Law Commission
Reforming the law

# Remote driving:

# analysis of responses to the Issues Paper

**February 2023**

**This analysis is published alongside the Law Commission's advice to Government on remote driving**

# Contents

# List of Abbreviations

| | |
|---|---|
| ABI | Association of British Insurers. |
| ACSO | Association of Consumer Support Organisations. |
| ADS | automated driving system. |
| AEVA | Automated and Electric Vehicles Act 2018. |
| ALKS | automated lane keeping system. |
| APIL | Association of Personal Injury Lawyers. |
| ASDE | authorised self-driving entity. |
| AV | automated vehicle. |
| BIBA | British Insurance Brokers' Association. |
| BMF | British Motorcyclists Federation. |
| BSI | British Standards Institution. |
| BVRLA | British Vehicle Rental and Leasing Association. |
| CAV | Connected and Autonomous Vehicle. |
| CCAV | Centre for Connected and Autonomous Vehicles. |
| DDT | dynamic driving task. |
| DPTAC | Disabled Persons Transport Advisory Committee. |
| ERDO | Entity for Remote Driving Operation. |
| GB | Great Britain. |
| GDPR | United Kingdom General Data Protection Regulation (EU) 2016/679. |
| HGV | heavy goods vehicle. |
| MACS | Mobility and Access Committee for Scotland. |
| MIB | Motor Insurers' Bureau. |
| MRM | minimal risk manoeuvre. |
| NUIC | no user-in-charge. |

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|---|---|
| NUICO | no user-in-charge operator. |
| ODD | operational design domain. |
| OEM | Original Equipment Manufacturer. |
| PACTS | Parliamentary Advisory Council for Transport Safety. |
| RoSPA | Royal Society for the Prevention of Accidents. |
| SAE | Society of Automotive Engineers International. |
| SMMT | Society of Motor Manufacturers and Traders. |
| STGO | Road Vehicles (Authorisation of Special Types) (General) Order 2003. |
| TfL | Transport for London. |
| TfWM | Transport for West Midlands. |
| UIC | user-in-charge. |
| UNECE | United Nations Economic Commission for Europe. |
| VCA | Vehicle Certification Agency. |
| VSO | Vehicle Special Order. |

# Section A: Introduction

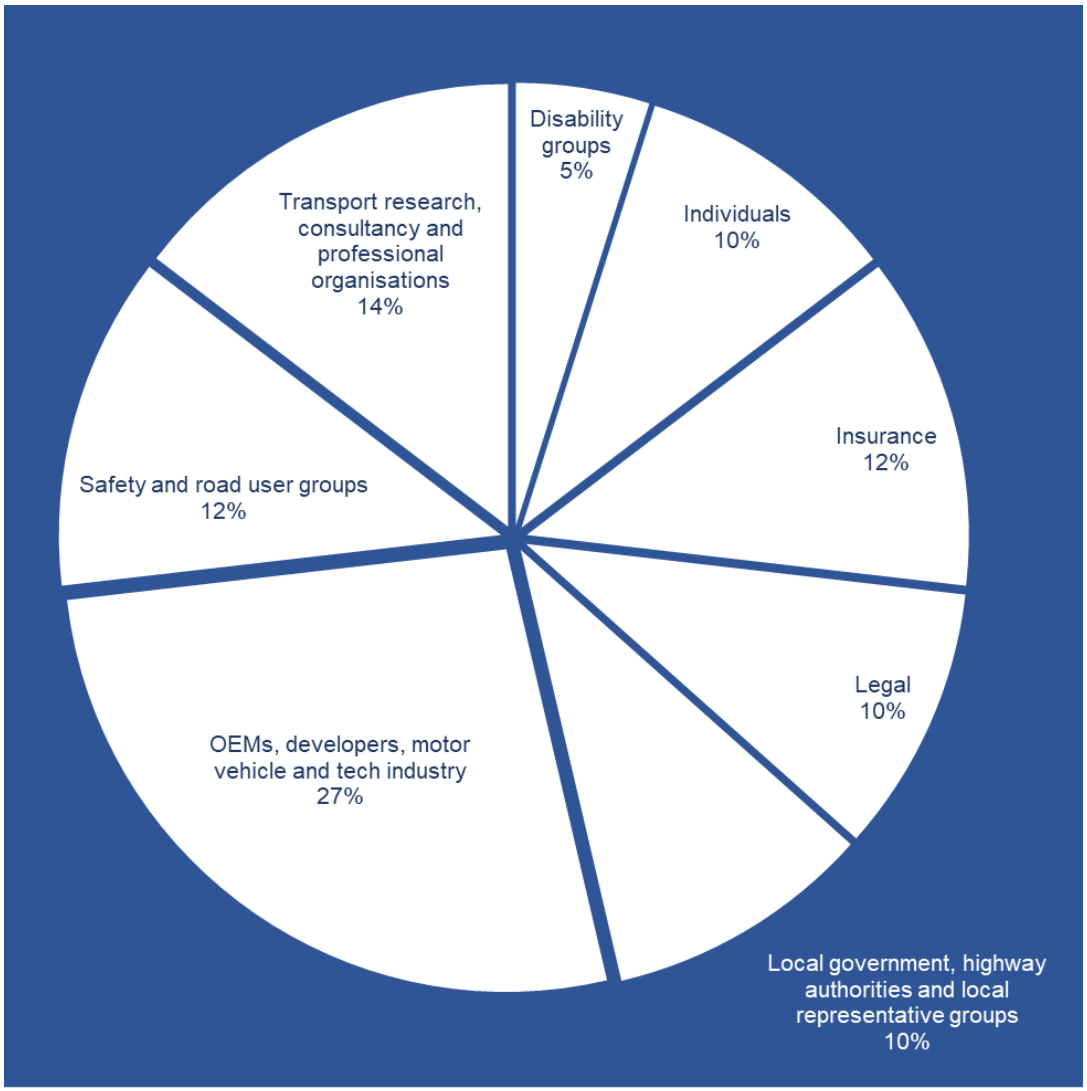
A.1 In March 2022 the Centre for Connected and Autonomous Vehicles (CCAV) and International Vehicle Standards (IVS) asked the Law Commission to clarify the current legal status of remote driving and consider whether reforms are needed.

A.2 The Law Commission published its remote driving Issues Paper on 24 June 2022 and invited views until 2 September 2022. This paper reports on the responses received.

A.3 On the basis of the responses received and further analysis the Law Commission has provided advice to UK Government regarding remote driving published alongside this paper.

## WHO RESPONDED TO OUR ISSUES PAPER

A.4 We received responses from 41 respondents to our Issues Paper.



A.5 The pie chart above shows the range of persons and organisations responding to our Issues Paper:

(1) The largest four groups were: original equipment manufacturers (OEMs), developers of remote driving systems and those involved in the motor vehicle or technology industries (27%), transport research, consultancy and professional organisations (14%), insurance providers (12%) and safety and road user groups (12%).

(2) We also received responses from: local government, highway authorities and local representative groups (10%), individuals (10%), legal professionals (10%) and disability groups (5%).

A.6 All stakeholders who responded to our Issues Paper are listed in Appendix 1.

## KEY FINDINGS

A.7 There was broad agreement on two key issues:

(1) if remote driving is to happen on roads and in public places it should be carefully regulated by introducing a licensing scheme which places responsibilities on an Entity for Remote Driving Operation (ERDO); and

(2) remote driving from abroad should be banned in the first instance.

A.8 Additionally, the responses provided to our 23 questions revealed some recurring themes:

(1) The need to develop evidence regarding the safety of remote driving for all road users, including disabled and older users, and to improve public understanding of remote driving, including its potential benefits.

(2) The relationship between remote driving and automated vehicle regulation is critical and regulation needs to address this in detail.

