different to those required within an operator of crewed aviation. Other human factors, beyond fatigue may also need to be considered as specific requirements on remote pilot arousal. There may be some learning to be carried across from autonomous vehicles in other sectors.

Consultation Question 26

We seek views as to whether the law should permit remote pilots to act as pilot-in-command for more than one VTOL at the same time.

Please share your views below

In order to future proof legislation it would be prudent to allow for remote pilots to be pilot in command for more than one VTOL at the same time. The ability to operate safely in these circumstances will be very dependent on the vehicle, the remote pilot control station and other operational factors so there will need to be appropriate mechanisms in place to decide whether this can be approved or not, likely on a case by case basis initially and later through standardised approaches where possible.

Consultation Question 27

We seek views as to whether there should be an upper limit to the number of VTOLs for which a remote pilot can act as pilot-in-command at the same time.

Please share your views below

It is hard to determine any upper limit now for any future point in time as it will be very dependent on the vehicles, systems and operations. If a hard limit is defined now then it may become restrictive or obsolete in the future and require significant legislative change at that point.

Consultation Question 28

We seek views as to what additional safeguards should be introduced for remote pilots piloting multiple VTOLs.

Please share your views below

Further safeguards to manage arousal, fatigue, handover procedures and the ability to handle multiple emergency scenarios should be considered.

Consultation Question 29

We seek views as to whether there should be a role for a person supervising the flight of an autonomous passenger-carrying VTOL and acting as a point of contact in relation to it. What powers or responsibilities should such a person have?

Please share your views below

In order to support public adoption of such services it will most likely be necessary for there to always be a human somewhere as a supervisor for an autonomous passenger carrying VTOL. The needs for passengers to be able to contact a human for assistance during flight will be the same regardless of whether remotely piloted or autonomous.

The specific responsibilities of such a role are harder to determine since there are limitations to what such a supervisor can actually do, this area would need further development with aircraft manufacturers and operators since there is likely no equivalent role elsewhere within aviation currently, although there could be if other roles such as air traffic control become autonomous. Any similarity with other industries and the solutions used there should be considered.

Consultation Question 30

Should the law permit an uncrewed VTOL to transition between remotely piloted and autonomous flight during an operation?

Other

Please expand on your answer below

The aircraft manufacturers and operators are best placed to answer this, however it is perceivable that at a future point in time, it may be desirable to have the ability for the VTOL to be remotely piloted during certain phases of flight, perhaps take-off and landing and then switch to autonomous flight during the cruise phase. The main consideration here is of whether it is desirable to have the remote pilot unable to intervene as would presumably be the implication of full autonomous control.

It is also possible that in certain weather conditions that the autonomous system could offer greater abilities than a human pilot for the most complex flight phases. It

is possible that the autonomous control software could make better use of a larger amount of data than a person. This is similar to how some military aircraft are physically unstable in flight unless controlled by a complex control system and the pilot is ejected in the event of a failure in that control system. However, this could all still be completed whilst in remote pilot operation, the difference in moving to autonomous is that the remote pilot is unable to intervene and whether it would be desirable to switch between the ability to intervene or not is unclear.

Consultation Question 31

We seek views as to whether initial airworthiness standards for uncrewed VTOLs should include accessibility standards for persons with disabilities and reduced mobility.

Please share your views below

It is sometimes cited that retrofitting aircraft to be more accessible is disproportionately expensive or indeed is impossible, so with the introduction of new aircraft types and development of their airworthiness standards there would appear to be a potential for accessibility to be designed in from the start.

Within Future Flight Challenge we have a Director for Social Science Research and a full programme of social science work being carried out, including public survey and public dialogue. Accessibility and ensuring that passenger carrying VTOL are for the general population, not just an elitist form of flight for the rich have been clear trends of public concern. Therefore, it is clear that from a public perspective that accessibility should form a part of all aspects of vehicle development and operation, including both initial airworthiness standards and operators licensing.

A challenge to this is the relatively small size of the aircraft currently being developed and the limitations to weight that they can carry, therefore there is a fine balance to be struck in enabling all passengers to access aircraft services and the vehicles being viable to operate a commercial service in the first place. How the manufacturer and operators are able to support accessibility should be included in the initial airworthiness and operator licensing processes. It may have to be conceded that not all flights and operations are able to be fully inclusive, but this should be the exception, not the rule. It would be valuable to explore and identify any differences on what is happening on this aspect internationally, as interoperability is always desirable, but this should not result in weakening of requirements to the lowest common denominator.

Whilst the subject of this consultation is uncrewed passenger carrying VTOL, the above should also apply to passenger carrying crewed VTOL. The only practical difference being that for uncrewed the ability for certain tasks being carried is sometimes physically with a ground crew, but the remote pilot should still be responsible for ensuring that all passengers are safe on board and hence should confirm that all appropriate activities to enable that have been carried out.

Consultation Question 32

We seek views as to whether the CAA should be able to include accessibility standards within the licences granted to uncrewed VTOL operators.

Please expand on your answer below

See answer to question 31 as both are covered together.

Consultation Question 33

We seek consultees' views on any other issues with the current legal framework as it relates to operations involving autonomous VTOLs.

Please share your views below

The requirements on uncrewed VTOL and their operation, including but not limited to; environmental impact including noise, physical and cyber security have not been specifically mentioned in this consultation, presumably on the assumption that they would be the same as crewed aviation. However, it should be clear in legal frameworks that they apply equally, so any such requirements for crewed VTOL should also be consistent in Certified Category for UAS when passenger carrying. This is to safeguard for the future when aircraft may not go through initial airworthiness as a crewed aircraft, instead being developed for use solely under certified UAS regulation. The applicability of these aspects to other certified UAS vehicles should be reviewed to ensure applicability and proportionality as the actual needs may be different for the different uses within certified category.

In addition, this consultation has asked questions about initial airworthiness for certification of aircraft but the subject of further developments of any remote piloted or autonomous system has not been discussed. It is high likely that any aircraft will undergo continuous improvement such as software updates, how will these be handled for such vehicles? There may be the ability to read across from existing regulations for crewed aircraft but there is currently nothing clear in the certified category regulations for UAS. Also, are there any differences required in how such aircraft are maintained vs crewed aircraft? How will any associated systems such as remote pilot ground stations be maintained?

Drones

Consultation Question 34

We provisionally propose that a remote pilot for drones should continue to be defined as “a natural person responsible for safely conducting the flight of an unmanned aircraft by operating its flight controls, either manually or, when the unmanned aircraft flies automatically, by monitoring its course and remaining able to intervene and change its course at any time”. Do you agree?

Yes

Please expand on your answer below

3.1.118 remote pilot

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

[SOURCE: UK Regulation (EU) 2018/1139, modified “unmanned” changes to “uncrewed” [34]

Note that the BSI FLEX 1903 document, after extensive industry and public consultation, contains the following:

3.1.119 remote pilot in command (RPIC)

person, nominated by the uncrewed aircraft system (UAS) (3.1.137) operator, responsible for the safe conduct of the flight of an uncrewed aircraft (UA) (3.1.134) by operating its flight controls, either manually or, when the unmanned aircraft flies automatically, by monitoring its course and remaining able to intervene and change the course at any time

[SOURCE: JARUS, SORA 2.5 Annex I (Glossary of Terms) [33]

3.1.117 remote crew member

member of the crew that performs duties essential to the safety of flight, whose duties and responsibilities have been assigned by the UAS operator

NOTE The remote crew can include the remote pilot in command (RPIC) (3.1.119), airspace observer (3.1.9), maintenance staff, launch and recovery system operators

[SOURCE: JARUS, SORA 2.5 Annex I (Glossary of Terms) [33]

Consultation Question 35

We seek views on whether some low risk autonomous drone operations or drone operations conducted beyond visual line of sight might be accommodated in the open category. In particular:

- (1) whether there are any such use cases which might be suitable for the open category; and
- (2) if so, what conditions should be attached to these use cases if operated in the open category.

Please share your views below

Currently, given that autonomous and BVLOS drone operations are still in development it seems proportionate for them to be considered within specific or certified category (dependent on the use case/vehicle size). However, as the technology becomes more familiar and is routinely operated and can demonstrate confidence in the technology used then it may become disproportionate with the risk levels in the future.

In the future it could become sensible to consider this for use cases where there is sufficiently low ground and air risk, such as operations in remote or rural areas (so presenting low ground risk) that are also considered to be in atypical air environments. These could include uses such as inspection, or surveillance tasks, agricultural uses, search and rescue and some delivery tasks.

In the open category there are far fewer controls in place than in specific and certified but there is a precedent for their being some conditions such as those already existing in categories A1-A3. Therefore, similar conditions could be implemented to enable lower risk operations to be carried out within open category. Drone operators may be best placed to help identify what would be suitable conditions, however it could include conditions on the assurance of the system, the ability of the remote pilot (for remote piloted BVLOS), the size and flightworthiness of the aircraft and the operating environments and use cases that are allowed.

Consultation Question 36

We provisionally propose that for autonomous operations in the specific category, a UAS 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 manned 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.

Do you agree? (tick all that you agree with)

Please expand on your answer below

Any operator using an autonomous system will need to have full confidence that the UAS is appropriate for the use and can comply with all of the above, if this were not the case then this would pose a safety risk. There is also a reputational risk to the

industry in terms of public acceptance if there was not a need for a person (in this case the operator) to ensure that the UAS that they are using is fit for purpose. This may present a challenge in pragmatic terms, at least initially, as vehicle and system manufacturers will have to provide sufficient information and proof that the UAS can meet these requirements.

The UAS in practice may consist of multiple elements (ground infrastructure, communications, aircraft, control systems, geofencing systems...) and therefore could involve the operator having to understand an array of information and how that all comes together to create a compliant UAS.

Consultation Question 37

We seek views on what operational requirements should be applied to autonomous drone operations and drones that operate beyond visual line of sight in the specific and certified categories.

Please share your views below

Since this question is specifically related to which aspects of the rules of the air should be 'applicable operational requirements' it is best answered by operators and those with experience of flying drones. It would also be worth getting input from other airspace users since they will likely have some good experience and opinions to put forward. We are unable to provide specific guidance as are not suitably familiar with the details of UK SERA and any other rules of the air.

Consultation Question 38

We seek views on whether the current concept of a "remote pilot" is compatible with drone MSO. We also seek views on whether the remote pilots of drone MSO should continue to be subject to the same responsibilities as remote pilots for single drone operations.

Please share your views below

The role of the remote pilot in control of Multiple Simultaneous Operations may be subtly different when in control of operations where the aircraft operate relative to each other (often called swarming) vs when they are operating independent of each other. Where they are swarming then any intervention of a remote pilot is likely to be either to deal with an issue on a single aircraft (e.g. due to a failure) or to the whole swarm. This is likely a potentially lower workload than where the drones are operating independently from each other and therefore this distinction is important considering the sensible load that the remote pilot can support.

The question of whether the remote pilot should have the same responsibilities as for single drone operation may truly lie in the level of automation/autonomy that the drone operates under.

If the drones are autonomous then the responsibilities may be better aligned with the earlier questions on the operator being responsible for ensuring that the UAS (as a whole system) fulfils the requirements in Question 36.

If the drones are not autonomous, but are highly automated then the definition of remote pilot should still be applicable. It may be necessary for the remote pilot to have support from others to carry out tasks to meet this responsibility (e.g. pre flight checks of the aircraft) but the responsibility could still reasonably lie with the remote pilot. The individual specifics of the operation and experience of the remote pilot should be used to determine the number of drones that they can adequately be responsible for and hence currently is likely to be on a case by case basis justification as part of the specific category application safety case. If it is possible to set out frameworks to make this more routine and less arduous to assess in the future then that should be implemented but this will likely require sufficient data as an enabler.

There are operators of drone swarms and multiple drones (albeit currently with 1:1 control, it just means each drone has a separate pilot currently but there are some with experience of working in tandem etc), their input and experience on any questions around MSOs is key. Increasingly we are seeing applications for drone swarms with communications between remote pilots and directly between different types of drones, often referred to as a heterogeneous swarm.

Consultation Question 39

We seek views on whether there should be an upper limit to the number of drones for which an individual remote pilot is responsible.

Please share your views below

Since the use case, vehicle and operation for multiple simultaneous operations could vary significantly, it does not seem sensible to define an arbitrary figure as a maximum. Presenting a rationale with appropriate mitigations as to why it is safe for a remote pilot to be responsible for a given number seems a more appropriate solution.

Consultation Question 40

We seek views as to what additional safeguards should be introduced for remote pilots responsible for multiple drones.

Please share your views below

The human factor elements of MSO should be specifically understood as they may lead to different operational requirements dependent on the load upon the remote pilot, in some instances this may be a lower load due to higher levels of automation,

but in others, the load of oversight and monitoring may be higher and therefore fatigue may occur in a shorter period of time than for 1:1 operation.

It is possible that there are parallels to be drawn in this regard from other roles in other industries where an individual is responsible for monitoring multiple entities or data sources simultaneously.

Specific training, operating and emergency procedures for dealing with multiple drones should be developed.

Consultation Question 41

We provisionally propose that use of flight data recorder systems or devices should be mandatory for autonomous drone operations. Do you agree?

Yes

Please expand on your answer below

The safety culture within aviation has enabled safety levels to be very high and is an important element of public adoption of new technologies and acceptance from non users. A key element in that aviation safety culture is the understanding that arises from any near misses, incidents and accidents. The ability to gather information that would support any investigation, such as that of the AAIB, as well as internal investigations in the event of any unexpected occurrence is vital to that ongoing safety culture. When there is no remote pilot operating the aircraft and it is controlled autonomously, it is essential to understand what has happened and why. Therefore a requirement to create and maintain such data logs (which a clear retention period) would be necessary. The exact nature of how this can be practically achieved should be developed with inputs from industry (vehicle and system developers and operators) to ensure that the requirements are not arbitrarily set and can be achieved. This will need to be included in operations manuals etc. It should also be defined how compliance is to be monitored. Consideration should be given to whether this requirement should apply to all drones or only those above a certain size / weight. Imposing additional systems on smaller drones could make their use un-economical due to increased weight and cost of onboard systems.

Consultation Question 42

Should the law permit a drone to transition between remotely piloted and autonomous flight during an operation?

Other

Please expand on your answer below

Same response as per the same question for VTOL (Question 30). If however it is determined that for some reason this is not to be permitted by law for VTOL, that

should not automatically be carried across to drones as there may be reasons why this is not felt to be suitable for passenger carrying that are not applicable to other uses cases for drones. It may also be that there is the option of allowing this for specified category operations but not certified if there is deemed to be an issue of proportionality of risk during handover between remote piloted and autonomous. Some drones are under remote control for taxi and take-off and then operated autonomously during flight, particularly those that are fixed wing / do not take off vertically.

Consultation Question 43

We seek stakeholder views on any other issues with the current legal framework as it relates to operations involving autonomous drones.

Please share our views below

It is unclear whether there will/should be any different limitations for autonomous drones for different uses cases such as carrying dangerous goods, clarity on this is required to enable development of operations.

It is also not clear how further system developments are to be regulated, is some level of further development allowed specifically for autonomous systems or is this just considered a variation as per recent updated guidelines on variations to an OSC. Is there a threshold at which remote piloted or autonomous system developments need to be re-evaluated or shown to be safe?

Civil liability and insurance

Consultation Question 44

We provisionally consider that the current law governing air carrier liability for injury or death of passengers in the UK is adequate for the introduction of remotely piloted and autonomous operations. Do you agree?

Other

Please expand on your answer below

For passenger carrying for hire or reward - Yes.

One aspect however that is not considered in this consultation is the use of the vehicles to carry passengers where that is not for hire or reward, such as any use for emergency services such as medical transport or search and rescue transport of passengers. There is interest in VTOL from operators of helicopters that perform such purposes today, it is unclear whether that would always be a piloted use case or whether that interest extends to remote piloted or autonomous vehicles. The applicability of any provisions for such uses cases currently performed by helicopter

should be reviewed to determine whether they can be read across to remotely piloted or autonomous passenger carrying VTOL

Consultation Question 45

We provisionally consider that the current law governing liability for damage to cargo in the UK is adequate for the introduction of remotely piloted and autonomous operations. Do you agree?

Yes

Please expand on your answer below

Since there is no requirement in the relevant article for the aircraft carrying cargo to be piloted, it would seem adequate for the current liabilities to include carriage of cargo by UAS.

The value of the cargo may not be related solely to its weight and therefore the assumption that greater use of special declarations is one that seems logical given the use cases of UAS for delivery of time sensitive items.

This does highlight a need for those offering such delivery services and those using them to be aware of the legal limitations in liability being based on weight and the need to declare any 'special declarations' and agree any additional fees as a result to be made up front.

Consultation Question 46

We provisionally propose that liability for surface damage, in the case of UAS, should transfer to the lessee when the lease:

(1) is for more than 14 days; and

(2) specifies the aircraft is to be operated under the responsibility of the lessee.

Do you agree?

Other

Please expand on your answer below

Our response here is not directly related to question 46 as posed, on which we have no firm opinion. Instead it relates to the wider subject of surface damage in relation specifically to drones, rather than passenger carrying VTOL.

The current Civil Aviation Act 1982 Section 76(2) includes that liability is strict: damages can be claimed "without proof of negligence or intention or other cause of action, as if the loss or damage had been caused by the wilful act,

neglect, or default of the owner of the aircraft". – this strict liability means that owners/operators are unable to make a defence unless there is negligence on the part of the claimant. If a claimant makes a claim that a drone allowed something to cause surface damage, what proof will be required that it came from the owner/operator that the claim is raised against? If there are numerous drones operating in an area, how would the claimant be able to determine who owned/operated the drone in question? This could make the most visible or commonly known operators open to claims that are not accurate. For example, if someone knows a household name such as Amazon operate in their area would they assume that they are responsible and how would Amazon be able to defend such a claim in that case if they were not the only operator in the area and were not to blame?

The DfT and CAA have been investigating how Remote ID could be introduced for UAS in the UK but it is not guaranteed to be implemented and even if it were, it would need to be a networked solution and provide publicly available data for someone to be able to identify who was flying where and when.

Concerns such as these are important to public, the ability to know who is flying a drone and why is a clear area of importance that has emerged from public dialogue and survey carried out by University of Birmingham on behalf of Future Flight Challenge.

Consultation Question 47

We provisionally propose 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. Do you agree?

Yes

Please expand on your answer below

This is a key area of concern for public as per engagements in response to question 46 above. It is also unclear currently what role local authorities have in planning for such services that may limit their ability to operate (either by local planning or via by-laws). To determine the appropriate requirements will need to involve industry, public groups, local authorities and potentially DfT given the sensitivity of the subject. Discussion of this area with the Community Integration Group co-created between FFC and DfT should be explored.

Consultation Question 48

We provisionally propose that there should be a review product liability law (including the Consumer Protection Act 1987) to take account of the challenges of emerging technologies. The review should cover product liability as a whole, rather than be confined to aviation or automated vehicles. Do you agree?

Yes

Please expand on your answer below

The challenges in aviation in regards to emerging technologies and use of AI and machine learning techniques are not unique, the same challenges exist in many different domains of usage. There is a risk that product liability law is unable to keep up with developments, there is also conversely a risk that any prescriptive requirements stifle innovation. There is a balance to be struck in protecting consumers and non-consumers through product liability, innovation and the understanding of appropriate procedures and practices to ensure the products are suitably developed.

Consultation Question 49

We seek views as to whether the current law regarding liability for mid-air collisions is satisfactory in the case of collisions involving uncrewed aircraft systems.

Please share your views below

The consultation rationale makes sense for a passenger on board a VTOL that suffers a mid-air collision. However, it is unclear whether the current law regarding liability is sufficient where an uncrewed aircraft, in particular a drone, is involved in a mid-air collision with a crewed aircraft. If that should arise in injury or damage then how is liability determined. Will it be determined that the drone operator is always liable or is it dependent on the data showing what happened to determine any liability? Is there any difference whether the crewed aircraft only has a pilot on board (such as leisure flying) or passengers on board (either leisure or commercial for hire/reward)?

Consultation Question 51

We provisionally propose that multiple simultaneous operations should be considered as the Government develops proposals for the insurance requirements applicable to uncrewed aircraft. Do you agree?

Yes

Criminal liability

Consultation Question 59

We invite views on how operator responsibilities for dangerous goods might need to be adapted in light of autonomous operations.

Please share your views below

In the most part the responsibilities are clear and still apply when the aircraft is uncrewed. Some aspects would need amendment.

In the case of an uncrewed aircraft without passengers that is carrying dangerous goods:

- *Where there are references to documents being carried on board, these will need updating to being available for the remote pilot, or operator more generally in the case of autonomous operations.*
- *In the event of any incident, emergency procedures will need to be different as there will not be persons on board to complete any containing actions. Also the need to inform air traffic services and or emergency services (not all operations will be within air traffic controlled areas) and how that can be completed for autonomous operations needs to be determined. The operator should be responsible for determining all such requirements and ensuring that they are adequately trained for and met.*
- *Other requirements may be needed such as the aircraft being clearly and visibly identified as carrying dangerous goods and contact details or sources of information on how to proceed easily available (perhaps via a QR code) so that any member of public finding it in the case of landing at any destination not prepared for receipt can be kept safe. It would be the responsibility of the operator to determine such requirements and ensure that they are met. May also be helpful to know who the recipient of the DG is ie a hospital or medical site.*

In the case where the vehicle is uncrewed and carrying both passengers and dangerous goods then there will need to be thought applied as to relevant requirements to inform passengers and inform them of any actions required in an incident Where there is a remote pilot this may largely be done through whatever communication system is installed to enable the remote pilot to communicate with passengers (as per previous questions), where the system is autonomous there may be additional requirements to enable such communication through a supervisor or other role as previously discussed

Consultation Question 60

We ask for consultees' views about whether the offence of hijacking in domestic law should be updated to:

1. include the unauthorised seizure or control of autonomous or remotely piloted aircraft by technological means or by persons not on board the aircraft; and
2. expand the period in which hijacking can occur from the period when an autonomous or remotely piloted aircraft is "in flight" to the period when it is "in service".

Please share your views below

1 – Yes, a likely means of hijacking any remote piloted or autonomous aircraft whether passenger carrying or not is through using technology to ‘hack’ systems. The possibility of an in person attack at a control centre and any form of coercion should also be provisioned for also.

2 – Yes – a vehicle could be hijacked before, during or after it is in flight, any intervention to control an aircraft which is not legitimately carried out by the operator should be considered hijacking, regardless of when it occurs in relation to a flight planned by the operator.

Consultation Question 61

We also ask consultees for views on whether any offences against the aircraft other than hijacking need to be updated to account for increased autonomy in aviation.

Please share your views below

Consideration should also be given to how ATM and ATS services are to be used in the future, including UTM services as there is the potential for hacking of such systems to be carried out.

This may potentially be covered by the section on Air Navigation ‘where the communication of the information endangers the safety of an aircraft in flight or is likely to endanger the safety of an aircraft in flight.’

However, similar to hijacking, any timing implications should be also be considered – the current wording could imply that an aircraft has to already be in flight. If a system was hacked and false information supplied then it could allow flight plans to be created on a false basis which would endanger aircraft, does the wording allow for the action occurring ahead of any actual flight? Is there anything in the wording of the Aviation Security Act that would exclude UTM systems.

This is all likely to be covered in the second planned consultation in greater depth however

Impact

Consultation Question 62

We invite consultees to tell us if they have views on, or have experience or data to indicate, the likely costs and benefits of our provisional proposals in relation to VTOLs.

Please share your views below

Many of the proposals set out for VTOLs are extending existing crewed passenger carrying aviation regulation to these new vehicles and therefore should not be disproportionate to the costs expected by those in industry that will need to comply. There may be some specifics that aircraft manufacturers or operators identify as being disproportionate or hard to practically achieve, if this is the case then this

should be taken into consideration and hopefully any such issues will be highlighted by responses from those communities.

There is also cost to be incurred by the regulator and DfT where any legislative changes are required.

The report quotes one particular economic study carried out by PWC in terms of the economic benefits. Whilst any particular prediction is only as accurate as the assumptions it is based on turn out to be, there are numerous similar studies looking at the potential impact of this sector globally – both for eVTOL and for drones and they conclusively agree that there is a significant economic benefit to developing these technologies – both in terms of potential cost savings due to time savings from improved mobility and economic growth for companies offering products and services for this sector. There are additional social benefits that improved mobility can deliver, especially in regions that are poorly connected today, however in order for some of these to be realised there needs to be a growth of services beyond the initial services that are predicted to most benefit higher income sectors of the population (wealthy business travel). The ability to operate with remote pilots (and potentially autonomously further in the future) is an important factor in the operational economics as it both enables an additional passenger seat on the aircraft and leads to potential for remote piloting of multiple craft, these changes are likely required to enable the full scope of the service and create a price point that is more accessible to a broader section of the population.

Some other relevant studies:

<https://www.ukri.org/wp-content/uploads/2022/01/UKRI-140122-ISCFFutureFlightChallenge-Socio-economicStudyFull.pdf>

<https://www.ukri.org/publications/market-assessment-for-advanced-air-mobility-in-the-uk/>

Consultation Question 63

We invite consultees to tell us if they have views on, or have experience or data to indicate, the likely costs and benefits of our provisional proposals in relation to drones.

Please share your views below

In the case of drones, there is a balance to be struck in ensuring that regulations and legal requirements are proportionate so that the cost of implementing them is not overly onerous. This is particularly true in potentially high volume, low margin services where usage of drones can be competing with other transport modes. For example, the benefit of faster or more flexible delivery could be outweighed by the cost if the price point is deemed unviable.

As with eVTOL, there are numerous studies that have been completed globally to estimate the economic benefits of drone usage. There are benefits in terms of efficiency of tasks (such as inspection) and economic growth for companies delivering services and products. There are also other benefits that are not directly economic but are social and environmental – such as search and rescue, replacing hazardous tasks currently completed by humans with those completed by drone, enhanced options for medical delivery in particular for time sensitive or rural applications.

Since the definition of VTOL for this consultation is only focussed on passenger carrying, the use of VTOL aircraft for carrying cargo should also be considered within ‘drones’ when assessing economic benefits as the ability of large cargo capacity vehicles to better serve remote regions such as highlands and islands is significant.

Drones also have the potential to improve how key public services are delivered, particularly improving the efficiency and reducing cost and emissions of blue light services. They will also become increasingly important for defence and national security tasks.

Department for Science, Innovation & Technology and PWC (2022), *Skies without limits: The potential to take the UKs economy to new heights*, Version2, May 2022, Available at: <https://www.pwc.co.uk/issues/technology/drones/the-impact-of-drones-on-the-uk-economy.html>

Again, there is a cost to developing regulation and any legislative changes, the full cost of these is not available publicly but is likely to be significantly outweighed by the benefits above. There is also a duty for the CAA to enable fair and equitable access to all airspace users and hence a need for the CAA to enable such services, although that is more general than the specific subjects of automation and autonomy.

Consultation Question 64

We invite consultees to tell us if they believe or have evidence or data to suggest that any of our provisional proposals could result in advantages or disadvantages to certain groups or based on particular characteristics (with particular attention to age, disability, transgender identity, marriage and civil partnership, pregnancy and maternity, race, religion or belief, sex or gender, and sexual orientation).

Please share your views below

The proposals in many places mirror the status quo for crewed aviation. There is specific mention in the proposals around accessibility for passenger carrying services and we would strongly encourage that accessibility is seen as a key element of new vehicles and services.

The consultation is focussed on remote piloted and autonomous operations. There is a significant opportunity for remote pilots to be inclusive roles since physical constraints that could prevent people with disabilities being able to fulfil a role in crewed aviation may not be applicable for remote pilots. The CAA have consulted on remote pilot competencies for specific category including medical requirements and in our response to this we have highlighted that opportunity and a need to ensure that medical requirements are set to look at ability rather than disability. We have also highlighted that there will need to be adequate training and information for those making such medical decisions to understand fully the role of remote pilots to prevent potential discrimination. The same should apply for the ability and competencies required for remote pilots of certified category UAS.

There may be additional considerations to be made on how different groups react to remote piloted or autonomous passenger carrying services, in particular vulnerable passengers, those with additional needs and different age groups since the lack of crew on board may pose greater risks to these groups than in crewed aviation. It is noted in the consultation that there is a greater risk of non compliance or incidents from passengers due to a lack of crew and the aspect of vulnerability needs to be considered as part of that. Whilst it is a choice for people whether they use a service or not, any aspects that could be considered discriminatory when individual aspects are developed in regulation or legislation, should be further investigated. Relevant consumer and representative groups should be involved in their development.

Given that many passenger carrying VTOL services are likely shorter in duration than many long domestic or further flights the restrictions on carrying pregnant passengers should be reviewed and not necessarily assumed to be the same for existing commercial flights. This is unlikely to be specifically impacted by elements of remote piloting or autonomy but will need to be considered anyway for crewed VTOL flights.

RESPONSE TO LAW COMMISSION CONSULTATION ON AVIATION AUTONOMY

(Law Commission Consultation Paper 261)

Please note that this consultation response has been reproduced from information entered on the Citizen Space online portal.

Any personal email addresses and phone numbers have been excluded from this document.

Unanswered questions have been deleted from this document.

About you

What is the name of your organisation?

Vertical Aerospace

Airworthiness and certification

Consultation Question 1

We seek views on how current airworthiness and certification regulation might need to be adapted or developed in light of highly automated and autonomous aircraft. In particular, should provisions be adopted which allow for:

1. the certification of optionally piloted and uncrewed or unoccupied versions of conventional aircraft (hybrid versions); and
2. the separate certification of command units?

Please share your views below

The shift towards highly automated and autonomous aircraft will require changes to the regulatory framework in the UK. We believe provisions will need to be adopted that allow for both the certification of optionally piloted and uncrewed or unoccupied versions of conventional aircraft. Vertical supports modifying the framework so that a single type certificate covers both the optionally piloted and uncrewed configurations of the same aircraft. This will simplify the certification process and ensure consistency across different operational modes.

We believe the certification requirements for command units ultimately will depend on their use and the role they play in the overall operation of the aircraft. Vertical supports the approach put forward by EASA in Opinion 03/2023, which recognises that different systems will support different levels of autonomy. The regulations should be flexible enough to support a different approach to the regulatory oversight of command units that takes account of their particular technical attributes and the level of autonomy they enable.

Consultation Question 3

We seek views on whether current regulatory tools to support the development of highly automated and autonomous aviation technologies are adequate.

Please share your views below

As a manufacturer of manned eVTOL aircraft, Vertical Aerospace has significant experience navigating the regulatory frameworks for test flying. We have found the process of obtaining a permit to fly in the UK rigorous yet cumbersome, particularly in comparison to the experimental aircraft permit system allowed by the FAA in the United States. In order to unlock a successful autonomous aviation industry in the UK, Vertical would encourage the Law Commission, CAA and DfT to consider a process that is both rigorous, but agile enough to support innovation.

By way of a comparison between the two systems:

In the United States, the FAA's experimental aircraft permit process is designed to facilitate innovation and testing. The FAA allows for a more streamlined process, enabling quicker access to airspace for experimental purposes. The framework supports a dynamic and iterative approach to testing, which is crucial for developing cutting-edge aviation technologies.

In the UK, the permit to fly process was designed to support the repositioning of non-airworthy aircraft, such as ferrying an aircraft to a maintenance facility or repositioning for storage. The process is not optimised for the extensive and iterative test flying required for developing new aviation technologies, particularly those involving higher levels of automation and autonomy.

Vertical advocates for a new regulatory process explicitly designed for the testing of novel aircraft technologies, in consultation with the industry. This would clearly articulate the CAA's risk appetite for new technologies, and how different risk profiles are treated differently under the process.

Should this not be possible, Vertical suggests the following changes to the existing permit to fly process:

1. Simplify the documentation process by adopting a risk-based approach that tailors the level of detail required to the specific test scenarios and the maturity of the technology.
2. Establish clear timelines for the review and approval of permit to fly applications. Implement a fast-track process for low-risk test flights, supporting a more agile testing environment.
3. Introduce more flexibility in the procedural requirements to accommodate iterative testing and rapid prototyping. This could include mechanisms for provisional approvals or conditional permits that allow for ongoing modifications without the need for complete re-submission.

The current process for obtaining a permit to fly in the UK presents significant challenges that impede the rapid development and testing of aerospace technologies. By streamlining documentation, reducing approval times, and increasing flexibility, the UK can create a more conducive environment for innovation in aviation. Vertical strongly supports these changes to enable more efficient and effective testing of highly automated and autonomous aircraft.

Rules of the air

Consultation Question 4

We seek views on how highly automated and autonomous aircraft should act in emergency scenarios. In particular:

1. should highly automated and autonomous aircraft be given the freedom to operate outside the rules of the air in emergency circumstances; or
2. should a comprehensive set of rules be developed for highly automated and autonomous aircraft in emergency situations.

Please share your views below

Highly automated and autonomous aircraft should be given flexibility to operate outside the standard rules of the air during emergency circumstances. The primary goal in such scenarios is to ensure the safety of the aircraft, its occupants or cargo, the overflown and third-party property. In aviation emergencies, a swift response can mitigate against catastrophic failure. Automated systems onboard aircraft may be able to respond faster than a remote pilot, particularly in the instance of 'lost link' between the aircraft systems and the pilot in command.

Examples of where such aircraft should be able to deviate from the rules of the air include executing emergency manoeuvres without waiting for human intervention. These should be pre-programmed and validated during the certification process to ensure they meet safety standards.

Vertical also believes it is necessary to develop a comprehensive set of rules that guide the behaviour of highly automated and autonomous aircraft during emergencies. These rules should ensure consistency and predictability in how emergencies are handled, which is vital for maintaining airspace safety.

These rules should include:

- Systems on board should be capable of addressing all expected emergency scenarios to a minimally acceptable level, as defined by safety regulations. This includes predefined contingency plans for common emergencies, such as system failures, collision avoidance and emergency landings.
- Where applicable, the emergency procedures outlined in the Pilot Operating Handbook should be embedded in the aircraft's autonomous systems. This

ensures that the automated response aligns with established aviation practices.

- Pre-approved flight plans should include designated emergency landing locations – or diversion locations – that have been validated before take-off. This will align the rules with those required by EASA, for instance, under Part-IAM.
- In situations where communication with the control unit is lost, the aircraft should have pre-programmed actions to safely navigate and land autonomously.

In scenarios where remote pilot intervention is required, the remote pilot should be provided with situational awareness tools equivalent to what a pilot would see from the cockpit. This includes real-time data feeds, visual displays of the aircraft's surroundings, and the ability to declare an emergency.

Consultation Question 6

We seek consultees' views on whether the rules of the air relating to communication should be adapted for remotely piloted and autonomous aircraft.

Please share your views below

The rules mandating two-way communication between aircraft and air traffic management (ATM), as well as procedures for handling communication loss, are largely adequate for many remotely piloted and remotely monitored operations. These rules ensure that remote pilots can maintain situational awareness and coordinate effectively with ATM, which is crucial for safe and efficient flight operations.

Where changes are required, those rule changes should apply uniformly to both conventionally piloted and remotely piloted or autonomous aircraft. This consistency is essential to avoid confusion and ensure that all aircraft operating in the same airspace adhere to the same standards and protocols. This sort of harmonisation has underpinned the safety of the aviation system for many years.

Consultation Question 7

We ask for consultees' views on how the rules of the air might be adapted or developed for remotely piloted or autonomous flight

Please share your views below

Vertical supports the creation of new digital flight rules to support the operation of this new class of aircraft. This would reflect the unique operational requirements and risks that are not covered adequately by existing SERA provisions. Such rules can be designed with flexibility to accommodate rapid technological advancements

in autonomous flights. While they will be specific to remotely piloted and autonomous aircraft, they should be designed to integrate seamlessly with existing crewed aviation rules.

In the meantime – and given the long lead time to develop such a comprehensive set of new rules - additional applicability of certain existing SERA rules – as currently is the process in RPAS operational approvals, could be used to manage remotely piloted and autonomous operations.

VTOLs

Consultation Question 8

We provisionally propose that a person overseeing a VTOL flying automatically, who monitors its course and is able to intervene and change its course at any time should continue to be classified as a “remote pilot”. Do you agree?

Yes

Please expand on your answer below

We agree, however the licensing regime will need to be proportionate the tasks involved.

Consultation Question 9

We provisionally propose 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. Do you agree?

Yes

Consultation Question 10

We provisionally propose 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.

Do you agree? (Tick all that you agree with)

Please expand on your answer below

Yes, we agree.

However, it is important to highlight that, in practice, the remote pilot will need to delegate many of these responsibilities to other team members in the operating company. This delegation is necessary due to the nature of remote operations and represents an extension of current best practices and the typical delegation seen today. Ensuring these tasks are managed by a skilled and trained team within the AOC is crucial for maintaining safety and operational efficiency.

Consultation Question 12

We provisionally propose that the remote pilot-in-command should be responsible for, amongst other things, ensuring passengers are:

1. given a safety briefing; and
2. seated and wear seat belts during take-off and landing

Do you agree?

Yes

Consultation Question 13

We provisionally propose that air operators (rather than the remote pilot-in-command) should be responsible for preventing passengers from boarding:

1. who appear drunk or under the influence of drugs; or
2. whose carriage would, in the view of the operator's employees, endanger the safety of the aircraft or other passengers.

Do you agree?

Yes

Consultation Question 14

We provisionally propose that the remote pilot-in-command should have the power to take reasonable measures, including restraint of passengers, as set out in section 94 of the Civil Aviation Act 1982. Do you agree?

Yes

Please expand on your answer below

Yes, however there will be a practical challenge with this responsibility. Operators will need to agree with the regulator how they are going to meet this requirement, as part of the usual regulatory oversight.

Consultation Question 15

We provisionally propose that a person on board a VTOL aircraft (other than a crew member) should be able to take reasonable measures to protect the safety of the aircraft or of persons or property on board. Do you agree?

Yes

Consultation Question 17

We provisionally propose that passengers should be able to contact a member of crew at all times during an operation. Do you agree?

Yes

Please expand on your answer below

Yes, we believe it should be possible for passengers to contact a member of the operating organisation at all times throughout the flight. However, it is not necessary for the Pilot in Command (PIC) to be in direct communication with the passengers. Instead, a designated member of the operating team should be responsible for passenger communications to ensure continuous availability and responsiveness, allowing the PIC to focus on flight operations. This approach ensures that passengers have access to assistance when needed while maintaining the safety and efficiency of the flight.

Consultation Question 18

We provisionally propose 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. Do you agree?

Yes

Consultation Question 19

We provisionally propose that it should be a criminal offence for a person to act as the remote pilot of a VTOL when the level of alcohol in their blood, breath or urine is over a prescribed limit. Do you agree?

Yes

Consultation Question 20

We provisionally propose that the remote pilot should be subject to the reporting obligations currently applicable to pilots under the Air Operations Regulation. Do you agree?

Yes

Consultation Question 21

We provisionally propose that a remotely piloted VTOL should be required to be capable of detecting and recording information relating to accidents and near accidents for the purposes of reporting it. Do you agree?

Yes

Consultation Question 22

We provisionally propose that licences should be required for remote VTOL pilots. So far as appropriate, these should follow the classes and ratings adopted for crewed VTOLs. Do you agree?

Yes

Please expand on your answer below

We support the existing ICAO classification system for pilot licensing but emphasise the importance of flexibility to accommodate the specific skills needed for remote operation of VTOL aircraft. Traditional stick and rudder skills are less relevant for remote operators, especially when dealing with highly autonomous aircraft. Whereas systems management and situational awareness tailored to remote operations become crucial.

Consultation Question 23

We provisionally propose that operators of remotely piloted VTOL should be certified. Do you agree?

Yes

Consultation Question 24

We provisionally propose that operators of remotely piloted VTOLs should continue to be required to:

- ☒ (1) have the means necessary for the scale and scope of operations planned;
- ☒ (2) use only suitably qualified and trained personnel;
- ☒ (3) implement a management system to ensure safety;

- ☒(4) ensure operations only take place in accordance with the operations manual;
- ☒(5) establish procedures to minimise the consequences to safe flight operations of disruptive passenger behaviour;
- ☒(6) develop and maintain security programmes suitable for the aircraft and type of operation;
- ☒(7) have a management system to prevent fatigue.
- ☒(8) ensure the continuing airworthiness of the aircraft; and.
- ☒(9) establish procedures for any reasonably foreseeable emergency situation.

Consultation Question 25

We seek views as to whether there are additional responsibilities that operators of remotely piloted VTOLs should need to fulfil.

Please share your views below

No -although we recognise that, as mentioned in previous comments, some responsibilities that currently sit with the PIC in traditional aviation will need to be delegated to other members of the operator. This should be dealt with via traditional regulatory oversight, not via prescriptive regulations.

Consultation Question 26

We seek views as to whether the law should permit remote pilots to act as pilot-in-command for more than one VTOL at the same time.

Please share your views below

We support the proposal to permit remote pilots to act as pilot-in-command for more than one VTOL at the same time. Advances in automation and remote piloting technology will make it feasible for a single remote pilot to oversee multiple aircraft safely and efficiently. Allowing a remote pilot to manage multiple VTOLs simultaneously can lead to more efficient use of resources, reducing operational costs and increasing the scalability of VTOL operations.