(3) The need to avoid fragmentation and uncertainty in liability, particularly in relation to:

(a) entities and individuals that may be involved in providing remote driving (and possibly automated driving, or assisting the latter);

(b) transitions in the mode in which a vehicle runs, for example, where a vehicle may transition between automated and remote driving.

(4) Insurance and data storage approaches are fundamental in supporting any framework of accountability and both should be areas of focus.

A.9 Whilst the remit of the Law Commission's remote driving advice is confined to England and Wales, we are very grateful that Transport Scotland responded to the Issues Paper expressing its willingness to collaborate on the future regulation of remote driving.

## SUMMARY OF ANALYSIS

A.10 Below we set out a brief summary of each section of the analysis.

### Concerns about remote driving

A.11 Before addressing the questions, several respondents expressed concerns about the safety challenges posed by remote driving.

A.12 These respondents saw a difference between remote driving as an add-on to automated driving and "pure" (or "independent") remote driving of manually controlled vehicles. They accepted that some remote driving of vehicles equipped with automated driving technologies might be safe in specific and limited circumstances. They were, however, opposed to pure remote driving on roads and public places, describing it as fundamentally unsafe.

## SECTION A: INTRODUCTION

A.13 Section A is this introduction.

## SECTION B: WHAT IS "REMOTE DRIVING"

A.14 In the Issues Paper, we asked whether driving should be defined in terms of an individual performing all or any sub-tasks of dynamic driving, namely steering, braking or accelerating. We suggested that an individual would only be a driver if they monitored the driving environment or the way a vehicle drives with a view to themselves steering, braking or accelerating. Monitoring alone should not be enough for that individual to be classified as a driver.

A.15 Furthermore, we suggested that a "remote driver" is a driver who is outside the vehicle and who uses some form of wireless connectivity to control the vehicle.

A.16 A narrow majority agreed with the proposed definitions. However, the issue generated considerable debate.

A.17 Those who agreed with our definitions saw them as consistent with the Society of Automotive Engineers International's taxonomy, the Road Traffic Act 1988 and the Automated and Electric Vehicles Act 2018 (in particular, its control and monitoring tests used to define self-driving). They also broadly align with the UK Civil Aviation Authority's definition of a remote pilot for operation of unmanned aerial vehicles.

A.18 Several respondents thought that a driver should perform all the listed tasks - not simply any of the tasks. The distinction between a remote assistant and a remote driver also generated considerable discussion. In principle, respondents accepted that there was a crucial difference between a remote assistant, who merely "advises" an automated driving system (ADS), and a driver who controls steering and braking. However, some stakeholders gave examples where the distinction was difficult to apply in practice.

## SECTION C: CONSTRUCTION AND USE REGULATIONS

A.19 Four potentially problematic construction and use regulations (regulations 104,107,109 and 110) were discussed in the Issues Paper. We asked stakeholders whether these or any other construction and use regulations create problems for remote driving in practice.

A.20 Almost half of the stakeholders who responded thought that construction and use regulations were causing difficulties in practice, mainly because their application was so uncertain.

### Exemptions for trials

A.21 We asked stakeholders whether various exemptions to construction and use regulations were easy to navigate or whether they presented barriers to testing and trialling.

A.22 Several stakeholders thought that the scope of current exemptions should be expanded. However, there were slightly more stakeholders who expressed reservations about the use of exemptions on safety grounds. Several stakeholders, including three safety groups, expressed grave reservations about any relaxation of construction and use regulations for remote driving trials.

### Maintaining construction and use regulations in the interests of safety

A.23 We also asked stakeholders whether any particular construction and use regulations should be maintained in the interests of safety, even for trials and demonstrations.

A.24 Many respondents highlighted that several regulations, such as 104 (maintaining a view ahead and proper control) were crucial and should not be relaxed for trials. Many stakeholders also proposed that new construction and use regulations should be introduced in respect of remote driving, in the interests of safety.

## SECTION D: CIVIL LIABILITY

A.25 In Chapter 4 of the Issues Paper, we asked if remote driving was likely to cause problems for victims. We discussed possible solutions in Chapter 10.

### Problems for victims

A.26 Most respondents argued that remote driving would cause problems for victims by making the allocation of liability more complex and claims more difficult to pursue. Respondents focused on three issues: latent defects (and the consequent need to consider product liability), connectivity failure and cybersecurity.

A.27 Several stakeholders expanded on the problems in detail. Failures of connectivity may result from failures in the network. However, it would be almost impossible to claim against the network provider, as providers did not guarantee the service. Furthermore, a connectivity failure may result in control passing back and forth between the remote driver and the automation responsible for a minimal risk condition in a way that made liability difficult to untangle. Victims would also face particular difficulties in pursuing product liability claims for failures in a minimum risk manoeuvre.

A.28 The complexities could have practical consequences. It might be difficult to find solicitors willing to enter into no win no fee arrangements for such claims. Seriously injured claimants may face delays in obtaining rehabilitation therapies, while smaller claims may be disproportionately costly for the claimant to bring at all.

A.29 In response to the possibility of cyber-attacks, some respondents thought the Motor Insurers' Bureau (MIB) should step in as an insurer of last resort for uninsured or untraced drivers. The MIB disagreed and had concerns about bringing uninsured remotely-driven vehicles within their remit.

### Reform

A.30 We provided two options for civil claims where harm was caused by remote driving:

(1) to give victims additional rights to claim against the ERDO for breach of statutory duty if the ERDO failed to comply with specified safety, maintenance and loading duties; or

(2) a more comprehensive strict liability regime, along the lines of the Automated and Electric Vehicles Act 2018 (AEVA).

A.31 The responses received on the topic were mixed, including several layers and interdependencies. However, most of the comments favoured the AEVA approach, which was seen as simpler and easier for victims. Several respondents noted insurers were better placed to access data and pursue claims than individuals. Insurers agreed but on condition of clear rights of subrogation including against the ERDO if they were at fault. They also wanted a duty on the ERDO to provide reasonable disclosure, including an obligation to record and store data. The MIB had grave concerns about bringing uninsured or untraceable remote drivers under its remit.

## SECTION E: THE SAFETY CHALLENGES OF REMOTE DRIVING

A.32 In the Issues Paper we highlighted the many safety challenges associated with remote driving such as connectivity, cybersecurity and staff training. We asked whether there were any additional challenges not identified in the paper. We also asked whether remotely driven vehicles required an ADS to mitigate the risk, for example, of the vehicle losing connectivity.

### The driver's detachment and the work environment

A.33 Many stakeholders focused on the issues created by the driver of a vehicle not being physically present in the vehicle. They expressed concerns over the potential lack of situational awareness a remote driver may have. Several highlighted that conventional drivers are more "present" and more alive to their surroundings because of the risk of physical harm should they fail to pay attention.

A.34 Stakeholders felt that particular attention should be paid to human factors such as workstation set-up, driver's hours and training. One stakeholder also noted that performance evaluation of remote drivers should be regularly undertaken as a safety measure.

### Do remotely driven vehicles need an ADS and should any ADS be regulated as such?

A.35 Many stakeholders who responded to this part of the Issues Paper felt that remote driving was just not feasible without some form of ADS as a back-up to the remote driver. Should a vehicle experience a loss of connectivity or a fault that prevented the remote driver from acting appropriately, an ADS would be needed to take over the driving task and bring the vehicle to a safe condition.

A.36 Views differed on whether this risk mitigation meant that the vehicle should simply stop in its current trajectory or whether it would need to pull in safely to the side of the road. Several respondents said it would depend on context.

A.37 Some stakeholders commented that if the risk mitigation manoeuvre was carried out by an ADS, the ADS would need to be operating in the background at all times. It would also limit the use of the vehicle to operational domains within the ADS capability.

## SECTION F: REMOTE DRIVING FROM ABROAD

A.38 In the Issues Paper we highlighted the possibility that vehicles may be driven on British roads from another jurisdiction. We briefly considered the accountability issues raised by remote driving from abroad. We asked for views on how the problems raised by remote driving from outside the jurisdiction can be addressed. We also asked whether remote driving from abroad should be prohibited.

A.39 Most respondents expressed strong reservations about the feasibility of remote driving from abroad. Some expressed safety concerns whilst others emphasised that it would be difficult to hold remote drivers from abroad accountable for their actions on British roads.

A.40 A majority of the stakeholders who provided responses thought that remote driving from abroad should be prohibited. However, some developers said it would be feasible with sufficient training and if the ERDO was held fully accountable. A few stakeholders suggested that remote driving from abroad might be possible in the future, following bilateral or multilateral international agreements.

### International perspectives

A.41 In the Issues Paper we also provided a brief overview of how remote driving is regulated internationally. We highlighted regulation relating to remote driving in the US, Germany, Japan, Australia and Finland. We asked stakeholders whether they had any experience relating to how remote driving is regulated abroad.

A.42 This received relatively little response. One stakeholder mentioned the use of teleoperations in the Netherlands and Belgium; one referred to recent developments in the regulation of pavement delivery devices; and one indicated that other sectors such as the maritime industry may be relevant.

## SECTION G: SHORT-TERM REFORM

A.43 In the Issues Paper, we considered how the problems might be addressed without primary legislation. We described how the Secretary of State for Transport has flexible

powers to amend the Road Vehicles (Construction and Use) Regulations 1986 and provide exemptions from them. We asked stakeholders whether the Road Vehicles (Authorisation of Special Types)(General) Order 2003 (STGO) should be amended and whether any changes to construction and use regulations were needed to enable the safe introduction of remote driving.

A.44 We also asked whether the Highway Code should be amended to reflect the guidance on remote driving operations currently contained in CCAV's Code of Practice. We noted that the Code of Practice contains some guidance on how trialling organisations should interpret construction and use regulations which may be relevant for remote driving. If added to the Highway Code, this guidance would then be given statutory effect.

### Amending the STGO and construction and use regulations

A.45 Many stakeholders supported amending construction and use regulations to make clear how it applied to remote driving. Developers were also supportive of amendments to make clear that trials with a commercial element to them were permitted. However, some stakeholders expressed reservations on the grounds that the line between commercial trials and deployment was blurred and safety may not be adequately prioritised in trials with a commercial element.

A.46 In relation to amending construction and use regulations generally to accommodate remote driving, very few respondents expressed a definite opinion. No respondents objected but only a handful thought that the regulations should be amended. Some stakeholders thought that changes would not be needed until remote driving was more feasible and widespread whilst others thought that longer-term solutions such as ERDO licensing would be better.

### Adding Code of Practice Guidance to the Highway Code

A.47 A majority of stakeholders objected or expressed reservations to this suggestion. Many of these stakeholders felt that remote driving was complex enough to warrant its own, dedicated, statutory guidance. Others noted that the guidance in the Code of Practice was not suitable for inclusion in the Highway Code as it was directed at trialling organisations as opposed to providing general guidance to all road users.

## SECTION H: REGULATION IN THE LONGER TERM

A.48 In the Issues Paper, we provisionally proposed a new licensing scheme for the organisation behind remote driving. We referred to this organisation as an Entity for Remote Driving Operation or "ERDO".

### Strong support for ERDO licensing

A.49 There was widespread support for ERDO licensing from across industry, safety groups and others. It was seen as proportionate to the increased regulatory risk of remote driving and promoting better safety assurance and accountability.

A.50 Proposals to make it an offence to drive (or cause or permit a person to drive) a vehicle beyond line-of-sight unless the vehicle is overseen by a licensed ERDO also received substantial support.

A.51 Additionally, there was remarkable consistency in the issues raised across all responses, regardless of whether they agreed or disagreed with the licensing proposal.

### Minimising duplication with NUIC operator licensing

A.52 In the Issues Paper, we suggested that the regulation of remote driving should be as similar as possible to NUIC operation. Stakeholders agreed with this approach. Some supported parallel licensing systems for ERDO and NUIC operator licensing that might be combined with minimal duplication. However, several respondents went further and suggested ERDO licensing could usefully be subsumed within NUIC operator licensing where remote driving supports automated vehicle operation.

A.53 Those who disagreed with ERDO licensing argued that remote driving should only be possible as part of automated driving. Thus, a NUIC operator licence could cover both roles. They worried that adding a further regulatory role for remote driving would add confusion and increase the risk of expensive satellite litigation.

### ERDO requirements

A.54 We proposed requirements to obtain an ERDO licence relating to good repute, financial standing, conducting operations within Great Britain and professional competence to run the service. These were strongly supported, mostly on the basis of parity with NUIC operator licensing. Those who disagreed generally did so on the basis that there was no need for a separate system of ERDO licensing.

A.55 There was also overwhelming support for the proposal that an ERDO should be required to submit a safety case on how it will operate remote vehicles safely. It was seen as integral to safety assurance. No one disagreed with this proposal.

### The duty of candour

A.56 A strong majority of respondents agreed an ERDO should face criminal offences where misrepresentations and non-disclosure in the safety case have implications for safety. They thought it would promote safety and compliance.

A.57 Those who agreed did so on the basis of parity with ASDE/NUIC operator offences recommended in the Automated Vehicles report. Some suggested liability should only arise if there was an intention to mislead regulators. Others thought any criminal sanctions would be disproportionate for low weight, low speed delivery robots operating on pavements.

### ERDO duties

A.58 We sought views on a list of eight duties that should apply to an ERDO operator: the duty of safety; maintenance; loading; insurance; information following an incident; not to impede traffic flow; checking the route and paying tolls; and responding to the regulator's requests for information.

A.59 A majority of respondents agreed with all the duties listed. Several respondents suggested that for some of the duties (maintenance, loading and not impeding traffic flow) liability should not be strict and only require reasonable care. Many respondents highlighted a wide range of additional duties that ERDOs should comply with, from

ensuring remote driving staff undergo drug and alcohol testing, to fire safety of workstations and ensuring children have appropriate seats.

### Regulatory sanctions

A.60 There was overwhelming support for giving the regulator of ERDOs a range of regulatory sanctions. Respondents saw robust regulatory sanctions as crucial to maintaining safety. Some highlighted that the emphasis should remain on learning rather than punishment of the ERDO. Additional criminal sanctions were also suggested, including barring people from working in the industry and offences of failing to identify remote drivers operating an ERDO's vehicles.

### Inspection powers

A.61 There was widespread support for a power to inspect remote operation centres. Respondents saw inspection powers as necessary for effective enforcement. Several developers agreed, provided that the powers were used proportionately. Divergent views were provided on whether notice of visits should be provided.

### An immunity for individual drivers for matters outside their control

A.62 In the Issues Paper we noted that individual drivers bear heavy responsibilities, not only for dynamic driving but also for loading, the condition of the vehicle and ensuring that children wear seat belts. We asked if remote drivers should be given statutory immunity in respect of these issues if the matters were outside their knowledge or control. Instead, the ERDO would need to fulfil the responsibility in another way. Most people agreed this should be a company responsibility rather than falling on the individual.

#### Only if the issue is outside the driver's knowledge or control

A.63 Several respondents stressed that in some cases, the individual driver may be aware of the problem and have control over it. In these cases, the immunity should not apply. It is important that if a driver is made aware of an issue they should heed the warning and take appropriate action in response.

### A competent and careful driver defence

A.64 Most people agreed that beyond line-of-sight remote drivers should have a defence to a driving charge if a competent and careful driver in the same circumstances could not have avoided the offence.