Consultation Question 27

We seek views as to whether there should be an upper limit to the number of VTOLs for which a remote pilot can act as pilot-in-command at the same time.

Please share your views below

We support a performance-based approach to determine the number of VTOL aircraft that a remote pilot can operate simultaneously, rather than specifying a fixed number in regulations. This approach allows manufacturers and operators to demonstrate their capability to safely manage multiple aircraft based on specific performance criteria and operational conditions.

Manufacturers and operators should be required to conduct rigorous testing and provide evidence that their systems can handle the complexity of managing multiple aircraft simultaneously. This includes demonstrating robust safety protocols, effective emergency response strategies, and integration of autonomous technologies.

A performance-based approach ensures that the regulatory framework remains adaptable to advancements in technology and varying operational contexts.

Consultation Question 29

We seek views as to whether there should be a role for a person supervising the flight of an autonomous passenger-carrying VTOL and acting as a point of contact in relation to it. What powers or responsibilities should such a person have?

Please share your views below

Yes there should be a supervising role for a person in the case of truly autonomous passenger-carrying air operations. This should include supporting interaction with ATC, ensuring contingency plans / emergency response systems are satisfactory and overall aircraft airworthiness.

Consultation Question 30

Should the law permit an uncrewed VTOL to transition between remotely piloted and autonomous flight during an operation?

Yes

Please expand on your answer below

Yes, the law should permit an uncrewed VTOL to transition between remotely piloted and autonomous modes. This capability is essential for handling emergencies and lost link scenarios effectively.

In emergencies, there may be situations where an autonomous system needs to revert to remote piloting, allowing a human operator to intervene and take control. This mode ensures that the aircraft can be managed safely in unforeseen circumstances where human judgment and decision-making are required.

Similarly, in lost link scenarios, where communication between the remote pilot and

the aircraft is disrupted, the ability for the aircraft to autonomously continue its flight or safely land is vital.

Consultation Question 31

We seek views as to whether initial airworthiness standards for uncrewed VTOLs should include accessibility standards for persons with disabilities and reduced mobility.

Please share your views below

Initial airworthiness is not currently the regulatory mechanism that addresses passenger accessibility, instead it is regulated via operational rules and guidelines. Given this context, we propose that initial airworthiness standards for uncrewed VTOLs should not include accessibility standards for passengers with reduced mobility. Doing so would place an additional requirement on UK manufacturers to our foreign competitors.

Instead, accessibility should be addressed through comprehensive operational regulations that ensure these aircraft can accommodate passengers with disabilities effectively. This approach aligns with existing practices in the broader aviation industry, where operational standards are designed to uphold accessibility and inclusion without being part of the technical airworthiness criteria.

Consultation Question 32

We seek views as to whether the CAA should be able to include accessibility standards within the licences granted to uncrewed VTOL operators.

Please expand on your answer below

There should be no specific licensing requirement placed on VTOL operators regarding accessibility standards, unless such obligations are extended to all forms of air passenger transport.



The commercial and public sector use of cellular-connected drones (SIM-enabled) has the potential to deliver significant benefits to the UK through innovations that, for example:

- Can improve productivity by completing tasks more efficiently such as surveying construction sites quicker;
- Provide crucial information to emergency services such as those responding to traffic incidents, and/or;
- Reduce workplace dangers to potentially save lives.

If we get the safety element of drones right, there are a number of potential economic and societal benefits. Many of the most beneficial uses of drones arise from circumstances where the drone needs to leave a pilot's sight such as inspection of power lines or road/railway bridges and the delivery of time-critical medical supplies. However, to ensure safety, most drones today are required to be flown within sight of the pilot, known as Visual Line Of Sight. A cellular-connected drone – one that is connected to a mobile network through an inbuilt SIM card – solves this problem. With a cellular connection, it is possible to track and control the drone so that it can be flown safely and securely Beyond Visual Line of Sight (BVLOS).

Most drones are currently controlled via hand-held radio transmitter with flights restricted to the radius of radio signal reception. A cellular-connected drone is one that is connected to a mobile network through an inbuilt SIM card. Mobile connectivity is a standardised and scalable solution to providing a connection to the drone, using the pre-existing availability of connectivity worldwide.

BVLOS drone utilisation has recently been enabled by the CAA and Ofcom, meaning that we can expect to see an increase in trials and commercial use of drones at a distance, and using spectrum bands that are also used for cellular communications (whereas most drones today use WiFi or model aircraft bands).

Safely operating a potentially significant increase in the number of drones flying Beyond Visual Line of Sight will also need a new traffic management system to co-ordinate drone flights with other airspace users. This is commonly referred to as a "UTM" (Unmanned, Universal or Unified Traffic Management) system. This needs cellular connectivity to provide, for example, remote and trusted verification of drone identity, location and flight plan authorisation.

Cellular connection can provide further benefits as a complementary system for verifying location and the ability to have dynamic no-fly zones that can be established in response to events rather than only static zones as currently exist over airports. On the other hand, it also requires careful input from the main licensees of the cellular spectrum (i.e. Mobile Network Operators), to ensure that there are no issues with interference, which put at risk both communications and safe drone use.

Given the increasingly close ties between drone market innovation and our network, we welcome the Law Commission's work to explore the legislative landscape. As the work develops, we believe that it is vital that MNOs like Vodafone are included as a critical partner when considering the future legal framework for the management of drones in the UK.

For example, within the consultation paper questions 6 and 37, Vodafone would like to be involved in reviewing and regulating the requirements of how communications should be adapted for remotely piloted and autonomous aircraft. As this market begins to scale, the terrestrial network could become essential for C2 Communications link as well as providing vital operational data to various stakeholders within the industry such as the regulators and insurers. Further analysis and insights from proof of concepts and trials will help inform and build any regulatory framework that Vodafone would be happy to be involved with.

RESPONSE TO LAW COMMISSION CONSULTATION ON AVIATION AUTONOMY

(Law Commission Consultation Paper 261)

Please note that this consultation response has been reproduced from information entered on the Citizen Space online portal.

Any personal email addresses and phone numbers have been excluded from this document.

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About you

What is the name of your organisation?

Wing

Airworthiness and certification

Consultation Question 3

We seek views on whether current regulatory tools to support the development of highly automated and autonomous aviation technologies are adequate.

Please share your views below

Wing recognises the efforts of the UK, and particularly the Civil Aviation Authority (CAA), in supporting the development of highly automated aviation technologies. Despite the efforts to date, we believe that the current regulatory tools are not yet fully adequate for fostering these advanced technologies.

Navigating the complex landscape of UK-specific rules alongside retained EU regulations can be challenging, especially where the EU has moved on (e.g., setting up a UTM framework by passing U-space Regulation (EU) 2021/664 and associated AMC & GM) whilst the UK is still considering its approach (e.g., when it comes to establishing a regulatory regime for UTM).

We see a need for greater coherence and scalability. Specifically, we advocate for a clear, risk-based pathway for scaling 'specific' category BVLOS UAS operations grounded on performance-based (non-prescriptive) requirements. In this sense, we welcome the forthcoming UK adoption of JARUS' SORA v2.5 as an important step towards a proportionate and operation-centric risk assessment methodology in alignment with other jurisdictions globally.

Similarly, it is crucial to establish a seamless transition from sandboxes to commercial operations. Without a clear framework that recognises and accommodates rapid technological development, there is a risk that sandbox projects remain isolated with little or no return on investment for operators and other

industry stakeholders.

In addition, to promote sustained growth and efficiency, it is key to streamline routine approvals through digital processes for flight, airspace access, administrative, etc. authorisations and permits.

We recognise ongoing efforts to address many of these challenges and look forward to working with the CAA and others involved in establishing a highly innovative regulatory framework in the UK.

Rules of the air

Consultation Question 6

We seek consultees' views on whether the rules of the air relating to communication should be adapted for remotely piloted and autonomous aircraft.

Please share your views below

As the Law Commission points out, the rules of the air currently require the “two-way communication between aircraft and stations or locations on the surface of the earth” under the premise that there is a pilot on board of the aircraft who can communicate by voice. However, this framework is outdated and unsuitable for highly automated uncrewed aircraft systems (UAS). To address this, communication rules must evolve to support digital, automated, and non-voice- or human-signal-based interactions.

Establishing electronic conspicuity in UK airspace will be a vital cornerstone of this undertaking, as it will increase situational awareness and cooperation of airspace users in the surrounding airspace. For example, Wing’s uncrewed aircraft are equipped with ADS-B In technology, and Wing’s take-off sites (“Nests”) are equipped with ADS-B receivers that enable continuous crewed air traffic monitoring and thus timely appropriate action. Moreover, Wing will also be capable of processing the crewed air traffic electronic conspicuity means detailed in EASA’s U-space regulatory package, specifically in AMC1 SERA.6005(c).

The CAA has already done important work on electronic conspicuity, and we would encourage regulators and lawmakers in the UK to prioritise policy development that does not prescribe technology-specific solutions, such as mandating ADS-B Out for UAS, which is cost-prohibitive and impractical to implement on all aircraft.

Consultation Question 7

We ask for consultees' views on how the rules of the air might be adapted or developed for remotely piloted or autonomous flight

Please share your views below

When considering how rules of the air might apply to highly automated uncrewed aircraft flights, it is important to recognise the dynamic and fast-paced nature of the industry, which is innovating on a daily basis.

Despite the rapid progress in these technologies over the past few years, we are likely to see even faster development in the near future. Given this potential for rapid change, Wing would consider it premature to develop a new, bespoke ruleset. Doing so could pose an obstacle for innovation, as it would be challenging to ensure the ruleset adequately accommodates evolving technology in this sector.

Instead of developing an entirely new ruleset, we propose making limited updates to the existing rules of the air, specifically where current rules are clearly conflicting with or not factoring in UAS of varying levels of automation. For example, the rules concerning communication must evolve to support digital, automated, and non-voice or human-signal-based interactions, as outlined in our response to question 6; a similar consideration applies to the right-of-way rules, which must be updated to effectively account for UAS flights.

We recommend that the CAA maintain flexibility in allowing 'specific' category UAS operators to satisfy the applicable SERA requirements and any potential relevant additional conditions and limitations they might impose during the operational authorisation process, while ensuring international alignment – this will allow UAS operators to scale across different markets using their existing data and established proof points, without starting from scratch in the UK or elsewhere.

Drones

Consultation Question 34

We provisionally propose that a remote pilot for drones should continue to be defined as “a natural person responsible for safely conducting the flight of an unmanned aircraft by operating its flight controls, either manually or, when the unmanned aircraft flies automatically, by monitoring its course and remaining able to intervene and change its course at any time”. Do you agree?

No

Please expand on your answer below

Wing acknowledges that some 'specific' category UAS operational concepts may still require remote pilots. However, as automation progresses and uncrewed operations expand, the need for remote pilots is expected to significantly diminish. Consequently, it would be of greater utility to reframe this role as one predominantly focused on flight management overseeing UAS flights occurring within a specific area instead of controlling individual aircraft.

As the tactical tasks currently performed by remote pilots become automated, we foresee a shift in human roles. Rather than 'remote pilots' controlling and monitoring individual aircraft, we anticipate the emergence of operators specialising in

‘advanced integrated system management’, which will handle off-nominal events on an exception basis. This evolution mirrors the paradigm shift in human roles seen in other industries due to automation.

Therefore, a future-proof regulatory framework must accommodate this shift from remote piloting to managed automation by structured organisations. Emphasis should be placed on the responsibilities of operators rather than individual remote pilots, with a focus on the organisations’ safety management processes instead of individual role definition. A more appropriate definition, replacing the traditional notion of a remote pilot could, for example, describe a person, or group of people, or automated system that is responsible for ensuring the safety and compliance with the authorised limitations and conditions of UAS flights.

As technology advances towards greater automation, having a human in the loop may become unnecessary or even adversely impact safety. We therefore submit that it would be appropriate to distinguish between the traditional concept of a ‘remotely piloted aircraft’ associated with the role of ‘remote pilot’ from the concept of ‘managed automated aircraft’ associated with the ‘system management organisation’ of the operator, responsible for safely managing the advanced integrated system.

Consultation Question 36

We provisionally propose that for autonomous operations in the specific category, a UAS 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 manned 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.

Do you agree? (tick all that you agree with)

Please expand on your answer below

The Law Commission’s proposal in question 36 shifts the in-flight responsibilities of remote pilots, as laid down in UAS.SPEC.060(3) of Part B of the Annex to UK Regulation (EU) 2019/947, to the operators and their UAS, a concept we generally endorse as reasonable, as outlined in our response to question 34. However, we

advocate for certain adjustments to accommodate varying levels of automation in uncrewed aviation, such as the communications and right-of-way rules, as outlined in our response to question 7.

Requirement (2):

Primarily, while we agree with the first requirement in (2) to avoid any risk of collision, in adherence to Chapter 2 of Section 3 of Annex I (Rules of the Air) to UK Regulation (EU) No 923/2012 on collision avoidance, we question the adequacy of the second requirement for a highly automated UAS to ‘discontinue a flight when continuing it may pose a risk to other aircraft, people, animals, environment or property’.

We believe that this blanket requirement to discontinue a highly automated flight in the presence of potential risk is overly stringent, considering that there are and will be alternative, more proportionate deconfliction strategies available.

This view is consistent with the current regulatory framework – according to the CAA, SERA.3210 applies to certain ‘specific’ category BVLOS UAS operations (as appropriate) under AMC1 to Article 7(2) of UK Regulation (EU) 2019/947. This provision addresses the ‘requirements on the right of way between certain types of aircraft, and manoeuvres that must be taken to avoid collisions.’

Notably, although these right-of-way rules need to be adequately updated to effectively account for UAS, there is no stipulation within the AMC or SERA.3210 itself that requires discontinuing a flight, recognising that there are often more effective mitigation actions available, such as altering the flight path to avoid a collision.

Therefore, we believe mandating flight discontinuation is not the most appropriate approach. A more proportionate solution, especially as automation increases and systems become more advanced and reliable, would be to replace the requirement to discontinue a flight in all cases with a requirement to “take appropriate action to [avoid any risk of collision with crewed aircraft]”. This would provide operators and highly automated UAS the flexibility to respond to risks according to their nature and severity. Such actions could be supported by the deployment of UTM systems, as outlined in our response to question 38.

Requirement (5):

Given that emergency services are likely to utilise highly automated UAS in their emergency response efforts in the same way that some agencies already employ manually-controlled drones, we recommend revising the blanket prohibition on highly automated UAS from “flying 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”.

A more proportionate and performance-based requirement would be to mandate that UAS operators “maintain a safe distance from areas where an emergency response effort is ongoing unless they have permission to fly close to or inside

these areas from the responsible emergency response services”. This revised approach promotes a risk-based framework that supports the safe and responsible operation of UAS while respecting the integrity of emergency response activities.

Consultation Question 37

We seek views on what operational requirements should be applied to autonomous drone operations and drones that operate beyond visual line of sight in the specific and certified categories.

Please share your views below

With over 400,000 completed flights globally, Wing can draw on the wealth of operational experience it has gained to confidently suggest that current operational requirements translate well to highly automated UAS operations, especially where these operations are based on an operation-centric risk assessment methodology, like SORA.

The operational requirements for highly automated UAS operations in the ‘specific’ category should thus be the ones set out in UK Regulation (EU) 2019/947 based on the upcoming UK implementation of JARUS’ SORA 2.5. Additionally, the UK CAA has defined the applicable SERA requirements in an acceptable means of compliance, specifically AMC1 to Article 7(2) of the UK Regulation (EU) 2019/947 – according to this AMC, the CAA may apply additional requirements of SERA to UAS operations via operational authorisations as conditions and limitations, based on the nature of the operation and the result of the risk assessment process.

It is important to stress that as automation in uncrewed aircraft operations increases, there should not be a corresponding rise in applicable operational requirements – on the contrary, the safety and reliability of highly automated systems should mean that fewer requirements might be necessary. Consequently, we consider that the current regulatory tools are generally sufficient and adequate to support greater automation and scalability of UAS operations in the ‘specific’ category, provided they are implemented in a coherent, proportionate, and flexible manner, as outlined in our response to question 3.

Consultation Question 38

We seek views on whether the current concept of a “remote pilot” is compatible with drone MSO. We also seek views on whether the remote pilots of drone MSO should continue to be subject to the same responsibilities as remote pilots for single drone operations.

Please share your views below

In our response to question 34, we outlined that distinguishing between the traditional concept of a ‘remotely piloted aircraft’ associated with the role of ‘remote pilot’ from the concept of ‘managed automated aircraft’ associated with a ‘system

management organisation' may become a necessary distinction.

In a 'remotely piloted aircraft' concept that relies on individual control and supervision of aircraft by the remote pilot, the cognitive workload increases proportionately with the number of aircraft supervised. Under this model, it may become practical to establish a maximum number of aircraft that can be effectively supervised by an individual.

However, many of today's advanced integrated systems are managed very differently; as most tactical functions are automated, the human responsibilities evolve to that of highly automated system management – a concept commonly referred to as 'managed automated aircraft'. Under this model, operators manage system-wide configurations and constraints resulting in the personnel's cognitive workload being independent from the number of UAS managed. For example, in an emergency situation requiring aircraft to immediately vacate a certain volume of airspace, the Wing operator may input a geographic restriction to the system which is automatically disseminated and enforced by all UAS without delay.

As we look forward, many of the tasks currently performed by a remote pilot will be re-distributed to various automated systems (such as UTM). In such a model, the ratio of pilot:UAS no longer is appropriate and the number of UAS has no implications on the cognitive workload of the personnel managing the system. Taking into account the efficiencies from these technological advances and automated systems including UTM, reframing this responsibility in terms of advanced system management organisations performing flight management over a particular area would be more relevant and effective. Therefore, the long term outlook requires a thorough reevaluation of the role of the remote pilot, shifting more responsibilities to operators, their organisational system management, and their highly automated systems.

Consultation Question 39

We seek views on whether there should be an upper limit to the number of drones for which an individual remote pilot is responsible.

Please share your views below

Wing does not consider that it would be necessary or helpful to impose an upper limit to the number of drones that an individual remote pilot is responsible for.

As we have outlined in our response to question 38, UAS with higher levels of automation are managed at the system level, with no clear or direct relation between fleet-size and operating personnel workload. Additionally, as operations will scale up, it is crucial to ensure the economic viability of most UAS use cases. Central to this is reducing the regulatory burden that mandates a large remote pilot workforce, which would negatively impact the ability of most UAS operators, chiefly the many small UAS companies that power the UK's drone ecosystem, to scale up operations both technically and economically.

As we have outlined in our response to question 37, we advocate for maintaining a risk-centric approach in authorising operations involving highly automated UAS in the 'specific category, consistent with UK Regulation (EU) 2019/947 and the forthcoming UK SORA adoption. This means that the degree or nature of oversight by UAS operators (whether delivered via remote pilots in their traditional conception or through a more operator-based, system-reliant approach, as suggested in our response to question 34) over a proposed number of drones will already have been accounted for in the UAS operator's risk assessment and the CAA's subsequent operational authorisation application processing.

Consultation Question 43

We seek stakeholder views on any other issues with the current legal framework as it relates to operations involving autonomous drones.

Please share our views below

The UK has an opportunity to become a leader in the regulation of highly automated uncrewed aircraft flights. We appreciate that realising this potential may require unique regulatory decisions that might not fully align with those of the EU or the US, or the formulation or refinement of particular rulesets that are still in progress in these regions – the update of the communication and right-of-way rules to effectively account for highly automated UAS, as proposed in our response to questions 6, 7 and 36, exemplifies this need.

While we support this aspect of regulatory innovation, we believe it is equally crucial to consider the emerging international consensus on the regulation of highly automated drones, which includes the adoption of globally-recognised standards. As outlined in our response to question 7, it is vital that UAS operators can scale across different markets using their existing data and established proof points, rather than having to start from scratch in the UK or elsewhere. We strongly urge UK regulators and lawmakers to prioritise international alignment when developing frameworks for automation in uncrewed aircraft operations in the 'specific' category.

Criminal liability

Consultation Question 59

We invite views on how operator responsibilities for dangerous goods might need to be adapted in light of autonomous operations.

Please share your views below

The current regulatory framework in the UK governing the transport of dangerous goods (DG) by air using UAS is rooted in the International Civil Aviation Organization's (ICAO) Technical Instructions for the Safe Transport of Dangerous Goods, ensuring alignment with global jurisdictions such as the EU, US and Australia. While this alignment ensures consistency and safety, there is significant potential to enhance proportionality and flexibility to better accommodate the unique

characteristics of UAS operations, particularly within the 'specific' category.

Presently, UAS operators must obtain separate approval from the CAA for the carriage of DG, in addition to the operational authorisation required in the 'specific' category. While this dual requirement ensures safety, there exists an opportunity to streamline or integrate these processes. Harmonising documentation requirements, leveraging UAS operators' safety management procedures, or refining training program criteria could simplify approvals without compromising safety. This approach would not only reduce administrative burden but also ensure that safety remains paramount in all 'specific' category UAS operations involving DG transport.

It is noteworthy that there is currently no bespoke application form tailored specifically for UAS operators seeking DG approval. Developing such a form tailored to UAS operations, and integrating it effectively within the 'specific' category operational authorisation application process, would streamline applications and ensure that essential operational details are adequately captured. This includes specific considerations related to UAS technical characteristics, operational capabilities, and proportionate risk assessments, thereby enhancing the effectiveness and efficiency of the CAA assessments.

As automation in UAS operations continues to evolve, the fundamental principle guiding the transport of DG in the 'specific' category must remain unchanged – demonstrating that the transported DG do not pose a high risk to third parties or the environment. This should be based on proportionate, performance-based requirements rather than rigid, prescriptive criteria.

In this context, operators of highly automated UAS carrying DG in the 'specific' category should benefit from simplified requirements, based not only on the limited amount of DG carried onboard and the lack of direct exposure risk due to the absence of onboard crew or passengers, but also reflecting the safety and reliability of these advanced systems.

Consultation Question 60

We ask for consultees' views about whether the offence of hijacking in domestic law should be updated to:

1. include the unauthorised seizure or control of autonomous or remotely piloted aircraft by technological means or by persons not on board the aircraft; and
2. expand the period in which hijacking can occur from the period when an autonomous or remotely piloted aircraft is "in flight" to the period when it is "in service".

Please share your views below

The vast majority of drone users are law-abiding and do not have harmful intentions. Therefore, a balanced counter-UAS policy is crucial: one that effectively

combats malicious activity without inadvertently penalising lawful UAS operations, including but not limited to unnecessary hijacking throughout the duration of the UAS service. Rules of Engagement (ROE) governing the response to identified UAS threats should clearly convey policies, have an escalation protocol minimising damage or intrusion, and incorporate diverse detection and mitigation measures, developed in close collaboration with national security agencies.

In developing ROE, training, best practices and any necessary approval processes, it is crucial to distinguish in counter-UAS rules between detecting versus tracking drones and an emphasis that mitigation is reserved only as a last resort. Increasing awareness and adoption of network identification, which essentially acts as a digital licence plate that is visible to government agencies and other users including the general public, would enable others to identify and understand drones nearby while still maintaining the needed level of privacy to protect this data.

Training for any entity performing mitigation should stress the initial use of network identification and other available information to assess drone intent. The first line of defence should involve contacting or warning the UAS operator, and disrupting or disabling the aircraft, whether through non-physical measures such as jamming or through physical actions for tactical interception, should be reserved only as a last alternative. Violations of these protocols should be grounds for appropriate corrective measures, including revoking authority to perform mitigation functions.

To aid in efforts to minimise unneeded disruptions in the airspace, including hijacking, any entity authorised to perform mitigation actions should prioritise accessing information that will enhance situational awareness, threat assessment and security in the airspace. A decentralised, identity and access management system can leverage a variety of identification technologies, including remote ID, UAS operator registration information, and other airspace data, to support safety and security. Utilising these existing sources of information can prevent any unnecessary disruptions to the functioning of the airspace. Training for mitigation entities should emphasise that, whenever they access and exchange this data, it is of paramount importance that they adhere to appropriate privacy, data protection and data retention safeguards to assure the security and protection of personally identifiable information (PII).

As another information source in this data access management system, the UK CAA should establish a Verified Operator Program (VOP). VOP would serve as a free, voluntary program for qualifying commercial drone operators meeting certain criteria for managerial competence, safety culture, and lack of fraudulent activities. While the CAA and its partner agencies would establish and maintain the VOP, appropriate entities, including duly authorised government agencies, would be able to access this information as needed and when appropriate for an authorised need to identify proximate UAS.

RESPONSE TO LAW COMMISSION CONSULTATION ON AVIATION AUTONOMY

(Law Commission Consultation Paper 261)

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Unanswered questions have been deleted from this document.

About you

What is the name of your organisation?

York Gliding Centre

Airworthiness and certification

Consultation Question 1

We seek views on how current airworthiness and certification regulation might need to be adapted or developed in light of highly automated and autonomous aircraft. In particular, should provisions be adopted which allow for:

1. the certification of optionally piloted and uncrewed or unoccupied versions of conventional aircraft (hybrid versions); and
2. the separate certification of command units?

Please share your views below

The certification should be the same as for the equivalent crewed aircraft but should include verification of the integrity of remote controlling systems (the interface between the command centre and the aircraft).

There should be separate certification of command system include standards of ongoing maintenance.

Consultation Question 2

We welcome views on what changes to the certification system might be necessary to enable higher automation and autonomy in aviation.

Please share your views below

There should be a requirement for certificated over-ride systems by authorised humans and non-human monitoring stations (independent of the command centre).

Consultation Question 3

We seek views on whether current regulatory tools to support the development of highly automated and autonomous aviation technologies are adequate.

Please share your views below

Regulatory tools need to anticipate advances in artificial intelligence which could result in perverse work-around for navigation and rules of the air problems encountered en route by the autonomous system.

Rules of the air

Consultation Question 4

We seek views on how highly automated and autonomous aircraft should act in emergency scenarios. In particular:

1. should highly automated and autonomous aircraft be given the freedom to operate outside the rules of the air in emergency circumstances; or
2. should a comprehensive set of rules be developed for highly automated and autonomous aircraft in emergency situations.

Please share your views below

Option 2 should be explored but it will require a system for ensuring the conformity of software solutions.

Consultation Question 5

We seek consultee views about what challenges remotely piloting an aircraft in an emergency scenario presents and how these might be addressed

Please share your views below

Remote piloting presents fewer challenges than autonomy.

However, in a situation in which the remotely piloted air vehicle encounters a crewed vehicle, it will be important for the remote pilot to have at least the same situational awareness as that which would be the case if the the remotely piloted

aircraft were actually crewed. This implies a range of sensors and the capacity to anticipate rule-breaking tendencies by the human pilot.

Consultation Question 6

We seek consultees' views on whether the rules of the air relating to communication should be adapted for remotely piloted and autonomous aircraft.

Please share your views below

There need not be a requirement for spoken communication as long as intentions, observations and confirmation of instructions can be communicated to other parties (aviators and air traffic controllers) by other means.

Consultation Question 7

We ask for consultees' views on how the rules of the air might be adapted or developed for remotely piloted or autonomous flight

Please share your views below

Most rules of the air are adequate. However, the ability of the remote and autonomous vehicle to detect other airspace users needs to be reflected in equivalent rules for visibility and separation eg reliable detection ranges may mean that the visibility and separation rules may need to be reconsidered.

VTOLs

Consultation Question 8

We provisionally propose that a person overseeing a VTOL flying automatically, who monitors its course and is able to intervene and change its course at any time should continue to be classified as a "remote pilot". Do you agree?

Yes

Please expand on your answer below

Much depends on whether the system is being operated in segregated airspace or in mixed use airspace.

Consultation Question 9

We provisionally propose 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. Do you agree?

Yes

Please expand on your answer below

..... and should be subject to equivalent rules regarding the ability to detect other airspace users and ground hazards.

Consultation Question 10

We provisionally propose 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.

Do you agree? (Tick all that you agree with)

Please expand on your answer below

The specification and integrity of instruments for 'see and avoid' purposes is a crucial area for regulation.

Consultation Question 11

We invite views as to whether there are additional operational responsibilities that a remote VTOL pilot should be required to fulfil.

Please share your views below

If the VTOL pilot is human, there will need to be rules about continuous attention or relief pilots.

Consultation Question 12

We provisionally propose that the remote pilot-in-command should be responsible for, amongst other things, ensuring passengers are:

1. given a safety briefing; and
2. seated and wear seat belts during take-off and landing

Do you agree?

Yes

Please expand on your answer below

It needs to be clear whether the individual has to be the deliverer of these services or needs to be reasonably assured that they have been carried out.

Consultation Question 13

We provisionally propose that air operators (rather than the remote pilot-in-command) should be responsible for preventing passengers from boarding:

1. who appear drunk or under the influence of drugs; or
2. whose carriage would, in the view of the operator's employees, endanger the safety of the aircraft or other passengers.

Do you agree?

Yes

Please expand on your answer below

But the remote pilot should still be assured that these measures have been implemented for each flight.

Consultation Question 14

We provisionally propose that the remote pilot-in-command should have the power to take reasonable measures, including restraint of passengers, as set out in section 94 of the Civil Aviation Act 1982. Do you agree?

No

Please expand on your answer below

The authoriser should be a crew member on board.

Consultation Question 15

We provisionally propose that a person on board a VTOL aircraft (other than a crew member) should be able to take reasonable measures to protect the safety of the aircraft or of persons or property on board. Do you agree?

Other

Please expand on your answer below

This question needs unpacking. In the case of an optionally piloted aircraft being remotely piloted at the time of the flight, should an unqualified passenger be authorised to take over control in the event of a single rotor failure, for example? I would suggest that this would not be a desirable outcome of a minor technical problem.

Consultation Question 16

We seek views on whether the powers of crew on board a VTOL aircraft should be broadened to reflect those of the pilot-in-command under the Civil Aviation Act 1982 to:

1. take reasonable measures to protect the safety of the aircraft or persons or property on board;
2. maintain good order and discipline; or
3. enable the crew to disembark or deliver a person.

Please share your views below

Yes they should but there needs to be an extensive analysis of the wide range of scenarios that could arise in different variations of VTOL craft.

Consultation Question 17

We provisionally propose that passengers should be able to contact a member of crew at all times during an operation. Do you agree?

Yes

Consultation Question 18

We provisionally propose 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. Do you agree?

Yes

Please expand on your answer below

With similar rules about rest and illness.

Consultation Question 19

We provisionally propose that it should be a criminal offence for a person to act as the remote pilot of a VTOL when the level of alcohol in their blood, breath or urine is over a prescribed limit. Do you agree?

Yes

Consultation Question 20

We provisionally propose that the remote pilot should be subject to the reporting obligations currently applicable to pilots under the Air Operations Regulation. Do you agree?

Yes

Consultation Question 21

We provisionally propose that a remotely piloted VTOL should be required to be capable of detecting and recording information relating to accidents and near accidents for the purposes of reporting it. Do you agree?

Yes

Consultation Question 22

We provisionally propose that licences should be required for remote VTOL pilots. So far as appropriate, these should follow the classes and ratings adopted for crewed VTOLs. Do you agree?

Yes

Consultation Question 23

We provisionally propose that operators of remotely piloted VTOL should be certified. Do you agree?

Yes

Please expand on your answer below

..... and robustly assessed. They must have a strong aviation track record.

Consultation Question 24

We provisionally propose that operators of remotely piloted VTOLs should continue to be required to:

- ☒ (1) have the means necessary for the scale and scope of operations planned;

- ☒ (2) use only suitably qualified and trained personnel;
- ☒ (3) implement a management system to ensure safety;
- ☒ (4) ensure operations only take place in accordance with the operations manual;
- ☒ (5) establish procedures to minimise the consequences to safe flight operations of disruptive passenger behaviour;
- ☒ (6) develop and maintain security programmes suitable for the aircraft and type of operation;
- ☒ (7) have a management system to prevent fatigue.
- ☒ (8) ensure the continuing airworthiness of the aircraft; and.
- ☒ (9) establish procedures for any reasonably foreseeable emergency situation.

Do you agree? (tick all that you agree with)

Please expand on your answer below

The airworthiness definition must be extended to include the command-centre : aircraft link.

Consultation Question 25

We seek views as to whether there are additional responsibilities that operators of remotely piloted VTOLs should need to fulfil.

Please share your views below

There must be consideration of military VTOL systems and their interaction with civil systems.

Consultation Question 26

We seek views as to whether the law should permit remote pilots to act as pilot-in-command for more than one VTOL at the same time.

Please share your views below

Perhaps in a graduated scheme linked to the skills of the pilot and the capacity of the operator and operating systems.

Consultation Question 27

We seek views as to whether there should be an upper limit to the number of VTOLs for which a remote pilot can act as pilot-in-command at the same time.

Please share your views below

No but the operator and the pilot should be licensed following an assessment of capacity. This will allow for the development of technologies to enable greater numbers in due course.

Consultation Question 28

We seek views as to what additional safeguards should be introduced for remote pilots piloting multiple VTOLs.

Please share your views below

See answer to Q27.

Consultation Question 29

We seek views as to whether there should be a role for a person supervising the flight of an autonomous passenger-carrying VTOL and acting as a point of contact in relation to it. What powers or responsibilities should such a person have?

Please share your views below

It is hard to see how a single person could fulfil this role in all scenarios. Consideration should be given to supervision:

- At the point of departure
- En route/ on board
- At the arrival point

Consultation Question 30

Should the law permit an uncrewed VTOL to transition between remotely piloted and autonomous flight during an operation?

Yes

Please expand on your answer below

Given provision of approved/ licensed technology.

Consultation Question 31

We seek views as to whether initial airworthiness standards for uncrewed VTOLs should include accessibility standards for persons with disabilities and reduced mobility.

Please share your views below

Yes. Absolutely.

Consultation Question 32

We seek views as to whether the CAA should be able to include accessibility standards within the licences granted to uncrewed VTOL operators.

Please expand on your answer below

Not sure what the stem means. The licensing of the operator should be dependent on the meeting of a single national standard with a high bar.

Consultation Question 33

We seek consultees' views on any other issues with the current legal framework as it relates to operations involving autonomous VTOLs.

Please share your views below

We are concerned about the proliferation of segregated airspace. Regulation should ensure that all airspace users can continue to access the maximum volume of unsegregated airspace.

Drones

Consultation Question 34

We provisionally propose that a remote pilot for drones should continue to be defined as "a natural person responsible for safely conducting the flight of an unmanned aircraft by operating its flight controls, either manually or, when the unmanned aircraft flies automatically, by monitoring its course and remaining able to intervene and change its course at any time". Do you agree?

Yes

Please expand on your answer below

The remote pilot must be able to maintain situational awareness and not just monitor the progress of the air vehicle along a course.

Consultation Question 35

We seek views on whether some low risk autonomous drone operations or drone operations conducted beyond visual line of sight might be accommodated in the open category. In particular:

- (1) whether there are any such use cases which might be suitable for the open category; and
- (2) if so, what conditions should be attached to these use cases if operated in the open category.

Please share your views below

Only with the continuation of strict maximum altitude restrictions.

Consultation Question 36

We provisionally propose that for autonomous operations in the specific category, a UAS 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 manned 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.

Do you agree? (tick all that you agree with)

Please expand on your answer below

Agree with all suggestions above.

Consultation Question 37

We seek views on what operational requirements should be applied to autonomous drone operations and drones that operate beyond visual line of sight in the specific and certified categories.

Please share your views below

We oppose the expansion of segregated airspace to accommodate autonomous operations. Regulation should require that autonomous air vehicles should be fitted with appropriate sensors to permit safe operation in unsegregated airspace only.

Consultation Question 38

We seek views on whether the current concept of a “remote pilot” is compatible with drone MSO. We also seek views on whether the remote pilots of drone MSO should continue to be subject to the same responsibilities as remote pilots for single drone operations.

Please share your views below

Drone pilots should require certification and licensing but to a lower standard than for air vehicles with human occupants.

Consultation Question 39

We seek views on whether there should be an upper limit to the number of drones for which an individual remote pilot is responsible.

Please share your views below

For each individual pilot, the limit should be a feature of their licence. A national upper limit would need to be continually uplifted as technology advances.

Consultation Question 40

We seek views as to what additional safeguards should be introduced for remote pilots responsible for multiple drones.

Please share your views below

See answer to Question 39.

Consultation Question 41

We provisionally propose that use of flight data recorder systems or devices should be mandatory for autonomous drone operations. Do you agree?

Yes

Please expand on your answer below

Recording/ downloading to a secure cloud location automatically after each flight.

Consultation Question 42

Should the law permit a drone to transition between remotely piloted and autonomous flight during an operation?

Yes

Please expand on your answer below

For longer passenger carrying flights this will be essential but should only be authorised if the operator can evidence safe systems and technologies.

Consultation Question 43

We seek stakeholder views on any other issues with the current legal framework as it relates to operations involving autonomous drones.

Please share our views below

Sensor fit needs to be certificated for deployment on unsegregated airspace. Navigation systems should be intelligent enough to avoid congested areas.

Civil liability and insurance

Consultation Question 44

We provisionally consider that the current law governing air carrier liability for injury or death of passengers in the UK is adequate for the introduction of remotely piloted and autonomous operations. Do you agree?

Yes

Consultation Question 45

We provisionally consider that the current law governing liability for damage to cargo in the UK is adequate for the introduction of remotely piloted and autonomous operations. Do you agree?

Yes

Consultation Question 46

We provisionally propose that liability for surface damage, in the case of UAS, should transfer to the lessee when the lease:

(1) is for more than 14 days; and

(2) specifies the aircraft is to be operated under the responsibility of the lessee.

Do you agree?

Yes

Consultation Question 47

We provisionally propose 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. Do you agree?

Other

Please expand on your answer below

We are not sure why you are suggesting this modification.

Consultation Question 49

We seek views as to whether the current law regarding liability for mid-air collisions is satisfactory in the case of collisions involving uncrewed aircraft systems.

Please share your views below

Liability should lay with the remote pilot; the operator and the technology provider but to varying relative proportions depending on the degree of autonomy.

Consultation Question 50

We seek consultees' views on whether they expect any difficulties applying existing insurance requirements to uncrewed aircraft systems.

Please share your views below

The division of responsibility for negative occurrences is likely to be problematic eg if a mid air collision occurs because another aircraft was not detected, it will have to be decided whether the manufacturer or the operator was to blame (or the pilot if such was notionally in control but lacked sufficient traffic information).

Consultation Question 51

We provisionally propose that multiple simultaneous operations should be considered as the Government develops proposals for the insurance requirements applicable to uncrewed aircraft. Do you agree?

Other

Please expand on your answer below

We are not sure if this questions refer to a single operator; a single geography or a single remote pilot.

Criminal liability

Consultation Question 52

We provisionally consider that the current approach in the Air Navigation Order 2016 placing criminal liability on an operator is adequate for autonomous operations.

Do you agree?

No

Please expand on your answer below

The manufacturer must also considered (cf recent Boeing aircraft incidents).

Consultation Question 53

We provisionally consider that the “reasonable care” defence in article 265(3) of the Air Navigation Order 2016 applies adequately for “direct contraventions” under Article 265(5) to (8) involving autonomous operations. Do you agree?

Other

Please expand on your answer below

We are not sufficiently informed by the current law to comment.

Consultation Question 55

We provisionally propose that a remote pilot of an uncrewed aircraft operating in the certified category should be treated as a pilot-in-command for the purposes of criminal liability pursuant to article 265(1) of the Air Navigation Order 2016. Do you agree?

Yes

Consultation Question 56

We ask for consultees’ views on the criminal liability of pilots (or remote pilots) when an aircraft operating autonomously returns control to the pilot or vice-versa. In particular, should a pilot (or remote pilot) only become criminally liable for the piloting of the aircraft at the end of a transition period?

Please share your views below

Yes.

Consultation Question 57

We provisionally propose that the pilot-in-command of aircraft in a multiple simultaneous operation should be criminally liable for breach of operating requirements in the same way as a pilot in command of a single aircraft would be. Do you agree?

Yes

Consultation Question 59

We invite views on how operator responsibilities for dangerous goods might need to be adapted in light of autonomous operations.

Please share your views below

Loading and unloading possibilities in austere environments should be considered eg the unloading of potentially dangerous medicines in remote locations.

Consultation Question 60

We ask for consultees' views about whether the offence of hijacking in domestic law should be updated to:

1. include the unauthorised seizure or control of autonomous or remotely piloted aircraft by technological means or by persons not on board the aircraft; and
2. expand the period in which hijacking can occur from the period when an autonomous or remotely piloted aircraft is "in flight" to the period when it is "in service".

Please share your views below

We tentatively agree with both suggestions.

Consultation Question 61

We also ask consultees for views on whether any offences against the aircraft other than hijacking need to be updated to account for increased autonomy in aviation.

Please share your views below

You should consider the impact of malware on the potential to allow autonomous air vehicles to be used by malevolent powers as weapons to attack ground targets without the owners' or manufacturer's knowledge.

Impact

Consultation Question 63

We invite consultees to tell us if they have views on, or have experience or data to indicate, the likely costs and benefits of our provisional proposals in relation to drones.