A.65 Several respondents agreed but stressed that care would be needed to understand what went wrong taking into account the driving apparatus, staff training and driver's choices. Some thought the defence should only apply if there was evidence of failures in the remote driving system. The respondents that disagreed thought the minimum standards built into current offences provide sufficient protection from unfairness and that changing the approach for remote drivers could endanger other road users.

# Section B: Defining a "remote driver"

## CONCERNS ABOUT REMOTE DRIVING

B.1 Several respondents prefaced their answers by drawing attention to the considerable safety challenges posed by remote driving.[1] PACTS and RoSPA commented:

> *However, [PACTS / RoSPA] does have concerns that remote driving poses considerable safety challenges. Just one example of a challenge that would need to be overcome would be how the remote driver can regain situational awareness and react to an emergency or obstruction when they are not in the vehicle, particularly if they are viewing the surroundings of the vehicle on a screen…. It should not be assumed that remote handling constitutes a viable backup for problems encountered by vehicles under the control of an automated driving system, or that remotely controlled driving of a vehicle is feasible in busy environments or on high-speed roads.*

B.2 The RAC Foundation also stressed the safety concerns:

> *We acknowledge that technology has enabled remotely operated drone operations and remote robotic surgery. It follows that safe remote operation of a road vehicle is probably not impossible. But creating the circumstances where the remote driver would have the benefit of the haptic information enjoyed by a driver in a vehicle, in a controlled environment ensuring no loss of concentration, and for that to sit within an auditable framework of regulation strikes us as an extremely tall, expensive and, frankly, as matters stand, implausible, order.*

B.3 BIBA added:

> *Remote driving is untested on public roads and we perceive that public awareness of remote driving is currently very low and safety concerns may be a barrier to acceptance of the technology. We believe that insurance capacity to support this new technology is also very likely to be a barrier – at least in the short term and until safety concerns are overcome.*

## POTENTIAL BENEFITS AND RISKS OF REMOTE DRIVING FOR DISABLED PEOPLE

B.4 Disabled Persons Transport Advisory Committee (DPTAC) and Mobility and Access Committee for Scotland (MACS) drew attention to potential benefits of remote driving:

> *DPTAC would like to highlight the potential for remote driving to radically open up the job market for disabled people. Currently many jobs require an element of driving: from carers or child minders who need to go to hospital*

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[1] They were the Parliamentary Advisory Council for Transport Safety (PACTS), DAC Beachcroft, the RAC Foundation, Richard Morris, The Royal Society for the Prevention of Accidents (RoSPA), and the British Insurance Brokers' Association (BIBA).

*appointments or school pick-ups for example. If the 'driving' element of the job could be conducted by remote drivers, more disabled people could work in professions they would be suited to. Remote driving's different set-up to conventional driving has the potential to open up opportunities for more disabled drivers to drive professionally also.* [DPTAC]

*MACS welcomes the value of new technology in helping to remove many of the daily barriers that disabled people face and the introduction of remote driving may introduce opportunities for some disabled people, and this is very much welcomed.* [MACS]

B.5 DPTAC noted that the emergence of remote driving could expand the eligibility of disabled persons to own their own car under the Motability Scheme. They explained:

*… currently some disabled persons do not take advantage of the scheme because they cannot drive. But if a remote driver could help them, they could take advantage of having a personal vehicle.*

B.6 They also highlighted the need to consider ways in which remote driving might affect disabled people differently, and in particular possibly placing them at higher risk:

*… how safe would some members of our communities be - for example Deafblind individuals - if they were unable to detect the vehicle whilst crossing the road – this is already an issue with Electric Vehicles where there is little or no noise.* [MACS]

*The development of remote driving technology must take into account disabled persons both as users of the technology (as 'remote drivers'), passengers in such vehicles, and road users interacting with remotely driven vehicles. It is essential that road safety takes into account disabled persons in each of these aspects of the technology. There is a need to consider safety aspects of remote driving on disabled pedestrians in particular. We are not confident this has been given due consideration. We should in particular look to learnings from other jurisdictions.* [DPTAC]

## THE DISTINCTION BETWEEN REMOTE DRIVING AS AN ADJUNCT TO AUTOMATED DRIVING AND "PURE" REMOTE DRIVING

B.7 Several respondents highlighted the difference between remote driving as an adjunct to automated driving, and "pure" remote driving for non-automated vehicles. Some questioned whether "pure" remote driving could ever be safe. As DAC Beachcroft said:

*We do wish to re-emphasise that non-automated remote driving is fundamentally unsafe for roads and other public places.*

B.8 Similarly, the Association of British Insurers (ABI) and Thatcham Research supported "more robust regulations and clearer guidance on the use of remote driving technologies for automated vehicles for use in specific and limited operational design

domains". However, ABI and Thatcham Research emphasised that they did **not** support "the use of remote driving technologies to control manually driven vehicles".

B.9 Wayve thought that both could be safe, but the two uses of remote driving should be considered separately:

> *Remote driving for long periods of time brings specific risks and should be considered separately to remote driving as an adjunct to NUIC AV operation.... While there are many overlapping issues, we believe these use cases are distinct and necessitate further consideration as separate activities. For example, a national or international standard for all types of remote driving could not be generalised since NUIC operation with remote driving will be under very specific circumstances for limited periods of time which means human factors and staff training differ from remote driving as an end-to-end journey. It's not clear that one licensing regime supports both activities.*

B.10 Richard Morris said that remote driving not associated with automated driving should be confined to direct sight at low speeds:

> *I would suggest that a "remote driver" (with legal responsibility for the dynamic driving task), can only be within direct line of sight of the vehicle and must have direct sight of the intended path of the vehicle. In this case the speed should be limited to walking pace, and the vehicle should come to a direct halt if the remote driver releases the controls or if there is any communication drop-out. The logic for this is that the driver can enter the vehicle and resume normal driving in the case of any control issues.*

B.11 Voysys, a Swedish company that develops software for safe teleoperation went further and argued that removing in-vehicle safety drivers is necessary for automated vehicles to be commercially viable and productive. It noted that the ability to exert remote direct control is helpful when encountering unknown use cases:

> *Our customers are usually deploying with one remote safety driver per vehicle in confined areas, then gradually moving into higher degrees of full autonomous driving. Such an approach must be possible also on public roads for economical deployment of autonomous services/fleets. It takes too much time and effort to cover for all edge cases using physical safety drivers.*

## WHAT IS "REMOTE DRIVING"

### Q1: Do you agree with the following tentative definitions?

**(1) A driver is an individual who performs all or any of the following tasks:**

**(a) steering (lateral control);**

**(b) braking, removing a brake, or accelerating (longitudinal control); or**

**(c) monitoring the driving environment with a view to responding to objects or events by exercising lateral or longitudinal control (provided that this activity is safety critical).**

**(2) A remote assistant is not a driver if they do not exercise direct longitudinal or lateral control, but only advise an automated driving system to undertake a manoeuvre.**

**(3) For the purposes of this project, a "remote driver" is a driver who is outside the vehicle and who uses some form of wireless connectivity to control the vehicle (covering both in or beyond line-of-sight).**

B.12 In all, 28 people answered this question. A narrow majority agreed with the definitions in the Issues Paper.[2] However, the issue generated considerable debate. Several respondents thought that a driver should perform all the listed tasks – not simply any of the tasks. Furthermore, the distinction between a remote assistant and a remote driver proved to be particularly controversial.