Please share your views below

We are enthusiastic about the positive use of drones but worried about their negligent or malevolent use. We do not wish to see further erosion of uncontrolled airspace and hence we accept that drones will increasingly operate alongside crewed aircraft. As such, the emphasis should be on enabling uncrewed aircraft to detect and avoid crewed aircraft rather than obliging crewed aircraft to adopt expensive aids to conspicuity. Greater emphasis should be placed in law on the operators of uncrewed aircraft to 'see and avoid' than on crewed aircraft operators.

Consultation Question 64

We invite consultees to tell us if they believe or have evidence or data to suggest that any of our provisional proposals could result in advantages or disadvantages to certain groups or based on particular characteristics (with particular attention to age, disability, transgender identity, marriage and civil partnership, pregnancy and maternity, race, religion or belief, sex or gender, and sexual orientation).

Please share your views below

Accessibility to uncrewed passenger craft and the ability of operators to render assistance in flight should be addressed. There is potential for disability discrimination.

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(Law Commission Consultation Paper 261)

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About you

What is the name of your organisation?

Zipline International

Airworthiness and certification

Consultation Question 1

We seek views on how current airworthiness and certification regulation might need to be adapted or developed in light of highly automated and autonomous aircraft. In particular, should provisions be adopted which allow for:

1. the certification of optionally piloted and uncrewed or unoccupied versions of conventional aircraft (hybrid versions); and
2. the separate certification of command units?

Please share your views below

1. Airworthiness for UAS (Uncrewed Aircraft Systems) in particular can be demonstrated by declaration of compliance to a set of industry consensus standards that have been recognized by the CAA. This approach would be consistent with FAA's BVLOS Aviation Rulemaking Committee (ARC) recommendations, and Zipline believes this approach is appropriate given the overall risk of such operations and consistent with the risk mitigation strategy adopted by other civil aviation authorities. Verification of compliance to industry standards may be appropriate for aircraft that carry passengers under this framework, similar to the provisions for determining airworthiness of Light Sport Aircraft. In general, performance-based design verification approaches are preferable to traditional type certification processes because they can be tailored to the expected use cases and risk posed by the aircraft system.
2. No, a separate certification of command units shouldn't be required. Regulatory oversight of safety critical interfaces is likely sufficient. The OEM

and/or operator (as appropriate) should declare that the command unit has been tested to be compatible with the aircraft.

Consultation Question 3

We seek views on whether current regulatory tools to support the development of highly automated and autonomous aviation technologies are adequate.

Please share your views below

Being proactive about enabling advanced aviation will have a huge impact on society - from improving safety for countless industries, to reducing carbon emissions, to equalising access to healthcare. As a recent entrant to the UK market with our drone delivery service, Zipline sees the positive and proactive intention the UK Government has to enable advanced aviation in multiple different forms. However, the aviation industry is still at a very early stage in integrating automated and highly autonomous aircraft. Enabling this technology and all of the positive impacts to society it holds requires an iterative approach. Trying to answer every question at the start of the process may feel like the logical approach, but may instead hold back innovation. Questions can be answered progressively through a “crawl, walk, run” approach that will enable innovators and regulators to test and learn.

Autonomous operations in aviation is not happening in its true form yet. Whilst this consultation poses interesting questions, there is no true operational experience to draw from yet. It is therefore very difficult to accurately and appropriately forecast/preempt/estimate the need for further regulatory requirements and legal provisions.

Zipline has engaged with regulators and governments on how to incorporate drone delivery technology into the airspace for many years. We were one of the first manufacturer-operators in the world to have an approved, commercial drone delivery system when we started flying BVLOS in integrated airspace in Rwanda in 2016. We believe the UK has an opportunity to capitalise on the knowledge gained from global operations to fully realise the societal and economic benefits this technology presents.

Zipline believes the UK should adopt a flexible approach that aligns with the industry’s current needs and future evolution. While the drone industry remains quite nascent, many parts of the industry have moved beyond testing and sandboxing. Indeed, many operators are successfully and regularly operating Beyond Visual Line of Sight (BVLOS) in other jurisdictions, either applying the SORA or other rigorous, iterative, risk-based processes. As an example, Zipline alone makes 1000 deliveries a day through large scale BVLOS networks in integrated airspace.

Right now, the UK appears focused on enabling sandboxes to test new concepts, and looking at potential blockers that are far into the future, such as those covered by this Law Commission consultation. Zipline would encourage the UK to take an

iterative process that prioritises public/private partnership aimed at solving the current challenges around deploying highly automated operations. Zipline believes that this will ensure that resources are being invested to realise the benefits of these technologies, drive economic viability and ultimately nurture safe innovation within the aviation ecosystem.

We believe that existing regulation does not need to be a blocker to initial operations. At this point, we don't see the need for further regulatory development around autonomous or highly automated operations. As mentioned above, the largest hurdle is the lack of commitment to deployment of commercially viable BVLOS operations. The UK market remains appealing to operators like Zipline, equipped with technology which will progressively increase automation in an incremental way. However, practical and regulatory barriers that limit the deployment of BVLOS operations to segregated airspace and time limiting to a six month operational period are standing in the way of learning how highly automated operations can be introduced in the UK. This prevents industry and government from gaining further experience into the regulatory issues they may or may not present.

Rules of the air

Consultation Question 4

We seek views on how highly automated and autonomous aircraft should act in emergency scenarios. In particular:

1. should highly automated and autonomous aircraft be given the freedom to operate outside the rules of the air in emergency circumstances; or
2. should a comprehensive set of rules be developed for highly automated and autonomous aircraft in emergency situations.

Please share your views below

In a true emergency scenario, highly automated and autonomous aircraft should act in a manner to minimise risk.

1. Rules of the air may need to be adapted to safely integrate certain highly automated and autonomous aircraft into the airspace. These aircraft should be allowed to deviate from the rules of the air in the interest of safety. However, even if highly automated and autonomous aircraft are given the freedom to operate outside the rules of the air there must remain a high level of predictability and transparency in the rules of the air to ensure the safety of all airspace users.
2. No, Zipline does not believe that a comprehensive set of rules need to be developed for highly automated and autonomous aircraft in emergency situations.

Consultation Question 7

We ask for consultees' views on how the rules of the air might be adapted or developed for remotely piloted or autonomous flight

Please share your views below

All operators bear responsibility for collision avoidance. Zipline would recommend the Law Commission and UK Government refer to the FAA BVLOS Aviation Rulemaking Committee's (ARC) Report, published in March 2022 for a view on how the rules of the air might be adapted. The ARC proposes a move away from conspicuity and manoeuvrability as the only factors to consider for right of way, and instead, establish a risk-based approach that increases conspicuity requirements. The ARC recommended a change to the right of way rules to give uncrewed aircraft right of way over unequipped crewed aircraft in operating environments with minimal General Aviation activity.

Drones

Consultation Question 34

We provisionally propose that a remote pilot for drones should continue to be defined as "a natural person responsible for safely conducting the flight of an unmanned aircraft by operating its flight controls, either manually or, when the unmanned aircraft flies automatically, by monitoring its course and remaining able to intervene and change its course at any time". Do you agree?

No

Please expand on your answer below

Zipline does not agree with this definition. To the degree that a remote pilot is necessary to safely operate and/or monitor a specific unmanned aircraft system to intervene, then it is likely appropriate. However, Zipline believes this definition is too narrow and presumes a level of human intervention that may not be consistent with certain types of scaled operations. In many of these operations there may not be a natural person that acts in a remote pilot capacity as defined here.

Consultation Question 36

We provisionally propose that for autonomous operations in the specific category, a UAS 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 manned 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.

Do you agree? (tick all that you agree with)

Please expand on your answer below

Zipline has no objection regarding the proposed list of requirements (shifted from the remote pilot to the operator), although the requirement (2) must be explained further. As BVLOS and autonomous operations continue to become more common practice, a more balanced approach has to be developed on the responsibilities between manned and unmanned aviation, e.g. priorities, right of way.

Also, to ensure compliance, the government will have to provide some level of guidance on "how" they expect operators to comply with it. A close collaboration between government and industry should take place to develop this material.

Consultation Question 37

We seek views on what operational requirements should be applied to autonomous drone operations and drones that operate beyond visual line of sight in the specific and certified categories.

Please share your views below

Companies operating in the specific category and conducting BVLOS operations are committed to ensuring the highest standards of safety, efficiency, and compliance in their operations.

We believe that autonomous operations operating under the specific category could be under similar operational requirements, including:

- Safety and risk management: as for all operations in the specific category, comprehensive risk assessments should be conducted to identify and mitigate potential hazards, including evaluating the operational environment, potential obstacles, third-party risks, etc. This includes the implementation of safety protocols and adequate training to ensure a safe management of autonomous and BVLOS operations.

- Regulatory compliance: it is important to ensure that operations comply with the relevant national legal and regulatory framework. This includes establishing clear reporting protocols for operational data and incidents.
- Technological capabilities: UAS technology must include reliable communication systems and high level of redundancies for critical components, as well as undergo regular maintenance and continued improvements on both hardware and software components.
- Airspace integration: Safe, effective, and practical solutions must be developed to ensure that autonomous and BVLOS operations can be integrated into the civilian airspace. This requires a close collaboration between industry, government, and any other relevant stakeholders.
- Environmental considerations: Noise pollution and negative environmental impact of UAS operations should be mitigated through proportionate and adequate measures. Environmental benefits and potential positive offsets should also be considered.
- Public awareness, education and engagement: this would be a joint initiative for industry/operators and government. There is a need to engage with local communities on UAS operations to hear and be responsive to their perspectives, thus resulting in an improved social licence. Being transparent and open as to what, how, where and most importantly why BVLOS/autonomous operations are conducted is key.

Consultation Question 38

We seek views on whether the current concept of a “remote pilot” is compatible with drone MSO. We also seek views on whether the remote pilots of drone MSO should continue to be subject to the same responsibilities as remote pilots for single drone operations.

Please share your views below

We believe that autonomous operations operating under the specific category could be under similar operational requirements, including the MSO.

Consultation Question 39

We seek views on whether there should be an upper limit to the number of drones for which an individual remote pilot is responsible.

Please share your views below

No, there should not be an upper limit to the number of drones for which an individual remote pilot is responsible that is codified in regulation or law. Any upper limit should be risk- and performance-based. If the overall system is able to achieve the performance requirements and is considered safe, then there should be a regulatory path for the operation to be deemed acceptable.

Consultation Question 41

We provisionally propose that use of flight data recorder systems or devices should be mandatory for autonomous drone operations. Do you agree?

No

Please expand on your answer below

A requirement to use conventional flight data recorder devices for autonomous drone operations is unnecessarily prescriptive and does not improve safety or accident investigation outcomes. Any such requirement should be performance-based. For example, it is reasonable to require the operator to have a means to retrieve all applicable data after a flight is complete, including for flights that do not end as intended. This would provide flexibility for operators to use any combination of onboard and offboard systems (e.g. networked/cloud-based logging based on data transmitted from the drone throughout its flight). It is also reasonable to require operators to furnish this information to accident investigation authorities within a given time period.

Consultation Question 42

Should the law permit a drone to transition between remotely piloted and autonomous flight during an operation?

Yes

Please expand on your answer below

The operator should have the flexibility to transition between different flight modes, so long as the operator is able to demonstrate that those transitions can be conducted safely. For example, procedures and operational steps to make those transitions (e.g. from autonomous to remotely piloted, or the reverse) are documented in approved manuals and appropriate training is provided to applicable personnel.

Consultation Question 43

We seek stakeholder views on any other issues with the current legal framework as it relates to operations involving autonomous drones.

Please share our views below

The Law Commission is encouraged to review the FAA's forthcoming BVLOS Rulemaking, which is expected to include a proposal that all drone operators name an "accountable executive" for purposes of regulatory compliance and oversight. Naming this person ensures that a specific organisational representative can be held legally responsible in their professional capacity. However, this person should not be held personally liable, except in extreme cases where there is evidence of gross personal negligence. In general, the organisation should be held liable, not specific people who may be monitoring or supervising each flight.

Civil liability and insurance

Consultation Question 49

We seek views as to whether the current law regarding liability for mid-air collisions is satisfactory in the case of collisions involving uncrewed aircraft systems.

Please share your views below

We agree with the Law Commission's analysis that the law in this area is sufficient and does not need reforming.

Consultation Question 50

We seek consultees' views on whether they expect any difficulties applying existing insurance requirements to uncrewed aircraft systems.

Please share your views below

We do not currently have any difficulties applying existing insurance requirements for uncrewed aircraft systems in the UK but this position might change as demand and complexity will rapidly evolve.

Consultation Question 51

We provisionally propose that multiple simultaneous operations should be considered as the Government develops proposals for the insurance requirements applicable to uncrewed aircraft. Do you agree?

Other

Please expand on your answer below

Zipline agrees that insurance can play a critical role in this ecosystem. In the consultation, the Law Commission notes that the UK Government has suggested developing proposals for insurance requirements applicable to uncrewed aircraft. We suggest that insurance requirements be linked to the risk of an operation and thus be performance based, as recommended for regulation. More drones per operator does not necessarily equal more risk. If automation minimises the chance of human error, one pilot controlling 20 drones may actually produce a lower risk operation than one pilot controlling one drone within line of sight. We recommend the UK Government consider the risk of an operation and the performance of the systems involved when developing insurance requirements, rather than the novel nature of multiple simultaneous operations.

Criminal liability

Consultation Question 52

We provisionally consider that the current approach in the Air Navigation Order 2016 placing criminal liability on an operator is adequate for autonomous operations.

Do you agree?

Yes

Please expand on your answer below

Yes, we agree with the Law Commission's provisional assessment.

Consultation Question 53

We provisionally consider that the "reasonable care" defence in article 265(3) of the Air Navigation Order 2016 applies adequately for "direct contraventions" under Article 265(5) to (8) involving autonomous operations. Do you agree?

Yes

Please expand on your answer below

Yes, we agree with the Law Commission's suggestion.

Consultation Question 54

We seek views on whether for autonomous operations the reasonable care defence should be applicable to the vicarious liability created in article 265(1) of the ANO.

Please share your views below

Yes, we agree with the Law Commission's suggestion.

Consultation Question 59

We invite views on how operator responsibilities for dangerous goods might need to be adapted in light of autonomous operations.

Please share your views below

The UK is still at an early stage in regulating UAS/RPAS carriage of dangerous goods (DG), regardless of the level of automation. This includes assessing and better understanding the level of risk of BVLOS and highly automated operations - and a posteriori the operators' (and others) responsibilities. It is therefore difficult to answer this question for now. But overall, we believe that the operator's responsibilities for DG will largely remain the same for autonomous operations since what the operator is responsible for while conducting BVLOS/highly automated operations should still be applicable to autonomous operations. There could be some aspects of the operations such as emergency procedures that might have to be reviewed but there should not be drastic changes.

RESPONSE TO LAW COMMISSION CONSULTATION ON AVIATION AUTONOMY

(Law Commission Consultation Paper 261)

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About you

What is your name?

Rules of the air

Consultation Question 4

We seek views on how highly automated and autonomous aircraft should act in emergency scenarios. In particular:

1. should highly automated and autonomous aircraft be given the freedom to operate outside the rules of the air in emergency circumstances; or
2. should a comprehensive set of rules be developed for highly automated and autonomous aircraft in emergency situations.

Please share your views below

Option 2.

Consultation Question 5

We seek consultee views about what challenges remotely piloting an aircraft in an emergency scenario presents and how these might be addressed

Please share your views below

In an emergency situation, human factors come into play. In particular when operating under time pressure a remote pilot is more likely to take risks that they otherwise would normally avoid.

Any flight poses both ground and air risk and the UAS Implementing Regulation is in place to establish firm boundaries on what is considered safe limits. We have already seen a significant number of operators taking risks under commercial pressure, time sensitive pressure or under emergency circumstances that have lead to a high number of incidents with human factors being the most common root cause.

VTOLs

Consultation Question 8

We provisionally propose that a person overseeing a VTOL flying automatically, who monitors its course and is able to intervene and change its course at any time should continue to be classified as a “remote pilot”. Do you agree?

Yes

Consultation Question 9

We provisionally propose 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. Do you agree?

Yes

Consultation Question 10

We provisionally propose 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.

Do you agree? (Tick all that you agree with)

Consultation Question 11

We invite views as to whether there are additional operational responsibilities that a remote VTOL pilot should be required to fulfil.

Please share your views below

A remote VTOL pilot should have a minimum level of competence in line with those held by crewed aviation pilots.

Consultation Question 12

We provisionally propose that the remote pilot-in-command should be responsible for, amongst other things, ensuring passengers are:

1. given a safety briefing; and
2. seated and wear seat belts during take-off and landing

Do you agree?

Yes

Consultation Question 13

We provisionally propose that air operators (rather than the remote pilot-in-command) should be responsible for preventing passengers from boarding:

1. who appear drunk or under the influence of drugs; or
2. whose carriage would, in the view of the operator's employees, endanger the safety of the aircraft or other passengers.

Do you agree?

Yes

Consultation Question 14

We provisionally propose that the remote pilot-in-command should have the power to take reasonable measures, including restraint of passengers, as set out in section 94 of the Civil Aviation Act 1982. Do you agree?

Yes

Consultation Question 15

We provisionally propose that a person on board a VTOL aircraft (other than a crew member) should be able to take reasonable measures to protect the safety of the aircraft or of persons or property on board. Do you agree?

Yes

Consultation Question 16

We seek views on whether the powers of crew on board a VTOL aircraft should be broadened to reflect those of the pilot-in-command under the Civil Aviation Act 1982 to:

1. take reasonable measures to protect the safety of the aircraft or persons or property on board;
2. maintain good order and discipline; or
3. enable the crew to disembark or deliver a person.

Please share your views below

Yes.

Consultation Question 17

We provisionally propose that passengers should be able to contact a member of crew at all times during an operation. Do you agree?

Yes

Consultation Question 18

We provisionally propose 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. Do you agree?

Yes

Consultation Question 19

We provisionally propose that it should be a criminal offence for a person to act as the remote pilot of a VTOL when the level of alcohol in their blood, breath or urine is over a prescribed limit. Do you agree?

Yes

Consultation Question 20

We provisionally propose that the remote pilot should be subject to the reporting obligations currently applicable to pilots under the Air Operations Regulation. Do you agree?

Yes

Consultation Question 21

We provisionally propose that a remotely piloted VTOL should be required to be capable of detecting and recording information relating to accidents and near accidents for the purposes of reporting it. Do you agree?

Yes

Consultation Question 22

We provisionally propose that licences should be required for remote VTOL pilots. So far as appropriate, these should follow the classes and ratings adopted for crewed VTOLs. Do you agree?

Yes

Consultation Question 23

We provisionally propose that operators of remotely piloted VTOL should be certified. Do you agree?

Yes

Please expand on your answer below

..... and robustly assessed. They must have a strong aviation track record.

Consultation Question 24

We provisionally propose that operators of remotely piloted VTOLs should continue to be required to:

- ☒ (1) have the means necessary for the scale and scope of operations planned;
- ☒ (2) use only suitably qualified and trained personnel;
- ☒ (3) implement a management system to ensure safety;
- ☒ (4) ensure operations only take place in accordance with the operations manual;
- ☒ (5) establish procedures to minimise the consequences to safe flight operations of disruptive passenger behaviour;
- ☒ (6) develop and maintain security programmes suitable for the aircraft and type of operation;
- ☒ (7) have a management system to prevent fatigue.
- ☒ (8) ensure the continuing airworthiness of the aircraft; and.
- ☒ (9) establish procedures for any reasonably foreseeable emergency situation.

Do you agree? (tick all that you agree with)

Consultation Question 26

We seek views as to whether the law should permit remote pilots to act as pilot-in-command for more than one VTOL at the same time.

Please share your views below

No, the risks of piloting multiple aircraft increase exponentially, a pilot should have their sole focus on a single aircraft at any time.

Consultation Question 27

We seek views as to whether there should be an upper limit to the number of VTOLs for which a remote pilot can act as pilot-in-command at the same time.

Please share your views below

Yes. One, for the above reasons.

Consultation Question 30

Should the law permit an uncrewed VTOL to transition between remotely piloted and autonomous flight during an operation?

Yes

Drones

Consultation Question 34

We provisionally propose that a remote pilot for drones should continue to be defined as “a natural person responsible for safely conducting the flight of an unmanned aircraft by operating its flight controls, either manually or, when the unmanned aircraft flies automatically, by monitoring its course and remaining able to intervene and change its course at any time”. Do you agree?