### Agreement

B.13 Those who agreed with our definitions saw them as consistent with other terminology, including the SAE terminology, the Road Traffic Act and our definition of when a vehicle drives itself. The Society of Motor Manufacturers and Traders (SMMT) said:

> *We agree with the definitions above. The control and monitoring tests, as represented by (1) above, are key to determining who is considered as the driver of a vehicle at any given time. In the context of automated vehicles, a vehicle that is "driving itself" is operating in a mode in which it is not being controlled, and does not need to be monitored, by an individual. As such, we wish to emphasise that remote driving, or teleoperation, is not automated driving, as it does not pass either of the control or monitoring tests.*

B.14 The Royal Society for the Prevention of Accidents (RoSPA) observed that the proposed definitions were consistent with the Road Traffic Act 1988 and the SAE Taxonomy J3016.[3]

B.15 Reed Mobility pointed out that, once a person is considered to be driver, they have greater responsibilities. However, our definitions were a useful summary of who should be considered a driver in the first place:

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2 16 respondents agreed with 1(1), 15 agreed with 1(2) and 18 agreed with 1(3). 11 people answered "yes" to all three sub-questions.

3 Society for Automotive Engineers International (SAE), J3016 Taxonomy and Definitions for Terms Related to Driving Automation Systems for On-Road Motor Vehicles (April 2021) (SAE Taxonomy J3016).

*Of course, the responsibilities of a driver extend beyond those listed - for example, checking the status of the vehicle before starting a journey, ensuring younger passengers are securely accommodated within the vehicle etc. - but as a quick definition of what the dynamic driving task entails, the proposed points are a good summary.*

### *All* of the tasks rather than any of the tasks

B.16 The Academy of Robotics recommended that a person should only be defined as a remote driver if they exercise **all** the functions listed in Question 1(1). They thought that to be a driver, an individual "must have both longitudinal and lateral control and must exercise this control with a clear understanding of the environment". Furthermore, "in order for a remote driver to exercise control rather than simply executing an action, they must also be monitoring the driving environment to be able to determine an appropriate response". Accordingly, the Academy of Robotics submitted that "actions such as braking should be considered as interventions rather than control."

B.17 StreetDrone also criticised the extension of the definition of "driver" to an individual who performs "any of the following tasks". StreetDrone observed that under the proposed definition "someone who removed a brake" would be a driver and explained that "in certain circumstances this role might be fulfilled by someone simply dispatching vehicles, who then takes no further driving roles."

B.18 Transport for London (TfL) made a similar point. They referred to recommendation 10 of the Automated Vehicles joint report, which reads "can drive itself safely and legally even if an individual is not monitoring the driving environment, the vehicle or the way it drives":

> *This definition implies that the term 'drive' encompasses all elements of the dynamic driving task. However, the definition of driver offered above relates to 'any or all' of the listed tasks. This has the potential to create confusion, particularly around the use of AVs. We would welcome further clarification on this.*

### The example of aviation

B.19 The NCC Group thought that the relevant legal definitions should be aligned as far as possible with definitions for remote operation of unmanned aerial vehicles, as set out by the UK Civil Aviation Authority:

> *The CAA definition of a "remote pilot" – an individual who (i) operates the flight controls of the small unmanned aircraft by manual use of remote controls, or (ii) when the small unmanned aircraft is flying automatically, monitors its course and is able to intervene and change its course by operating its flight controls – could be easily adapted to a "remote driver" of road vehicles.*

B.20 The 5G Automotive Association referred to its White Paper on Tele-operated Driving.[4] Here Tele-operated Driving means that part or all of the tasks in the act of driving a vehicle are performed by a remote operator, usually over wireless communications.

### The difference between the definition of a driver and the responsibilities of a driver

B.21 Some respondents expressed concerns about the proposed definitions of remote drivers and instead focused on the responsibilities which should apply to such individuals. For example, Shoosmiths was concerned that our definition might conflict with existing legislation:

> *Instead we suggest that the definition of a driver and the tasks they perform should conform with the driver maintaining control as per reg 104 of the Road Vehicles (Construction and Use) Regulations 1986:*
>
> *"No person shall drive or cause or permit any other person to drive, a motor vehicle on a road if he is in such a position that he cannot have proper control of the vehicle or have a full view of the road and traffic ahead."*
>
> *As such the "driver" is the person with proper control of the vehicle (even if this does not limit to specific tasks in the proposed definition which might be conducted by driving assist technology).*

B.22 Shoosmiths suggested that under regulation 104, "the remote assistant would need to have a full view of the road to be a driver" and that introducing the concept of "beyond line of sight" would not assist as an alternative but would instead "run the risk of complication of a framework that is fit for purpose".

B.23 TfL was concerned with the third limb of the proposed definition of a driver in sub-question 1(1)(c), which they thought should be explicitly stated in type approval and/or authorisation requirements:

> *If a driver is defined as a person who is monitoring the driving environment with a view to responding by exercising lateral or longitudinal control, as part of type approval (and self-driving authorisation if applicable) it would need to be explicitly stated that a remote driver (or driver) is required to monitor the driving environment and that this activity is safety critical.*

B.24 TfL further criticised the definitions of a driver and remote driver proposed in sub-questions 1(1) and 1(3) on the grounds that "they ignore the non-dynamic elements of the driving task and perhaps need a greater level of detail":

> *The Law Commission's Automated Vehicles: joint report looked at other responsibilities that ordinarily fall to the driver but are outside the dynamic driving task. These include for example having appropriate insurance, maintaining the vehicle in a roadworthy condition and ensuring child passengers wear seatbelts. Whilst the intention may be that these*

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4 5G Automotive Association, *Tele-operated Driving Use Cases, System Architecture and Business Considerations* (December 2021), https://5gaa.org/wp-content/uploads/2021/12/5GAA_Tele_operated_Driving_White_Paper.pdf.

*responsibilities lie elsewhere it would be useful to have some mention of them within the initial definitions.*

### An individual

B.25 Richard Morris objected to the specification in sub-question 1(1) that a driver must be an "individual". He thought that an automated system should also be considered a driver.

### Monitoring without intending to exercise lateral or longitudinal control

B.26 Oxbotica said that there seemed to be a gap in the proposed definitions "for a remote operator who must constantly monitor the performance of the DDT on safety grounds, but who does not have direct longitudinal or lateral control." The company said that an example of this role would be "a remote operator who must flag any obstacles in the forward view that have been missed by the perception system". Such a person would not be a remote assistant, because they would be required to constantly monitor the driving environment. On the other hand, they would not be a remote driver either under the proposed definition, because they would not have the ability to exercise lateral or longitudinal control.

B.27 Oxbotica suggested that there may be use cases in which such forms of remote operation are safe and beneficial. Oxbotica's preferred solution was to remove the idea that monitoring the driving environment must be with a view to responding to objects or events by exercising lateral or longitudinal control. Instead, it should include anyone who monitors the DDT "with a safety responsibility to intervene in certain situations".

B.28 Secondly, Oxbotica questioned the reasoning behind the excluding of wired connections from the proposed definition of a remote driver, which the company argued "should be included for completeness". Oxbotica suggested two potential reasons why a wired connection might be used: first, "to recover a vehicle following a collision or breakdown"; second, to trail a reinforced wire from an AV to an operator in a follow-car, if there was an advantage to this.

### Monitoring with a view to exercising control

B.29 Trilvee were particularly concerned that our definition of a driver included someone who monitored the vehicle while "only exercising control in safety critical situations". They thought that this could create confusion with the role of a remote assistant.

B.30 DAC Beachcroft made a similar point. They did not regard a person who only monitored the vehicle to be a driver. Instead, the status of a remote assistant should only change to that of a remote driver at the point at which the remote assistant "assumes lateral or longitudinal control of the vehicle". DAC Beachcroft stressed that "if the remote assistant is actively monitoring the operational driving domain in real-time and *overrides the ADS*, then by definition the 'remote assistant' becomes a 'remote driver'" (emphasis added).

## THE DISTINCTION BETWEEN REMOTE DRIVING AND REMOTE ASSISTANCE

B.31 The distinction between remote driving and remote assistance was particularly controversial. Two people expressly disagreed with the proposed definition of a

remote assistant and eight answered “other”. Those expressing concern came from a range of backgrounds. The group included five OEMs, developers or industry associations, two legal respondents, two road safety groups, two insurance bodies, one transport authority and one private individual.

B.32 Some respondents agreed with the distinction but emphasised that it must be clear:

> *We agree with the proposed definitions. Regulations should clearly define the responsibilities and accountability of both remote assistants and remote drivers.* [Sustrans]

B.33 Others thought that tighter definitions were required:

> *In principle we agree with (2) but would observe that much hinges on the interpretation of ‘advise’ i.e. is this simply data or could it carry some degree of control (which we can see is not the intention)? This is something you discuss but probably requires very tight legal definition.* [RAC Foundation]

> *Further definition is needed… How would the self driving software interpret the remote driver's guidance and what priorities are given to human instruction vs self-drive software.* [Charles Puckle]

> *In the interest of safety of all road users, the definition of remote assistant should be very clear and should describe what level of ‘advice’ a remote assistant could give an ADS beyond which their actions would amount to remote driving. This should also consider the frequency of intervention and how much discretion an ADS has to accept or ignore this advice.* [TfL]

B.34 MIB called for more precision in the proposed definition of a remote assistant, to make it possible to identify the exact moment at which a remote assistant “advising” an ADS intervenes to take control of the dynamic driving task and becomes a remote driver. They thought that such clarity would be important to identify whether the ADS or remote driver was in control of an uninsured vehicle when it was involved in a collision.

### A challenging distinction

B.35 TRL largely agreed with the definitions but thought that “some use cases and technologies may challenge them”:

> *Someone monitoring the road environment with a view to proactively identify a hazard and command an AV to conduct a Minimum Risk Manoeuvre could be considered a remote assistant. They are only advising the AV to conduct an MRM but the ADS would still observe the environment and exercise control over the vehicle. However, if the design of the system is such that the MRM is simply an emergency stop function, it could be argued that the person monitoring the system is seeking to exert longitudinal control and is thus a remote driver.*

B.36 The Academy of Robotics wanted to clarify that a remote assistant does not exercise control. The company said that it would only consider a person to be a remote assistant if:

*"the A.I/AV has no conditions or checks within the software which would mark the assistant's trajectory as a higher priority than the AI/AV's own internal calculations"; or*

*"the suggested trajectory wouldn't be automatically implemented by the AV, but rather only provides a probabilistic alternative which gets processed by the AV software".*

B.37 However, Oxbotica explained that remote drivers, like modern in-vehicle drivers, do not control vehicles directly. Instead, they said that "there will be electronic systems between the remote driver's input device and the actuators":

> *For example, AEB would mean the remote driver does not have full and direct control of the brakes, as the brakes will sometimes be actuated without being commanded by the remote driver. With current production vehicles, increasing use of drive-by-wire means that even in-vehicle drivers are only advising electronic systems on how to steer and brake the vehicle. Ideally there should be a clear dividing line where electronic modification of inputs means a remote driver is actually advising an ADS, rather than having control of steering and/or braking.*

B.38 The difference between advice and control is less clear than first appears.

### Should a remote assistant be liable for their actions?

B.39 As remote assistance is a safety-critical function, some questioned whether remote assistants should be held personally liable for advising an ADS to undertake unsafe manoeuvres:

> *If an ADS requests input from a remote assistant about a hazard, for example flood water, and the remote assistant assesses and gives an instruction to the ADS that the hazard should be driven through, what responsibility should a remote assistant have for any injury or damage arising from the decision?* [BIBA]

B.40 Oxbotica also emphasised that remote assistants may give safety-critical advice. They argued that it should be "explicitly stated that advice from remote assistants may still be safety-critical (for example, almost any explicit path provided to the ADS is safety-critical)". Therefore:

> *If remote assistants are guilty of wilful misconduct or gross negligence, they should be subject to legal redress.* [Oxbotica]

B.41 DAC Beachcroft emphasised that a remote assistant could be held liable though a secondary claim under the AEVA if they had advised the ADS to undertake a manoeuvre when it was unsafe to do so.

## Pavement pods

### Starship

B.42 Starship said that its operating model is crucially different. It did not see its pods as road-based vehicles.[5] Instead, its fleet of personal delivery devices (PDDs) primarily operate on pavements, are lightweight, low speed and low risk. They operate autonomously in 99% of cases, with "remote operation" solely a "back-up function":

> *PDDs serve various purposes including the delivery of supermarket or e-commerce purchases over a distance of approximately 3-5 kilometres to the recipient. The PDDs travel on six wheels and at an average speed of 3.7mph along pedestrian pavements and public footpaths, delivering primarily groceries and food to their allotted destination. During a delivery journey a PDD might need to cross a public road at an appropriate place (for example, a zebra crossing) and these are the only situations whereby a PDD would be located on a public road (as opposed to a pavement or footpath).*

B.43 Starship argued that that "the distinction between a remote 'assistant' and a remote 'driver' should lie in the level and scale of intervention by a human operator in the dynamic driving task as opposed to simply the categories of action undertaken by a remote assistant". As their operators took control so rarely, they should not be treated as remote drivers:

> *Specifically: (a) the PDDs are 99% autonomous and the primary method of delivery is autonomous-based via the PDD's automated driving system ("ADS"); and (b) Starship's operating model is not built around the PDDs being driven remotely by human individuals. On occasion, where a PDD encounters an issue on a journey, Starship operates a field operation centre (based in Estonia) whereby a human back-up assistant – known as a Remote Assistant ("RA") – can remotely assist the PDD to complete the journey. Starship's PDDs have operated over 1.7 million miles in the UK to-date. Approximately 14 miles in every 1,000 miles travelled by a PDD requires assistance from a RA in the form of authorising/pointing the ADS to move or navigate the PDD to a specific point on a map. Further, approximately only 1 mile in every 1,000 miles travelled by a PDD requires intervention by a RA in the dynamic driving task. This can include, for example, steering around an obstacle or dealing with an unforeseen circumstance such as pavement works or flooding. Other forms of intervention can include (for example) checking a crossing and confirming to the PDD that – using the ADS – it is safe to proceed (this is nothing more than giving a 'green light' to the PDD).*

B.44 The company further added that it was "committed to reducing the number of journeys that require remote assistance further as automation and machine learning develops."

B.45 Starship criticised the proposed definitions of "driver", "remote assistant" and "remote driver" on the grounds that although its remote assistants are only rarely required to intervene in the dynamic driving task, these would make them subject to all the

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[5] Starship's view of what constitutes a road differs from that set out in the AV report – which regards a public pavement as a road.

responsibilities of a driver. Starship argued that a more effective definition of a remote assistant would be as follows:

> *A remote assistant is not a driver if their primary function is to advise an automated driving system to undertake a manoeuvre (including for example 'green light' crossings) or only exercise direct longitudinal or lateral control in cases of ADS failure, other unforeseen circumstances or emergency.*

Starship argued that this definition would also offer the benefit of encouraging "further technological and economic investment into the UK as the field of automated and remote operation develops".