Yes

Consultation Question 35

We seek views on whether some low risk autonomous drone operations or drone operations conducted beyond visual line of sight might be accommodated in the open category. In particular:

- (1) whether there are any such use cases which might be suitable for the open category; and
- (2) if so, what conditions should be attached to these use cases if operated in the open category.

Please share your views below

The air and ground risk of BVLOS operations are too high a risk to be conducted safely within the Open Category. The Open Category is too open to misuse and misunderstanding and is already under regulated.

Any increase in risk means that an operation should always remain within the Specific Category.

Consultation Question 36

We provisionally propose that for autonomous operations in the specific category, a UAS 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 manned 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.

Do you agree? (tick all that you agree with)

Consultation Question 37

We seek views on what operational requirements should be applied to autonomous drone operations and drones that operate beyond visual line of sight in the specific and certified categories.

Please share your views below

The aircraft must have a robust Detect and Avoid system as capable as a human pilot as well as full Electronic Conspicuity measures, both for allowing other air users to be aware of the autonomous aircraft and for the RP to be aware of other air users.

Consultation Question 38

We seek views on whether the current concept of a "remote pilot" is compatible with drone MSO. We also seek views on whether the remote pilots of drone MSO should continue to be subject to the same responsibilities as remote pilots for single drone operations.

Please share your views below

Yes.

Consultation Question 39

We seek views on whether there should be an upper limit to the number of drones for which an individual remote pilot is responsible.

Please share your views below

Yes. A single remote pilot must remain in charge of a single aircraft unless a specific safety case is in place to mitigate the risk.

Consultation Question 40

We seek views as to what additional safeguards should be introduced for remote pilots responsible for multiple drones.

Please share your views below

Multiple drones must be geocaged sufficiently and operated over a sterile ground area with robust use of risk buffer zones to mitigate the ground risk to uninvolved persons.

Consultation Question 41

We provisionally propose that use of flight data recorder systems or devices should be mandatory for autonomous drone operations. Do you agree?

Yes

Consultation Question 42

Should the law permit a drone to transition between remotely piloted and autonomous flight during an operation?

Yes

Consultation Question 43

We seek stakeholder views on any other issues with the current legal framework as it relates to operations involving autonomous drones.

Please share our views below

The use of autonomous drones should only be conducted within the Specific Category, accompanied by a sufficiently robust safety case for assessment. The use of AI and autonomy brings multiple additional risks.

RESPONSE TO LAW COMMISSION CONSULTATION ON AVIATION AUTONOMY

(Law Commission Consultation Paper 261)

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About you

What is your name?

Airworthiness and certification

Consultation Question 1

We seek views on how current airworthiness and certification regulation might need to be adapted or developed in light of highly automated and autonomous aircraft. In particular, should provisions be adopted which allow for:

1. the certification of optionally piloted and uncrewed or unoccupied versions of conventional aircraft (hybrid versions); and
2. the separate certification of command units?

Please share your views below

Nothing should be mandated that would financially or impact existing technology piloted air vehicles. Whilst the financial argument impact to existing air vehicles is obvious. The equipage of any additional requirements to the "existing fleet" might not be technically feasible or desirable for many reasons. e.g. integration, space, weight, usability etc

The burden of change should be borne by the new entrants / users.

Consultation Question 2

We welcome views on what changes to the certification system might be necessary to enable higher automation and autonomy in aviation.

Please share your views below

The use of EC equipment is both increasingly encouraged and accepted by piloted air vehicles.

Especially at the more cost sensitive levels of the industry (GA, lighter air vehicle types etc.) the word certification is synonymous with unbounded, disproportionate costs and / or technical requirements. Sadly this is a fact borne of much history.

This is an essential consideration when considering the effects of change on the existing airspace users and air vehicle fleets

Consultation Question 3

We seek views on whether current regulatory tools to support the development of highly automated and autonomous aviation technologies are adequate.

Please share your views below

Unable to comment really.

However accepted popular opinion and evidence of the existing user base (air vehicles and pilots) is that "industry" supplied products and technology (together with acceptance and implementation) is somewhat ahead of the regulators.

Rules of the air

Consultation Question 4

We seek views on how highly automated and autonomous aircraft should act in emergency scenarios. In particular:

1. should highly automated and autonomous aircraft be given the freedom to operate outside the rules of the air in emergency circumstances; or
2. should a comprehensive set of rules be developed for highly automated and autonomous aircraft in emergency situations.

Please share your views below

Autonomous air vehicles should conform to at least the same safety requirements as other airspace users when using shared / common airspace. In other words they should do nothing in their action that could endanger other air vehicles, especially air vehicles occupied by people, pilots, crew or passengers.

Literally in answer to 1. - Yes. Manned vehicles are specially enabled to so.

In principle I do see how 2. could be even be contemplated when considering and accepting the premise.

Consultation Question 5

We seek consultee views about what challenges remotely piloting an aircraft in an emergency scenario presents and how these might be addressed

Please share your views below

Difficult to answer specifically as emergencies, by their very nature, are unpredictable.

However broad headings include:

- Safety for the air vehicle and occupants
- Safety for others both airborne and on the ground
- Security from illegal interference exploiting and misusing the technology
- Skill and training of the remote "pilot" / operator

Consultation Question 6

We seek consultees' views on whether the rules of the air relating to communication should be adapted for remotely piloted and autonomous aircraft.

Please share your views below

Any "adaption" should not cause or require any changes to those required of manned air vehicles.

There are far too many varieties of special requirements and procedures already. To add more only invites error, which of course increases danger.

Put more simply, if I'm a pilot and I see another aircraft, I want (need?!) to be able to communicate about it, or on occasions directly with it (ie its operator), as I would with any other aircraft. In such circumstances there's no time for differing procedures.

Consultation Question 7

We ask for consultees' views on how the rules of the air might be adapted or developed for remotely piloted or autonomous flight

Please share your views below

In short, minimally! See previous responses.

VTOLs

Consultation Question 8

We provisionally propose that a person overseeing a VTOL flying automatically, who monitors its course and is able to intervene and change its course at any time should continue to be classified as a “remote pilot”. Do you agree?

Yes

Please expand on your answer below

What else can they be considered as?

Consultation Question 9

We provisionally propose 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. Do you agree?

Yes

Please expand on your answer below

What else are they?

Consultation Question 10

We provisionally propose 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.

Do you agree? (Tick all that you agree with)

Please expand on your answer below

As before. They have the same responsibilities as any other aircraft "commander".

Consultation Question 11

We invite views as to whether there are additional operational responsibilities that a remote VTOL pilot should be required to fulfil.

Please share your views below

Over my answer to Q10. Not qualified to comment on specificities.

Consultation Question 12

We provisionally propose that the remote pilot-in-command should be responsible for, amongst other things, ensuring passengers are:

1. given a safety briefing; and
2. seated and wear seat belts during take-off and landing

Do you agree?

Yes

Please expand on your answer below

See Q.10

Consultation Question 13

We provisionally propose that air operators (rather than the remote pilot-in-command) should be responsible for preventing passengers from boarding:

1. who appear drunk or under the influence of drugs; or
2. whose carriage would, in the view of the operator's employees, endanger the safety of the aircraft or other passengers.

Do you agree?

Yes

Please expand on your answer below

See Q.10

Consultation Question 14

We provisionally propose that the remote pilot-in-command should have the power to take reasonable measures, including restraint of passengers, as set out in section 94 of the Civil Aviation Act 1982. Do you agree?

Yes

Please expand on your answer below

See Q.10

Consultation Question 15

We provisionally propose that a person on board a VTOL aircraft (other than a crew member) should be able to take reasonable measures to protect the safety of the aircraft or of persons or property on board. Do you agree?

Other

Please expand on your answer below

Good question!

Most persons on board are perhaps unlikely to have the specialist knowledge required or situational awareness required to make a considered / appropriate.

However, in manned aviation there are many recorded occasions where 'non-pilots' have successfully intervened in the case of single pilot operations incapacitation.

Put another way: In many cases they are likely to make things worse, in others they could perhaps save the day!

Good luck Damocles...

Consultation Question 16

We seek views on whether the powers of crew on board a VTOL aircraft should be broadened to reflect those of the pilot-in-command under the Civil Aviation Act 1982 to:

1. take reasonable measures to protect the safety of the aircraft or persons or property on board;
2. maintain good order and discipline; or
3. enable the crew to disembark or deliver a person.

Please share your views below

Yes.

My view is that (non-pilot) crew should have the same powers and responsibilities as cabin crew under the existing regulations. After all their "pilot" is simply whoever has legal responsibility for the air vehicle at that time.

Caveat: There is difference between public transport / CAT and other operational types. eg SPO, NCO, NON-NCO, private etc. Note: Only the former have "cabin crew".

Consultation Question 17

We provisionally propose that passengers should be able to contact a member of crew at all times during an operation. Do you agree?

Yes

Please expand on your answer below

Definitely!

They're on board, they see things!

Consultation Question 18

We provisionally propose 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. Do you agree?

Yes

Please expand on your answer below

Does this question really need to be asked?

Consultation Question 19

We provisionally propose that it should be a criminal offence for a person to act as the remote pilot of a VTOL when the level of alcohol in their blood, breath or urine is over a prescribed limit. Do you agree?

Yes

Please expand on your answer below

See above.

Consultation Question 20

We provisionally propose that the remote pilot should be subject to the reporting obligations currently applicable to pilots under the Air Operations Regulation. Do you agree?

Yes

Please expand on your answer below

See Q.10

Consultation Question 21

We provisionally propose that a remotely piloted VTOL should be required to be capable of detecting and recording information relating to accidents and near accidents for the purposes of reporting it. Do you agree?

Yes

Please expand on your answer below

Once again. I see no reason why the requirements on this should be different to any other air vehicle engaged in or operated for, similar purposes.

Consultation Question 22

We provisionally propose that licences should be required for remote VTOL pilots. So far as appropriate, these should follow the classes and ratings adopted for crewed VTOLs. Do you agree?

Yes

Please expand on your answer below

In principle yes.

However there may environmental differences, for instance in a crewed air vehicle the pilot is likely to have some physiological cues in the case of a power unit failure, which a remote pilot cannot have.

Consultation Question 23

We provisionally propose that operators of remotely piloted VTOL should be certified.
Do you agree?

Yes

Please expand on your answer below

The certifications should match those of other types of air vehicles being used for similar purposes.

Consultation Question 24

We provisionally propose that operators of remotely piloted VTOLs should continue to be required to:

- ☒ (1) have the means necessary for the scale and scope of operations planned;
- ☒ (2) use only suitably qualified and trained personnel;
- ☒ (3) implement a management system to ensure safety;
- ☒ (4) ensure operations only take place in accordance with the operations manual;
- ☒ (5) establish procedures to minimise the consequences to safe flight operations of disruptive passenger behaviour;
- ☒ (6) develop and maintain security programmes suitable for the aircraft and type of operation;
- ☒ (7) have a management system to prevent fatigue.
- ☒ (8) ensure the continuing airworthiness of the aircraft; and.
- ☒ (9) establish procedures for any reasonably foreseeable emergency situation.

Do you agree? (tick all that you agree with)

Please expand on your answer below

Why should they be different to any other vehicle type being used for comparable operations?

Consultation Question 25

We seek views as to whether there are additional responsibilities that operators of remotely piloted VTOLs should need to fulfil.

Please share your views below

Unknown / not qualified to comment.

Consultation Question 26

We seek views as to whether the law should permit remote pilots to act as pilot-in-command for more than one VTOL at the same time.

Please share your views below

Perhaps if an air vehicle has more than a single PIC for different phases of the flight. eg Departure, Cruise and Arrival phases.

In the departure and arrival phases, no.

In the cruise phase there might be an argument for allowing a PIC to operate / monitor more than one provided there is an adequate number of stand-by remote pilots to enable the work load to be split in the case of emergencies (ground and airborne!) etc.

How many they may operate at any one time is another question altogether of course.

Consultation Question 27

We seek views as to whether there should be an upper limit to the number of VTOLs for which a remote pilot can act as pilot-in-command at the same time.

Please share your views below

See above.

Consultation Question 28

We seek views as to what additional safeguards should be introduced for remote pilots piloting multiple VTOLs.

Please share your views below

See above.

Consultation Question 29

We seek views as to whether there should be a role for a person supervising the flight of an autonomous passenger-carrying VTOL and acting as a point of contact in relation to it. What powers or responsibilities should such a person have?

Please share your views below

There is a party that is the legal "commander" somewhere in the entire process.

If there nobody else involved in the flight then it is the person spoken of here, accordingly they have the responsibilities of the Commander.

Consultation Question 30

Should the law permit an uncrewed VTOL to transition between remotely piloted and autonomous flight during an operation?

Yes

Please expand on your answer below

Subject to appropriate and suitable certification and operational control processes of course.

Consultation Question 31

We seek views as to whether initial airworthiness standards for uncrewed VTOLs should include accessibility standards for persons with disabilities and reduced mobility.

Please share your views below

Another good question.

Given many of the types being proposed and portrayed in the press etc., such a requirement might make the entire concept unviable.

Perhaps a suitable parallel regards the moral / legal requirement to provide such a facility in publicly accessible transport can be found in the taxi vs private hire car vs Uber arena.

Consultation Question 32

We seek views as to whether the CAA should be able to include accessibility standards within the licences granted to uncrewed VTOL operators.

Please expand on your answer below

Depends on the answers and decisions to the above.

Consultation Question 33

We seek consultees' views on any other issues with the current legal framework as it relates to operations involving autonomous VTOLs.

Please share your views below

Don't feel qualified to comment.

Drones

Consultation Question 34

We provisionally propose that a remote pilot for drones should continue to be defined as "a natural person responsible for safely conducting the flight of an unmanned aircraft by operating its flight controls, either manually or, when the unmanned aircraft flies automatically, by monitoring its course and remaining able to intervene and change its course at any time". Do you agree?

Yes

Please expand on your answer below

What is the alternative?

Consultation Question 35

We seek views on whether some low risk autonomous drone operations or drone operations conducted beyond visual line of sight might be accommodated in the open category. In particular:

- (1) whether there are any such use cases which might be suitable for the open category; and
- (2) if so, what conditions should be attached to these use cases if operated in the open category.

Please share your views below

Not qualified to comment.

Consultation Question 36

We provisionally propose that for autonomous operations in the specific category, a UAS 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 manned 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.

Do you agree? (tick all that you agree with)

Please expand on your answer below

Seems a sensible set of requirements to me.

Consultation Question 41

We provisionally propose that use of flight data recorder systems or devices should be mandatory for autonomous drone operations. Do you agree?

Yes

Please expand on your answer below

There should be a way measuring and recording deviations from required performance, especially regarding safety. (e.g. Collision risk, Minimum heights / separation distances, airspace infringements etc.)

Consultation Question 42

Should the law permit a drone to transition between remotely piloted and autonomous flight during an operation?

Yes

Please expand on your answer below

Provided there are appropriate certification and operational constraints.

Civil liability and insurance

Consultation Question 44

We provisionally consider that the current law governing air carrier liability for injury or death of passengers in the UK is adequate for the introduction of remotely piloted and autonomous operations. Do you agree?

Yes

Consultation Question 45

We provisionally consider that the current law governing liability for damage to cargo in the UK is adequate for the introduction of remotely piloted and autonomous operations. Do you agree?

Yes

Consultation Question 46

We provisionally propose that liability for surface damage, in the case of UAS, should transfer to the lessee when the lease:

- (1) is for more than 14 days; and
- (2) specifies the aircraft is to be operated under the responsibility of the lessee.

Do you agree?

Other

Please expand on your answer below

Don't feel qualified to comment.

Additionally, 14 days feels / sounds arbitrary.

Consultation Question 47

We provisionally propose 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. Do you agree?

Yes

Consultation Question 48

We provisionally propose that there should be a review product liability law (including the Consumer Protection Act 1987) to take account of the challenges of emerging technologies. The review should cover product liability as a whole, rather than be confined to aviation or automated vehicles. Do you agree?

Yes

Please expand on your answer below

I agree entirely. There are many potential sources of interest here in addition to land, sea and air vehicles.

Consultation Question 49

We seek views as to whether the current law regarding liability for mid-air collisions is satisfactory in the case of collisions involving uncrewed aircraft systems.

Please share your views below

As always, responsibility for "the law" regards aviation always seems to fall upon the aircraft Commander Accepting that this individual might / is likely to be an employee of an organisation.

In the UAS case there will always be an equivalent somewhere in the process. Wherever / whoever that is, is where the liability should be placed.

Criminal liability

Consultation Question 52

We provisionally consider that the current approach in the Air Navigation Order 2016 placing criminal liability on an operator is adequate for autonomous operations.

Do you agree?

Yes

Please expand on your answer below

I don't see the need to create any variance from this principal.

Consultation Question 53

We provisionally consider that the "reasonable care" defence in article 265(3) of the Air Navigation Order 2016 applies adequately for "direct contraventions" under Article 265(5) to (8) involving autonomous operations. Do you agree?

Yes

Please expand on your answer below

As above.

Consultation Question 55

We provisionally propose that a remote pilot of an uncrewed aircraft operating in the certified category should be treated as a pilot-in-command for the purposes of criminal liability pursuant to article 265(1) of the Air Navigation Order 2016. Do you agree?

Yes

Please expand on your answer below

How can they be anything else?

Consultation Question 56

We ask for consultees' views on the criminal liability of pilots (or remote pilots) when an aircraft operating autonomously returns control to the pilot or vice-versa. In particular, should a pilot (or remote pilot) only become criminally liable for the piloting of the aircraft at the end of a transition period?

Please share your views below

Another one for Damocles! However, here goes:

If the autonomous vehicle 'drops' control back to an on-board pilot, then responsibility rests with the pilot. My thinking being it is little to no different to an auto-pilot in a conventional aircraft dropping out because the aircraft has gone beyond its certified capabilities. I.E. Lack of monitoring by the crew.

In the remote piloted case, things might be different. However, autonomous or not, the overall flight should be monitored by the operator whatever level of automation is engaged at any moment. Where else can the responsibility lie?

Consultation Question 57

We provisionally propose that the pilot-in-command of aircraft in a multiple simultaneous operation should be criminally liable for breach of operating requirements in the same way as a pilot in command of a single aircraft would be. Do you agree?

Yes

Please expand on your answer below

If they're PIC, they're "in command".

The root cause for any issue might be a systemic or specific one, in which case then multiple simultaneous operations should not be approved in these circumstances.

Consultation Question 59

We invite views on how operator responsibilities for dangerous goods might need to be adapted in light of autonomous operations.

Please share your views below

I see two risks here, threat to occupants and property on-board and threat to occupants and property on the ground.

In the former, for cargo only operations there might be scope for some alleviations. For risks to persons on board and persons and property on the ground there should be no alleviations.

Consultation Question 60

We ask for consultees' views about whether the offence of hijacking in domestic law should be updated to:

1. include the unauthorised seizure or control of autonomous or remotely piloted aircraft by technological means or by persons not on board the aircraft; and
2. expand the period in which hijacking can occur from the period when an autonomous or remotely piloted aircraft is "in flight" to the period when it is "in service".

Please share your views below

Agree completely.

Impact

Consultation Question 62

We invite consultees to tell us if they have views on, or have experience or data to indicate, the likely costs and benefits of our provisional proposals in relation to VTOLs.

Please share your views below

Not qualified to comment.

Clearly all regulation needs to be minded of cost, however the potential size, especially financially, of this sector is likely to be large. Any argument regards the costs for compliance needs to be bear this in mind.

Consultation Question 64

We invite consultees to tell us if they believe or have evidence or data to suggest that any of our provisional proposals could result in advantages or disadvantages to certain groups or based on particular characteristics (with particular attention to age, disability, transgender identity, marriage and civil partnership, pregnancy and maternity, race, religion or belief, sex or gender, and sexual orientation).

Please share your views below

None foreseen by this respondent at this time.

RESPONSE TO LAW COMMISSION CONSULTATION ON AVIATION AUTONOMY

(Law Commission Consultation Paper 261)

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About you

What is your name?

Rules of the air

Consultation Question 4

We seek views on how highly automated and autonomous aircraft should act in emergency scenarios. In particular:

1. should highly automated and autonomous aircraft be given the freedom to operate outside the rules of the air in emergency circumstances; or
2. should a comprehensive set of rules be developed for highly automated and autonomous aircraft in emergency situations.

Please share your views below

We consider that State declared aircraft should maintain their current status and exemptions from the Basic Regulation.

VTOLs

Consultation Question 8

We provisionally propose that a person overseeing a VTOL flying automatically, who monitors its course and is able to intervene and change its course at any time should continue to be classified as a “remote pilot”. Do you agree?

Other

Please expand on your answer below

The LC Consultation adopts the definition of VTOL used by the CAA's recent policy statement on type certification of VTOL. That definition is:

a heavier-than-air aircraft, other than an aeroplane or helicopter, capable of performing vertical procedures by means of more than two lift/ thrust units and certified for one or more occupants.