B.46 Similarly, Einride wrote that its "remote pod operators" would not conduct the dynamic driving task in "nominal" operations:

> *At Einride we use the term "remote pod operator (RPO)" to describe this function; the primary role of the RPO is to supervise the ODD conditions during operation, and provide assistance to the ADS through suggested inputs during operations, particularly if they've encountered a situation the ADS cannot handle. In nominal operations, the RPO does not conduct the DDT on public roads.*

### The ratio of remote drivers to vehicles

B.47 Oxbotica pointed out that two drivers might drive a single vehicle:

> *We would like it clarified that there can be more than one driver at once for a vehicle (for example, two safety drivers each with e-stops but having different views of the environment).*

B.48 John Rainbird also thought that the regulation of remote driving should allow for the possibility of two drivers at once. Referring to the discussion of a steersman in Appendix 1, he commented that "the role of steersman is alive and flourishing" and "RTA 1988 192(1) is not out of date":

> *Although this referred originally to older, steam-driven vehicles, the distinction is still valid. Some articulated lorries have steerable wheels at the rear end of the trailer operated by a steersman. He/she moves around at the rear and sides of the trailer controlling the lateral movement with a games-style controller which is connected to the trailer by cable or wireless.*

B.49 TfL was particularly concerned that a remote driver could drive more than one vehicle at once. They suggested that the definition of a "remote driver" should specify that "there needs to be a 1:1 relationship between a remote driver and a vehicle".

B.50 On the other hand, TRL thought that a single person may monitor several vehicles at once with a view to taking control:

> *The 'one to many' relationship between remote drivers and remotely driven vehicles is likely to present a challenge. One could foresee a situation in a remote operations control centre where a handful of employees are monitoring many vehicles with the intent to take control. At one time, multiple*

*operators could be seen to be fulfilling the 1(c) condition at the same time until one of them actually takes control. If a collision occurs, which driver/operator would be seen as potentially liable in this case?*

# Section C: Construction and use regulations

C.1 In Chapter 3 of the Issues Paper we noted that there was no specific requirement for a driver to be in the vehicle. However, some of the requirements set by the construction and use regulations were difficult to apply to remote driving and had uncertain effects. We asked if this caused difficulties in practice.

C.2 We then outlined how developers could obtain exemptions from construction and use regulations. General exemptions for trials are available under the Road Vehicles (Authorisation of Special Types) (General) Order 2003 (STGO). Alternatively, developers can apply on a case-by-case basis for a "Vehicle Special Order". We asked if these exemption procedures were easy to navigate. We also sought views on whether any construction and use requirements should be maintained in the interests of safety.

## PRACTICAL DIFFICULTIES

### Q2: Do uncertainties surrounding construction and use provisions cause difficulties in practice? We are particularly interested in whether uncertainties over regulations 104, 107 or 110 are delaying trials or making it more difficult to obtain insurance.

C.3 Out of the 16 respondents who answered this question, seven thought that construction and use regulations were causing difficulties in practice.

### Problems in practice

C.4 Responses focused on the uncertain application of construction and use provisions. ABI and Thatcham Research said that insurers were turning down requests to insure automated vehicle trials without a safety driver because of the uncertain legal position:

> *Certain companies in the UK have already approached our members to try to secure insurance for automated vehicle trials without a safety driver in the driver's seat and instead being controlled remotely. However, there is a lack of clarity and no Government guidance to set out the legality of such a trial. While the consultation does point to Regulations 104, 107, 109, and 110, the applications of these provisions to remote driving is uncertain. Several insurance companies have had to turn down these opportunities and would continue to do so without greater legal protection or clarity from Government.*

C.5 Oxbotica said that trialling organisations (TOs) face "a time-consuming and costly process" to prepare for trials of a self-driving vehicle with a remote safety operator:

> *Effort needs to be made to understand the existing regulations and potential non-compliances due to the remote driver, to develop safety practices to ensure mitigations for those non-compliances, and most importantly to then ensure the trial can proceed legally. This requires consultation with expert lawyers and the relevant government authorities; however, even then the TO does not have absolute assurance that any particular trial is compliant with the law.*

C.6 They pointed out that "the government and its agencies cannot offer legal assurances, as the ultimate arbiter is seen as the courts". Similarly:

> *Expert lawyers cannot provide a definitive answer on how the courts will interpret laws that did not envision remote driving when they were written, due partly to the lack of relevant case law. The novelty of a remote driver also makes it unclear what deviations from the C&U regulations are significant enough to require a VSO, and which can be covered by the STGO.*

C.7 Oxbotica said that, as a result, trialling organisations spent "significant time and money" on every remote operator trial and still faced a risk of legal non-compliance. The uncertainty was also making it harder to obtain insurance for trials.

C.8 StreetDrone agreed that uncertainty is hindering progress within the industry:

> *To date we haven't experienced difficulties in testing and trials, as all activity has been completed with safety drivers. That being said there is uncertainty within the industry which is undoubtedly delaying some progress towards fully driver-out trials.*

### No experience of difficulties

C.9 By contrast, Imperium Drive and ITS UK said that construction and use regulations were not causing difficulties in practice:

> *We are currently not affected or inhibited because of these regulations.* [Imperium Drive]

> *We are not aware of any concrete examples of this. It would appear that the powers available to grant exemptions are sufficient for now.* [ITS UK]

C.10 TRL mentioned "a much more pressing issue that may delay trials". The liability of remote drivers for risks outside their control could dissuade people from taking up the role:

> *Currently, a remote driver in a trial accepts all liabilities a driver would in the event of an at-fault collision. However, for remote driving many failure modes of the system and operations sit outside of the driver's control and responsibilities. This includes latency issues, improper training, improper control equipment, etc. There are concerns currently that those accepting remote driving responsibilities are not adequately informed of the extent of their liability. Furthermore, if they are aware, the significant risks that sit outside of their control that they are liable for may dissuade people from taking on remote driver responsibilities which may prevent trials from ever progressing.*

### Comments on specific regulations

#### Regulation 104

C.11 Regulation 104 requires a driver to be in a position to have proper control of the vehicle and a full view of the road ahead. Eight responses discussed problems caused by this provision.

C.12 TRL highlighted the uncertainty of the phrase "full view of the road ahead":

> *We agree that there is uncertainty as to how a full view of the road ahead would be determined for a remote driver. When this wording was created for regulation 104, there was no need to consider the effect of network latency, image quality, and camera position which are likely to affect a remote driver's view. This uncertainty is likely to make obtaining insurance difficult*.

C.13 Other stakeholders were more concerned about the uncertain meaning of "proper control". They called for greater clarity about how "proper control" applies to remote driving:

> *As regards Construction and Use Regulation 104, we think any uncertainty is likely to accrue more towards the definition of "proper control" rather than "full view of the road and traffic ahead"… . While we do not think there needs to be an amendment to the Regulation, we believe it would be helpful to clarify what amounts to proper control and whether a person undertaking only part of the driving task is deemed to have proper control of the vehicle.* [SMMT]

> *We don't believe that regulation 104 needs amending. We do however think that there will be specific requirements for remote driving that ensure an ERDO can evidence proper control and view of the road ahead.* [Wayve]

> *To meet the requirements of regulation 104, "proper control" must be defined, to clarify if someone who has responsibility for only some of the driving task is in control of the vehicle.* [RoSPA]

C.14 Trilvee expressed concern about how regulation 104 can be complied with during an "e-stop":

> *To illustrate, in our use case, r104 would be complied with under normal operating circumstances, however in the event of a latency spike or signal degradation, the system automatically detects insufficient performance for safe remote driving and effects an 'e-stop' where the hazard lights are activated and the vehicle firmly brakes (including parking brake) holding course. If the connectivity returns to suitable quality, which can be in less than a few hundred milliseconds, the remote operator can resume control of the vehicle. During the period that the e-stop is active r104 may not be complied with.*

### Regulation 107

C.15 Regulation 107 makes it an offence to leave a vehicle on a road unattended unless the engine is stopped and the parking brake applied. Seven responses discussed this provision, with several of the responses asking for clarification and/or amendment.