The definition of VTOL does not appear to necessitate that the pilot be remote. A VTOL could have a pilot on board, whilst the aircraft is "flying automatically".

Therefore, providing the pilot is not physically on board the VTOL, then yes, as long as the individual has the ability to intervene and be responsible for the safe operation of the VTOL then they should be considered as a 'remote pilot'.

Consultation Question 9

We provisionally propose 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. Do you agree?

Yes

Please expand on your answer below

Yes, Commercial Air Transport (defined as "CAT" in this Consultation response) operations of remotely operated VTOLs should be subject to the equivalent level of responsibility of piloted CAT operations. It will be necessary to ensure that the means of compliance with the responsibilities reflect that capability of the VTOL systems and the information available to the remote pilot.

Consultation Question 10

We provisionally propose 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.

Do you agree? (Tick all that you agree with)

Please expand on your answer below

Yes, it is essential to ensure that VTOL operations are managed and controlled in accordance with equivalent CAT regulations. Accordingly, the responsibility of items 1-5 in this question must be allocated to the most appropriate and responsible person – in this case, the remote pilot. Through the use of appropriate technology, remote pilots will be capable of validating/ monitoring items 1-5 remotely while maintaining a manageable workload.

Consultation Question 12

We provisionally propose that the remote pilot-in-command should be responsible for, amongst other things, ensuring passengers are:

1. given a safety briefing; and
2. seated and wear seat belts during take-off and landing

Do you agree?

Yes

Please expand on your answer below

See response to Question 10 of this Consultation.

Consultation Question 13

We provisionally propose that air operators (rather than the remote pilot-in-command) should be responsible for preventing passengers from boarding:

5. who appear drunk or under the influence of drugs; or
6. whose carriage would, in the view of the operator's employees, endanger the safety of the aircraft or other passengers.

Do you agree?

Other

Please expand on your answer below

Operators should ensure that they have processes in place to ensure that their passengers are 'fit-to-fly'. This could be assured by either ground personnel or remote monitoring capability at the departure point. However, it would be

appropriate for the remote PIC to maintain the ability to deny boarding if circumstances justify.

Consultation Question 15

We provisionally propose that a person on board a VTOL aircraft (other than a crew member) should be able to take reasonable measures to protect the safety of the aircraft or of persons or property on board. Do you agree?

Other

Please expand on your answer below

We provisionally consider that this point may require further clarification as there may be circumstances where such 'reasonable measures' could, by an individual without aviation knowledge & experience, actually endanger the safety of a remotely piloted VTOL.

Consultation Question 16

We seek views on whether the powers of crew on board a VTOL aircraft should be broadened to reflect those of the pilot-in-command under the Civil Aviation Act 1982 to:

1. take reasonable measures to protect the safety of the aircraft or persons or property on board;
2. maintain good order and discipline; or
3. enable the crew to disembark or deliver a person.

Please share your views below

We provisionally consider that the powers of crew on board a VTOL aircraft should be broadened to reflect those of the pilot-in-command under the Civil Aviation Act 1982. However, it would be necessary to ensure that such responsibilities do not degrade those of the designated pilot-in-command. Consequently, it may be more appropriate for PIC responsibilities to be specifically delegated to the crew on board when appropriate or when communications are limited.

Consultation Question 17

We provisionally propose that passengers should be able to contact a member of crew at all times during an operation. Do you agree?

Yes

Please expand on your answer below

We provisionally agree.

Consultation Question 18

We provisionally propose 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. Do you agree?

Yes

Please expand on your answer below

We provisionally agree, as per CAT rules for pilot-in-command.

Consultation Question 19

We provisionally propose that it should be a criminal offence for a person to act as the remote pilot of a VTOL when the level of alcohol in their blood, breath or urine is over a prescribed limit. Do you agree?

Yes

Please expand on your answer below

We provisionally agree, as per CAT rules for pilot-in-command.

Consultation Question 20

We provisionally propose that the remote pilot should be subject to the reporting obligations currently applicable to pilots under the Air Operations Regulation. Do you agree?

Yes

Please expand on your answer below

We provisionally agree.

Consultation Question 21

We provisionally propose that a remotely piloted VTOL should be required to be capable of detecting and recording information relating to accidents and near accidents for the purposes of reporting it. Do you agree?

Yes

Please expand on your answer below

We provisionally agree.

Consultation Question 22

We provisionally propose that licences should be required for remote VTOL pilots. So far as appropriate, these should follow the classes and ratings adopted for crewed VTOLs. Do you agree?

Yes

Please expand on your answer below

We provisionally agree, subject to consideration being given to the level of experience and entry requirements for licensing.

Consultation Question 23

We provisionally propose that operators of remotely piloted VTOL should be certified. Do you agree?

Yes

Please expand on your answer below

We provisionally agree. Operators of remotely piloted VTOL aircraft should be certified as a CAT operator with equivalent certification requirements.

Consultation Question 24

We provisionally propose that operators of remotely piloted VTOLs should continue to be required to:

- ☒ (1) have the means necessary for the scale and scope of operations planned;
- ☒ (2) use only suitably qualified and trained personnel;
- ☒ (3) implement a management system to ensure safety;
- ☒ (4) ensure operations only take place in accordance with the operations manual;
- ☐ (5) establish procedures to minimise the consequences to safe flight operations of disruptive passenger behaviour;

- ☒ (6) develop and maintain security programmes suitable for the aircraft and type of operation;
- ☒ (7) have a management system to prevent fatigue.
- ☒ (8) ensure the continuing airworthiness of the aircraft; and.
- ☒ (9) establish procedures for any reasonably foreseeable emergency situation.

Do you agree? (tick all that you agree with)

Please expand on your answer below

We provisionally agree, it is essential that such operations and governed in the same way a CAT AOC operations. Operators need to ensure that they have the management systems in place to assure safe and compliant operations.

Consultation Question 26

We seek views as to whether the law should permit remote pilots to act as pilot-in-command for more than one VTOL at the same time.

Please share your views below

We provisionally consider that, with the correct level of monitoring and capability assessment, it may be possible for more than one VTOL to be operated by a single pilot. Consideration should be given to the type of operation, the complexity of the VTOL, the complexity of the airspace environment, and the competence of the pilot.

Consultation Question 27

We seek views as to whether there should be an upper limit to the number of VTOLs for which a remote pilot can act as pilot-in-command at the same time.

Please share your views below

We consider this area may require further consideration and be dependent on the nature of the VTOL operations and the capability of the VTOL itself.

Consultation Question 30

Should the law permit an uncrewed VTOL to transition between remotely piloted and autonomous flight during an operation?

Other

Please expand on your answer below

We consider this area may require further consideration. For example, it could be appropriate for a remote pilot to supervise the take-off and landing phases (the most critical stages of flight) and that en-route flying be autonomous.

Consultation Question 31

We seek views as to whether initial airworthiness standards for uncrewed VTOLs should include accessibility standards for persons with disabilities and reduced mobility.

Please share your views below

We consider that this should be an option and not necessarily an absolute requirement.

Consultation Question 32

We seek views as to whether the CAA should be able to include accessibility standards within the licences granted to uncrewed VTOL operators.

Please expand on your answer below

We provisionally consider that these could be granted as part of an operating licence (as a specific approval).

Drones

Consultation Question 34

We provisionally propose that a remote pilot for drones should continue to be defined as “a natural person responsible for safely conducting the flight of an unmanned aircraft by operating its flight controls, either manually or, when the unmanned aircraft flies automatically, by monitoring its course and remaining able to intervene and change its course at any time”. Do you agree?

Yes

Please expand on your answer below

We provisionally agree and suggest ‘.....monitoring flight control and navigation systems whilst remaining able to intervene.....’

Consultation Question 35

We seek views on whether some low risk autonomous drone operations or drone operations conducted beyond visual line of sight might be accommodated in the open category. In particular:

- (1) whether there are any such use cases which might be suitable for the open category; and
- (2) if so, what conditions should be attached to these use cases if operated in the open category.

Please share your views below

We consider that this would likely be dependent on what is deemed to be 'low risk'. The definition of low risk needs to be refined to enable consideration.

Consultation Question 36

We provisionally propose that for autonomous operations in the specific category, a UAS 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 manned 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.

Do you agree? (tick all that you agree with)

Please expand on your answer below

We provisionally agree.

System requirements should be a reflection of the risk posed by the operation and not by the UAS category.

Mid Air Collision (MAC) remains a risk that cannot be fully mitigated against but must be deemed ALARP and tolerable. Avoidance of 'any' risk of collision with manned aircraft is unrealistic. Manned aviation itself presents its own risks to fully compliant, unmanned operations.

Any flight that poses a risk to other aircraft, people, animals, environment, or airspace should be discontinued whether that be manned or unmanned.

Consultation Question 37

We seek views on what operational requirements should be applied to autonomous drone operations and drones that operate beyond visual line of sight in the specific and certified categories.

Please share your views below

- Pilots/Operators derived from an aviation background.
- FRTOL Licences.
- Ground based VHF Radio Set.
- Complete radio coverage in the area of operation.
- Electronic Conspicuity device (Mode s/ADS- B in /out).
- Live aircraft position tracking.
- Live system performance telemetry and data/log file recording.
- Approved maintenance exposition and airworthiness programme (akin to pt 145).

Consultation Question 41

We provisionally propose that use of flight data recorder systems or devices should be mandatory for autonomous drone operations. Do you agree?

Yes

Please expand on your answer below

We provisionally agree.

Consultation Question 42

Should the law permit a drone to transition between remotely piloted and autonomous flight during an operation?

Yes

Please expand on your answer below

We provisionally consider that the law should permit this.

Civil liability and insurance

Consultation Question 44

We provisionally consider that the current law governing air carrier liability for injury or death of passengers in the UK is adequate for the introduction of remotely piloted and autonomous operations. Do you agree?

Yes

Please expand on your answer below

We provisionally agree that the current law governing air carrier liability for injury or death of passengers in the UK, applicable to both domestic and international air transport, is adequate for the introduction of remotely piloted and autonomous operations.

Consultation Question 45

We provisionally consider that the current law governing liability for damage to cargo in the UK is adequate for the introduction of remotely piloted and autonomous operations. Do you agree?

Yes

Please expand on your answer below

We provisionally agree that the current law governing air carrier liability for injury or death of passengers in the UK, applicable to both domestic and international air transport, is adequate for the introduction of remotely piloted and autonomous operations.

Consultation Question 46

We provisionally propose that liability for surface damage, in the case of UAS, should transfer to the lessee when the lease:

- (1) is for more than 14 days; and
- (2) specifies the aircraft is to be operated under the responsibility of the lessee.

Do you agree?

Yes

Please expand on your answer below

We provisionally agree that liability for surface damage, in the case of UAS, should transfer to the lessee when the lease: i) is for more than 14 days; and ii) specifies the aircraft is to be operated under the responsibility of the lessee.

Consultation Question 47

We provisionally propose 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. Do you agree?

Yes

Please expand on your answer below

We provisionally agree that liability for surface damage, in the case of UAS, should transfer to the lessee when the lease: i) is for more than 14 days; and ii) specifies the aircraft is to be operated under the responsibility of the lessee.

Consultation Question 48

We provisionally propose that there should be a review product liability law (including the Consumer Protection Act 1987) to take account of the challenges of emerging technologies. The review should cover product liability as a whole, rather than be confined to aviation or automated vehicles. Do you agree?

Yes

Please expand on your answer below

We provisionally agree that reviews of product liability law to take account of emerging technologies are useful, providing such reviews are undertaken in a balanced and measured manner, ensuring such technologies have the opportunity to develop without being unnecessarily encumbered by these laws.

Criminal liability

Consultation Question 52

We provisionally consider that the current approach in the Air Navigation Order 2016 placing criminal liability on an operator is adequate for autonomous operations.

Do you agree?

Other

Please expand on your answer below

We provisionally agree that the current approach under Article 265 of the Air Navigation Order 2016, placing criminal liability on the operator, is adequate for autonomous operations. This is subject to further review of the defences under the same article to ensure they are each adequate in the context of autonomous operations.

Consultation Question 53

We provisionally consider that the “reasonable care” defence in article 265(3) of the Air Navigation Order 2016 applies adequately for “direct contraventions” under Article 265(5) to (8) involving autonomous operations. Do you agree?

Other

Please expand on your answer below

We provisionally consider that the reasonable defence in article 265(3) of the Air Navigation Order 2016 applies adequately for direct contraventions by operators under Articles 265(5)-(8) involving autonomous operations.

Consultation Question 54

We seek views on whether for autonomous operations the reasonable care defence should be applicable to the vicarious liability created in article 265(1) of the ANO.

Please share your views below

We provisionally consider that the “reasonable care” defence in article 265(3) of the Air Navigation Order 2016 should apply to the vicarious liability created in article 265(1) of the Air Navigation Order 2016. Additional clarity may, however, be required as to what would constitute “reasonable care” by an operator in this context. The Summary of the Consultation Paper states “Our preliminary view is that the[reasonable care] defence will work for autonomous flight [...]”. We would welcome additional thoughts on this from the Law Commission.

Consultation Question 55

We provisionally propose that a remote pilot of an uncrewed aircraft operating in the certified category should be treated as a pilot-in-command for the purposes of criminal liability pursuant to article 265(1) of the Air Navigation Order 2016. Do you agree?

Yes

Please expand on your answer below

We provisionally consider that the “reasonable care” defence in article 265(3) of the Air Navigation Order 2016 should apply to the vicarious liability created in article

265(1) of the Air Navigation Order 2016. Additional clarity may, however, be required as to what would constitute “reasonable care” by an operator in this context. The Summary of the Consultation Paper states “Our preliminary view is that the[reasonable care] defence will work for autonomous flight [...]”. We would welcome additional thoughts on this from the Law Commission.

Consultation Question 58

We invite consultees’ views on whether the Air Traffic Management and Unmanned Aircraft Act 2021 operates satisfactorily in the case of highly automated and autonomous flight.

Please share your views below

We provisionally consider that a wider review of the ATMUAA 2021 be undertaken to understand whether the powers conferred on police and prison authorities are appropriate in the context of autonomous commercial passenger, cargo or search & rescue air traffic.

RESPONSE TO LAW COMMISSION CONSULTATION ON AVIATION AUTONOMY

(Law Commission Consultation Paper 261)

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About you

What is your name?

Airworthiness and certification

Consultation Question 1

We seek views on how current airworthiness and certification regulation might need to be adapted or developed in light of highly automated and autonomous aircraft. In particular, should provisions be adopted which allow for:

1. the certification of optionally piloted and uncrewed or unoccupied versions of conventional aircraft (hybrid versions); and
2. the separate certification of command units?

Please share your views below

These are technical matters on which my ability to comment is limited. I would nevertheless expect that adaptation of existing conventional aircraft would be covered by existing STC processes, but it may be necessary to amend the regulation to the effect that if the STC would change a conventionally piloted aircraft to an uncrewed version, then the criteria applicable to uncrewed aircraft would have to be taken into account when assessing the STC. In principle, we see no reason why a command unit should not be separately certificated in the way that engines may hold a type certificate, but there would have to be a mechanism for determining the interface criteria or any limitations on the aircraft with which the command unit may be used.

Rules of the air

Consultation Question 4

We seek views on how highly automated and autonomous aircraft should act in emergency scenarios. In particular:

1. should highly automated and autonomous aircraft be given the freedom to operate outside the rules of the air in emergency circumstances; or
2. should a comprehensive set of rules be developed for highly automated and autonomous aircraft in emergency situations.

Please share your views below

In principle, option 1 would be consistent with the current position for conventional aircraft. It is recognised that in exceptional circumstances specific rules may be disregarded where safety requirements dictate it. However that applies only where an extensive number of rules or principles have already failed to eliminate the hazardous situation. Thus the circumstances in which a highly automated vehicle may depart from 'hard' rules should be clearly defined as should the priorities which must be observed. In general, we would anticipate that highly automated systems would in many cases act on the basis of a better and more completely informed position than in certain conventional operations (for instance single pilot GA operations with relatively inexperienced crew).

Consultation Question 5

We seek consultee views about what challenges remotely piloting an aircraft in an emergency scenario presents and how these might be addressed

Please share your views below

Beyond my professional expertise: but working out a forced landing without power, where necessary, without eyes on board, seems challenging. Primarily a matter for the technical regulator.

VTOLs

Consultation Question 8

We provisionally propose that a person overseeing a VTOL flying automatically, who monitors its course and is able to intervene and change its course at any time should continue to be classified as a “remote pilot”. Do you agree?

Yes

Please expand on your answer below

The position is analogous to that of the pilot/crew on board a conventional, but highly automated aircraft (as most modern commercial air transport aircraft are). The crew's function is much more a systems monitoring role than actually 'hand-flying' the aircraft.

Consultation Question 9

We provisionally propose 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. Do you agree?

Yes

Please expand on your answer below

Even if that remote pilot has multiple aircraft under his/her control, there should be someone identifiable as the pilot in command with certain legal responsibilities for the conduct of the flight. The maximum commonality with existing principles applicable to crewed aviation should be maintained. The responsibility of the commander should however only be attributed to one individual at a time, not all anyone serving as 'remote pilot' for a given operation (of whom there may, presumably, be several). Moreover with remote operations it is easier (and may be essential) to change the remote PIC, so again this should be accommodated.

Consultation Question 10

We provisionally propose 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.

Do you agree? (Tick all that you agree with)

Please expand on your answer below

I would also agree with items 1 and 2, in that the RPIC should satisfy him/herself on airworthiness and equipment operation. Ensuring airworthiness is a continuing airworthiness management function (and/or that of a maintenance organisation). As matters stand with conventional aviation, the pilot does not have the technical expertise to ensure airworthiness, and relies on assurance from others in that respect. That will not change in a remotely piloted/highly automated environment. Subject to that, the RP (RPIC if multi-crew) should indeed be satisfied before flight that the equipment is in good working order, correctly loaded etc. However, in a remote operation, it is possible to take advantage of a distributed crew such that not all tasks have to be carried out by the RPIC. RPIC must however be satisfied that they have been done, and done correctly.

Consultation Question 12

We provisionally propose that the remote pilot-in-command should be responsible for, amongst other things, ensuring passengers are:

1. given a safety briefing; and
2. seated and wear seat belts during take-off and landing

Do you agree?

Other

Please expand on your answer below

Yes, these briefings should be given and seat belts checked. However, it may be possible to take advantage of a distributed crew such that not all tasks have to be carried out by the RPIC personally. RPIC must however be satisfied that they have been done, and done correctly. Same principle applies as Q10.

Consultation Question 13

We provisionally propose that air operators (rather than the remote pilot-in-command) should be responsible for preventing passengers from boarding:

1. who appear drunk or under the influence of drugs; or
2. whose carriage would, in the view of the operator's employees, endanger the safety of the aircraft or other passengers.

Do you agree?

Yes

Please expand on your answer below

Again, with a distributed operation, these tasks may not be capable of being carried out by the RPIC. In any event, with passenger operations, there need to be personnel on hand (such as cabin crew or ground handling staff) who should have the same responsibilities as apply at present with conventional air transport.

Consultation Question 14

We provisionally propose that the remote pilot-in-command should have the power to take reasonable measures, including restraint of passengers, as set out in section 94 of the Civil Aviation Act 1982. Do you agree?

Yes

Please expand on your answer below

This needs to be delegable to the crew on board - that is implicit in the reference to 'authorising'.

Operators will need to take account of how they will determine whether it is reasonable to take the s.94 measures, if the on-board crew needs to report to the RPIC.

Alternatively the power should be exercisable by the senior crew member on board - but that individual would need a level of training, analagous to that undertaken by an airline captain, of what the powers are, what would be regarded as appropriate circumstances to exercise them, and what is reasonable.

Consultation Question 15

We provisionally propose that a person on board a VTOL aircraft (other than a crew member) should be able to take reasonable measures to protect the safety of the aircraft or of persons or property on board. Do you agree?

Other

Please expand on your answer below

This is somewhat harder since by definition such persons are wholly untrained in either what the law might be, or in what might be reasonable, but also in restraint or conflict management. What is reasonable would probably have to be determined by reference to the 'ordinary person in the street', not that of professional flight crew or law enforcement. It also begs the question of whether steps are taken to notify such a power to passengers - at the time of safety briefing for example. If it is not notified, it will be rarely exercised, so it becomes a dead letter; if it is notified, it runs the risk that persons who are likely to take the law into their own hands will be encouraged to do so, with potentially undesirable consequences in situations which do not call for it.

If such a measure is introduced, that person should be protected to the same degree as the PIC under existing law, so long as measures taken were reasonable.

Consultation Question 16

We seek views on whether the powers of crew on board a VTOL aircraft should be broadened to reflect those of the pilot-in-command under the Civil Aviation Act 1982 to:

1. take reasonable measures to protect the safety of the aircraft or persons or property on board;
2. maintain good order and discipline; or
3. enable the crew to disembark or deliver a person.

Please share your views below

As above, yes. It seems unnecessarily cumbersome always to require the RPIC to exercise these powers, and certainly the crew on board should have the power to take measures of their own initiative if circumstances do not permit seeking RPIC authority.

Consultation Question 17

We provisionally propose that passengers should be able to contact a member of crew at all times during an operation. Do you agree?

Yes

Please expand on your answer below

It's not entirely clear how that would work in practice; in reality it seems likely that operators would need to have additional remote crew available to cover the position where a single pilot is fully engaged with handling the aircraft (which may well coincide with circumstances when passengers on board wish to contact the crew). However the advantage of remote operations is that additional personnel may be brought to bear without being subject to the limitations of on board crew in conventional operations.

Consultation Question 18

We provisionally propose 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. Do you agree?

Yes

Please expand on your answer below

There should be no difference in principle from conventional aviation.

Consultation Question 19

We provisionally propose that it should be a criminal offence for a person to act as the remote pilot of a VTOL when the level of alcohol in their blood, breath or urine is over a prescribed limit. Do you agree?

Yes

Please expand on your answer below

There should be no difference in principle from conventional aviation.

Consultation Question 20

We provisionally propose that the remote pilot should be subject to the reporting obligations currently applicable to pilots under the Air Operations Regulation. Do you agree?

Yes

Please expand on your answer below

Again, there should be no difference in principle from conventional aviation. Thus to the extent reporting obligations may vary between commercial and non-commercial operations there should be comparable variation for uncrewed operations. There should be a light touch for light drone operations and purely leisure activities such as model aircraft, especially where the latter function within the BMFA.

Consultation Question 21

We provisionally propose that a remotely piloted VTOL should be required to be capable of detecting and recording information relating to accidents and near accidents for the purposes of reporting it. Do you agree?

Other

Please expand on your answer below

To the extent this is reasonably compatible with the technology, I agree. It is worth noting that light aircraft performing commercial operations are not required to carry FDRs etc, since the technology is not compatible. Some may question why, in principle, comparable advanced platforms carrying comparable numbers of passengers should be subject to a different regime simply because they are 'novel' or 'advanced'. The answer lies in two factors: first, that without a pilot on board there is a limit on the available evidence of what happened before an accident. Second, where highly automated technology is employed it may prove much easier to record data and if so the regulatory regime should take advantage of that

capability. There are likely to be many other advantages in terms of monitoring equipment performance or (if relevant) crew behaviour. We have heard intending operators of AAM equipment argue forcefully for a full OEM-backed equipment performance and health monitoring system and it does not seem a great step from that to gathering the type of data that an accident investigator would wish to have. Consideration should be given to whether a similar approach should be taken as in conventional aviation where FDRs and CVRs are subject to their own regimes for equipment integrity and are largely segregated from other equipment monitoring systems.

Consultation Question 22

We provisionally propose that licences should be required for remote VTOL pilots. So far as appropriate, these should follow the classes and ratings adopted for crewed VTOLs. Do you agree?

Yes

Please expand on your answer below

Again, there should be no difference in principle from conventional aviation.

Consultation Question 23

We provisionally propose that operators of remotely piloted VTOL should be certified. Do you agree?

Yes

Please expand on your answer below

Again, there should be no difference in principle from conventional aviation. Thus CAT and probably some categories of aerial work should be subject to an equivalent of an AOC, but not private/leisure operators.

Consultation Question 24

We provisionally propose that operators of remotely piloted VTOLs should continue to be required to:

- ☒ (1) have the means necessary for the scale and scope of operations planned;
- ☒ (2) use only suitably qualified and trained personnel;
- ☒ (3) implement a management system to ensure safety;

- ☒ (4) ensure operations only take place in accordance with the operations manual;
- ☒ (5) establish procedures to minimise the consequences to safe flight operations of disruptive passenger behaviour;
- ☒ (6) develop and maintain security programmes suitable for the aircraft and type of operation;
- ☒ (7) have a management system to prevent fatigue.
- ☒ (8) ensure the continuing airworthiness of the aircraft; and.
- ☒ (9) establish procedures for any reasonably foreseeable emergency situation.

Do you agree? (tick all that you agree with)

Please expand on your answer below

Yes, subject to the answer to Q23 - this generally only applies to commercial operations. There is of course a case for a 'non-commercial complex' category whereby private operation of certain classes of complex aircraft require, effectively, a professional level of support and/or operation (the latter may of course be achieved to some degree by the imposition of the equivalent, for a remote pilot, of a type rating which is required for a given aircraft type whether the operation is commercial or not.

Consultation Question 25

We seek views as to whether there are additional responsibilities that operators of remotely piloted VTOLs should need to fulfil.

Please share your views below

Operators should analyse what additional risk arises in their operation by virtue of the 'remoteness factor'. That additional risk may vary considerably depending on the nature of the operation. It is likely to identify extra steps, often on an operation-specific basis, which each operator should carry out.

Consultation Question 26

We seek views as to whether the law should permit remote pilots to act as pilot-in-command for more than one VTOL at the same time.

Please share your views below

Yes, subject to appropriate risk assessment by reference to the complexity of each aircraft or the nature of the operation. Conversely, it is important to take advantage

of the ability to bring more 'heads' to bear in a difficult situation and this should not be impeded by notions that only certain individuals are part of the crew at any point in time. That is not to say that the concept of an RP in command is not important, but in existing aviation it is common for flight crews to be able to seek advice from the airline's operations room as to possible course of action. Remotely piloted operations probably increase that ability.

Consultation Question 27

We seek views as to whether there should be an upper limit to the number of VTOLs for which a remote pilot can act as pilot-in-command at the same time.

Please share your views below

Probably, but this is beyond my professional expertise - certainly I have no idea where that number should be, but it is undoubtedly a function of the complexity of the aircraft or of the nature of the operation.

Consultation Question 29

We seek views as to whether there should be a role for a person supervising the flight of an autonomous passenger-carrying VTOL and acting as a point of contact in relation to it. What powers or responsibilities should such a person have?

Please share your views below

I assume this is a function that is distinct from the RPIC: that role must, in my view, remain for passenger-carrying VTOL operations, and must not be blurred by the existence of a supervisory role. If the scenario envisaged is an operations room with multiple RPICs handling their own operations and a supervisor to whom the RPICs report (if not, formally, in relation to command decisions for their own aircraft), it is probably harder to maintain the distinction between those formally in command of individual aircraft and their management than in conventional aviation. This probably tends to a situation where a supervisory pilot would need to be fully qualified, and current, on the type(s) in question and subject to some sort of licence to act as supervisor. Training would need to emphasise the operational and safety responsibilities that the role entails.

Consultation Question 30

Should the law permit an uncrewed VTOL to transition between remotely piloted and autonomous flight during an operation?

Yes

Please expand on your answer below

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

Consultation Question 31

We seek views as to whether initial airworthiness standards for uncrewed VTOLs should include accessibility standards for persons with disabilities and reduced mobility.

Please share your views below

In principle this should operate on the same basis as conventional aviation. Increased access should not come at the expense of increased risk to a PRM. Realistically if, for example there is no cabin crew on board, it may mean precluding some people with severe disability from travel in some VTOL types. That is not inconsistent with the position in conventional aviation, though probably accentuated in the case of small VTOLs.

Consultation Question 32

We seek views as to whether the CAA should be able to include accessibility standards within the licences granted to uncrewed VTOL operators.

Please expand on your answer below

As Q 31.

Drones

Consultation Question 34

We provisionally propose that a remote pilot for drones should continue to be defined as “a natural person responsible for safely conducting the flight of an unmanned aircraft by operating its flight controls, either manually or, when the unmanned aircraft flies automatically, by monitoring its course and remaining able to intervene and change its course at any time”. Do you agree?

Yes

Please expand on your answer below

This is the definition adopted by BSI Flex 1903.

Consultation Question 35

We seek views on whether some low risk autonomous drone operations or drone operations conducted beyond visual line of sight might be accommodated in the open category. In particular:

- (1) whether there are any such use cases which might be suitable for the open category; and
- (2) if so, what conditions should be attached to these use cases if operated in the open category.

Please share your views below

My view is that the essential limitations of the open category were adopted to define a straightforward category of low risk operations which can be carried out with limited regulatory oversight. If there is a case for changing the criteria for open category, that could be assessed, but otherwise the mechanism lies surely in the use of PDRAs in specific, perhaps greater use of LUCs, or easing the process for obtaining a specific approval when the operation 'only just' fails to fit within the 'open' parameters.

Consultation Question 36

We provisionally propose that for autonomous operations in the specific category, a UAS 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 manned 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.

Do you agree? (tick all that you agree with)

Please expand on your answer below

Yes, but surely this would be addressed in the SORA for the operation in question, with appropriate adjustment if any of these factors actually entailed negligible risk?

Consultation Question 38

We seek views on whether the current concept of a “remote pilot” is compatible with drone MSO. We also seek views on whether the remote pilots of drone MSO should continue to be subject to the same responsibilities as remote pilots for single drone operations.

Please share your views below

MSO are only permissible in the specific category if the risk is assessed to have been reduced to an acceptable level. BSI Flex 1903 refers to "multiple uncrewed aircraft ... under the command of a single multiple simultaneous operations remote pilot in command". There certainly should be a RPIC (with, perhaps assistance) and the RPIC is subject to the same responsibilities. If the multiple nature of the operation poses too many demands then it cannot be authorised or the RPIC has to have the benefit of suitably qualified assistants.

Consultation Question 39

We seek views on whether there should be an upper limit to the number of drones for which an individual remote pilot is responsible.

Please share your views below

Possibly, but as with VTOLs, the issues identified in Qs 26/27 apply.

Consultation Question 40

We seek views as to what additional safeguards should be introduced for remote pilots responsible for multiple drones.

Please share your views below

Beyond the obvious - namely that the RP needs a means of effectively tracking multiple vehicles and their environment - this is beyond my professional expertise.

Consultation Question 41

We provisionally propose that use of flight data recorder systems or devices should be mandatory for autonomous drone operations. Do you agree?

Other

Please expand on your answer below

This should be a function of the risk presented by the operation. It seems to be excessive for open category operations, but similar considerations apply as to Q21 for VTOLs. If anything FDR technology (as currently understood) is more appropriate to VTOL operations than to lighter drones.

Consultation Question 42

Should the law permit a drone to transition between remotely piloted and autonomous flight during an operation?

Yes

Please expand on your answer below

Similar considerations apply as to VTOLs (Q30) - of course within the specific category the SORA will have to identify the differences in risk between RP-operation and autonomous (or any highly automated 'hands-off' mode) and address them, as well as risk at time of mode transition.

There is extensive experience in conventional aviation on the benefits and disadvantages of very high levels of automation and this should be taken into account by the regulator in assessing the system (if certified) or the operation (if under specific category).

Civil liability and insurance

Consultation Question 44

We provisionally consider that the current law governing air carrier liability for injury or death of passengers in the UK is adequate for the introduction of remotely piloted and autonomous operations. Do you agree?

Other

Please expand on your answer below

Nothing in the Warsaw/Hague/Montreal/Reg 2027/97 regime as applied to UK air carriage is dependent on a pilot being on board and in the ordinary course will ensure adequate compensation in commercial air transport cases.

However the threshold of liability under MC99 where an air carrier is able to prove no negligence may be invoked by the operator of a very highly automated operation. We are unaware of any major (conventional) air accident in which that defence has been invoked (or, indeed, it's predecessor defences under Warsaw/Warsaw-Hague) but can see that position changing when operators simply programme the equipment to fly a defined route.

Similarly, outside the commercial arena, we can see more arguments as to whether

a private operator is at fault in relation to an accident to a leisure operation - but that reflects the current position in private conventional aviation.

Consultation Question 45

We provisionally consider that the current law governing liability for damage to cargo in the UK is adequate for the introduction of remotely piloted and autonomous operations. Do you agree?

Yes

Please expand on your answer below

As Q44, without the added complexity for private operations or thresholds of liability for passenger injuries.

Consultation Question 46

We provisionally propose that liability for surface damage, in the case of UAS, should transfer to the lessee when the lease:

- (1) is for more than 14 days; and
- (2) specifies the aircraft is to be operated under the responsibility of the lessee.

Do you agree?

No

Please expand on your answer below

I am not sure of a reason for modifying the current presumption under s.76 Civil Aviation Act 1982. If it's a proper lease under which the lessee takes operational responsibility then the statutory channelling of liability under s.76 applies. Of course it is open to the parties to regulate their liability among themselves but that would not override the statutory ability of surface interest to pursue owner or operator as appropriate.

Consultation Question 47

We provisionally propose 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. Do you agree?

Other

Please expand on your answer below

Most provisions of the ANO are disapplied for open and specific category operations under the implementing regulation, but any benefit of s.76 should be dependent on observing the regulations applicable to a UAS operation. The s.76 protection is not, however, limited to 'requirements of aviation legislation that are relevant to limiting intrusion into the claimant's land'. Arguably any breach of the ANO would disentitle the owner/lessee of the aircraft from relying on s.76, and I do not see why it should be different for UAS operators.

In this context the Law Commission will no doubt have seen the recent Manchester County Court decision in *AIUL v Wainwright and Persons Unknown* [2023] 5 WLUK 613 which touches on questions of trespass. As matters stand the law is unsatisfactory insofar as no-one knows the point to which a landowner's property rights extend above his/her land (and it is clearly variable) and thus engage the risk of trespass, nor do we know what height (below that) is reasonable for the purposes of s.76(1) of the 1982 Act. While the decision was plainly correct in addressing what was obviously mischievous behaviour, it was a missed opportunity to pass comment on those issues.

We are seeing increased instances of landowners challenging UAS overflight and these tensions will increase as UAS and AAM operations expand. As matters stand operators seem to be taking a relatively non-confrontational approach but the question will have to be resolved by the policymaker if we are not to have more cases before the courts, which are only likely to result in piecemeal development of the law. We would welcome the Law Commission's views on the topic.

Consultation Question 48

We provisionally propose that there should be a review product liability law (including the Consumer Protection Act 1987) to take account of the challenges of emerging technologies. The review should cover product liability as a whole, rather than be confined to aviation or automated vehicles. Do you agree?

Yes

Please expand on your answer below

The specific issue that needs to be addressed is how far the state of the art defence is available. If available, I can see it being invoked by suppliers of complex advanced technology to the detriment of those who otherwise have a bona fide claim against the producer of equipment which proves unsafe in service. This could be of particular relevance where a non-commercial operator of a AAM vehicle is able to establish no negligence, but the equipment was inherently unsafe, and s.4(a1)(e) CPA 1987 remains in force.

We understand that product liability law is under review in relation to advanced technology and highly automated systems; similar issues will apply in relation to driverless cars and there is little principled reasons why aeronautical systems should be treated differently.

Consultation Question 49

We seek views as to whether the current law regarding liability for mid-air collisions is satisfactory in the case of collisions involving uncrewed aircraft systems.

Please share your views below

Liability for mid-air collisions is essentially fault-based, at least as between the two operators. If either is commercial, the issues raised above (Qs44/45) apply to their liability to passengers/cargo interests. With very highly automated systems, the problem arises as to whether one can show fault on the part of the other. It is of course likely that other systems (eg a traffic management system) is also involved which provides for further complexity in a fault-based analysis. As with the product liability situation, this requires development if the current regime of channelling presumed liability for all victims of commercial air accidents is to be maintained.

Consultation Question 50

We seek consultees' views on whether they expect any difficulties applying existing insurance requirements to uncrewed aircraft systems.

Please share your views below

This is beyond my professional expertise - we understand this is essentially a question of rating and the ability to gather enough data for insurers to set appropriate market rates. The underlying law in relation to mandatory insurance for UAS (or AAM applications such as VTOL) is generally suitable, even if there are arguments that the minimum levels are too low.

Consultation Question 51

We provisionally propose that multiple simultaneous operations should be considered as the Government develops proposals for the insurance requirements applicable to uncrewed aircraft. Do you agree?

No

Please expand on your answer below

It is not clear to me why the existing insurance requirements (which apply per passenger or aircraft) need to be changed for MSO.

Criminal liability

Consultation Question 52

We provisionally consider that the current approach in the Air Navigation Order 2016 placing criminal liability on an operator is adequate for autonomous operations.

Do you agree?

Yes

Please expand on your answer below

In principle, similar arrangements should apply to operators (and regulated personnel such as pilots or mechanics) as with conventional aviation.

Consultation Question 53

We provisionally consider that the “reasonable care” defence in article 265(3) of the Air Navigation Order 2016 applies adequately for “direct contraventions” under Article 265(5) to (8) involving autonomous operations. Do you agree?

Yes

Consultation Question 54

We seek views on whether for autonomous operations the reasonable care defence should be applicable to the vicarious liability created in article 265(1) of the ANO.

Please share your views below

In principle yes. The operator is responsible for systems to ensure the operation is well run and complies with applicable regulation. There are circumstances where the pilot may struggle to identify a breach but in that event may have the protection of art.265(3). These principles should apply equally to conventional and highly automated aviation.

Consultation Question 55

We provisionally propose that a remote pilot of an uncrewed aircraft operating in the certified category should be treated as a pilot-in-command for the purposes of criminal liability pursuant to article 265(1) of the Air Navigation Order 2016. Do you agree?

Yes

Consultation Question 56

We ask for consultees’ views on the criminal liability of pilots (or remote pilots) when an aircraft operating autonomously returns control to the pilot or vice-versa. In

particular, should a pilot (or remote pilot) only become criminally liable for the piloting of the aircraft at the end of a transition period?

Please share your views below

If the RP lacks control until the transition period concludes, then it seems unjust to impose criminal liability for the operation of the autonomous system (though there may conceivably be other bases for imposing criminal liability on an RP for things that have nothing to do with the operation automated system). Ordinarily the point of resumption of criminal liability will be the point at which the RP has a level of control for which criminal responsibility is appropriate.

Consultation Question 57

We provisionally propose that the pilot-in-command of aircraft in a multiple simultaneous operation should be criminally liable for breach of operating requirements in the same way as a pilot in command of a single aircraft would be. Do you agree?

Yes

Consultation Question 58

We invite consultees' views on whether the Air Traffic Management and Unmanned Aircraft Act 2021 operates satisfactorily in the case of highly automated and autonomous flight.

Please share your views below

We have insufficient experience of the 'stop and search' type and FPN provisions under the 2021 Act to comment meaningfully.

What is of interest to me is, first, the way that the 2021 Act amends the Police Act 1997 to put various UAS offences on a par with serious crimes to enable senior police officers to authorise action to prevent the use of drones for malicious purposes. I am unaware of how frequently it has been used, and no doubt there will be many situations for which these powers will be valuable to prevent potentially serious events.

Second, the 2021 Act was, in this context, a missed opportunity to put a path to effective counter-UAS measures in place. There are multiple landowners and businesses who wish to prevent inappropriate use of UAS harming their interests, and, now, many sources of detector and effector capability for that purpose. Previous Government indications were that a regime would be introduced to regulate and license the use of such equipment but, at least so far as effector equipment is concerned, this remains the province of law enforcement agencies even though it remains unclear how far they actually want that responsibility in relation to private interests.

It is not clear how far C-UAS measures are part of the Law Commission's current remit but this is very much an open issue in policy and legislative terms.

Consultation Question 59

We invite views on how operator responsibilities for dangerous goods might need to be adapted in light of autonomous operations.

Please share your views below

In principle, I believe the operator (and possibly the remote pilot) should remain responsible much as occurs with conventional aviation. Consignors of dangerous goods should remain obliged to declare them accordingly. Existing legislation sets the threshold requiring a certified operation ('the carriage of dangerous goods, that may result in high risk for third parties in case of accident'). Beyond that I do not have the experience of dangerous goods issues to comment.

Consultation Question 60

We ask for consultees' views about whether the offence of hijacking in domestic law should be updated to:

1. include the unauthorised seizure or control of autonomous or remotely piloted aircraft by technological means or by persons not on board the aircraft; and
2. expand the period in which hijacking can occur from the period when an autonomous or remotely piloted aircraft is "in flight" to the period when it is "in service".

Please share your views below

Yes, in both cases (and, as noted in the consultation, these might extend to other types of aircraft). This begs the question of whether a hijacker who takes unlawful control of an operation system while no aircraft are in flight or in service and thereafter controls the UAS commits an offence within s.1 of the 1982 Act, on the basis that the aircraft is not in service (or in flight) at the time of seizure. This may merit further consideration.