C.16 The Society of Motor Manufacturers and Traders (SMMT) thought that regulation 107 would be the most challenging provision for remote drivers to comply with:

> *If, as paragraph 3.22 of the Issues Paper suggests, "attended" means there must be a person able to have a reasonable prospect of preventing interference with the vehicle, it is difficult to see how a remote driver, who*

*though is able to observe the vehicle, could reasonably prevent someone interfering with the vehicle, apart from simply driving away.*

C.17 Wayve also thought regulation 107 required amendment:

> *Regulation 107: This regulation may need amending to apply to automated vehicles. If "attended" also means there should be a person able to have a reasonable prospect of preventing interference with the vehicle, "reasonable" will need clarity in the case of remote driving where the individual operating the vehicle has limited options for this.*

### Regulation 109

C.18 Regulation 109 makes it an offence for a driver to be in a position to see a screen displaying non-driving related information.

C.19 Only three responses specifically addressed regulation 109. The SMMT were "not overly concerned about remote driving's compatibility" with this regulation. Instead they thought that the information a remote driver is permitted to see on a screen should mirror conventional driving. However, the SMMT expressed greater concern around information remote drivers might view on other screens. They thought this risk should be addressed through regulation of the ERDO:

> *We are more concerned about the risk of remote drivers viewing non-permitted information on brought-in screens, including personal devices, hand-held or otherwise. It is more difficult to enforce the law when such illegal activity is performed remotely out of public sight. This requires strong governance on the part of the remote driving operator, for example by way of real-time monitoring of the remote driver's behaviour, which is why we support the proposal for greater regulation by creating an Entity for Remote Driving Operation (ERDO).*

C.20 The Academy of Robotics detailed a specific concern: is a safety driver allowed to tag objects on a screen while they are driving? They explained that when the automated driving system misinterprets a complex image (such as a reflection on a windowpane) it shows the safety driver the relevant frame and asks for clarity. By "tagging" a section of the camera feed, a "skilled operator" and safety driver within an AV marks it for further analysis by a team monitoring the AV remotely from a command station. They said that the action of tagging is "often only a single tap that is performed in less than a second".

C.21 The Academy of Robotics stressed that the ability of a safety driver to devote more of their attention to tagging objects is highly dependent on where the AV is driving:

> *When we are confident that minimal intervention is required, we increase the level of autonomy and can increase the focus on tagging… . We don't do this in a busy city environment, but for instance on a route near our HQ in rural Norfolk, which the AV is familiar with, we can tag objects or features such as Chinese water deer which the AI hasn't seen before.*

C.22 The Academy of Robotics said that when an automated driving system asks for clarity in relation to an uncertain image (e.g. whether feet underneath a vehicle are the feet

of a badger or a child), it may need an immediate "yes/no" response to continue. In other cases, tagging the image immediately avoids the laborious exercise of sifting through hours of footage, which would be subject to the flaws of human memory.

C.23 The Academy of Robotics explained that at present, regulation 109 requires the company to perform the tagging process through physical buttons rather than on screens, despite the advantages of using digital buttons on a screen:

> *The use of screens rather than manual buttons enables us to capture digitally what action has taken place, when and which part of the observable scene it occurred in, via a smooth seamless process that doesn't hinder driving.*

C.24 Furthermore, annotating data afterwards incurs delay, expense, and loss of contextual information:

> *Waiting for the end of the route, uploading data, downloading annotations and re-testing them on the route means what could have been completed in a few hours by a single trained staff member now becomes a multi-team job spanning multiple days. This also doesn't solve the issue of real-time trajectory aids and information lost due to the annotator not being "part of the environment".* [Academy of Robotics]

C.25 To address these difficulties, the Academy of Robotics suggested that regulation 109 should "make a distinction between a highly trained safety driver and an ordinary driver". Although the company stressed that it would not recommend that "anyone" be permitted to touch screens in the way it described, it submitted that "specially qualified people" should be permitted to do so "with appropriate fail-safes and levels of autonomy in place".

### Regulation 110

C.26 Regulation 110 prohibits the use of hand-held mobile phones or other interactive communication devices while driving.

C.27 Only five responses referred to regulation 110, and no one thought that it required amendment. Wayve thought that the use of hand-held devices by remote drivers should be a matter for the ERDO licensing scheme:

> *In the same way as a driver in the vehicle is prohibited from using a mobile phone, a remote driver should also be prohibited. The ERDO will have to demonstrate robust training and governance to ensure remote drivers are not distracted, by handheld devices or otherwise.*

## Other construction and use regulations

C.28 Two developers (Trilvee and Oxbotica), referred to other construction and use regulations which may cause difficulties in practice in relation to remote driving:

> *We also wonder if regulation 30 is relevant (assuring the design of the vehicle permits a full view of the road)?* [Oxbotica]

*There may be potential questions as to whether in an unrecovered failover e-stop the vehicle may not be compliant with r103 (albeit for safety reasons).*[6] [Trilvee]

## EXEMPTION PROCEDURE

### Q3: Are the various exemptions easy to navigate, or do they put any unnecessary obstacles in the way of trialling new forms of vehicle?

C.29 Only 13 respondents answered Question 3. Two people said they were not aware of any difficulties:

> *The exemptions appear easy to navigate.* [Charles Puckle]
>
> *We are not aware of any examples of difficulties with this.* [ITS UK]

C.30 However, four respondents (Trilvee, Oxbotica, ABI and Thatcham Research and Clyde & Co) answered emphatically that the exemptions are not easy to navigate.

C.31 Oxbotica said that further guidance was needed beyond the updated CCAV Code of Practice to address the following issues:

(1) the vehicle categories for which the exemptions can be used;

(2) whether exemptions can be used for vehicles which do not correspond to an existing category;

(3) the "implications with respect to services (e.g. a trial passenger service)"; and

(4) "examples or guidance on the justifications that would be needed to obtain exemption from regs 104, 107 and 109."

C.32 Trilvee said that the STGO should be extended beyond technical testing to commercial trials:

> *Discussions with the VCA suggested even they had uncertainty over the applicability of STGOs for anything other than very low numbers of prototypes for technical testing. VSOs can provide for a reasonable number but are cumbersome to apply for. It would seem sensible for STGOs scope to be clarified to extend to on road vehicle trials (including commercial trials) up to a certain number of vehicles.*

C.33 Two stakeholders raised concerns that the STGO does not permit "special vehicles" used in tests and trials from carrying "any load" or transporting "goods or burden". This was perceived as a restriction on the trialling of both automated and remotely driven vehicles:

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6 Road Vehicle (Construction and Use Regulations) 1986, reg 103 covers obstruction. It reads: "No person in charge of a motor vehicle or trailer shall cause or permit the vehicle to stand on a road so as to cause any unnecessary obstruction of the road."

*We observe in paragraph 3.54 of the Issues Paper that the Special Types General Order prohibits trial vehicles from carrying "any load" or transporting "goods or burden" other than its own necessary gear and equipment. This could mean it may not be possible to trial remotely driven goods delivery vehicles with actual goods on board.* [SMMT]

*We do not have experience to comment in detail. However, the Special Types General Order prohibits trial vehicles from carrying "any load" or transporting "goods or burden" other than its own necessary gear and equipment. This would limit remote driving for AV trials. We do not support an exemption which relies on a case-by-case basis without clear guidance.* [Wayve]

### Concerns about extending exemptions

C.34 Other respondents used this question to highlight their concerns about extending exemptions to permit remote driving.

#### Limiting the use of exemptions to trials

C.35 TRL, the Parliamentary Advisory Council for Transport Safety (PACTS) and Charles Puckle said that exemptions from construction and use regulations should only be permitted for the purposes of tests and trials:

*Given that the regulations in question set a standard for safety, exemptions from their requirements are likely to result in reduced safety performance. This may be permissible in a trial scenario where exposure is limited, and risks may be more carefully managed. However, in a deployment scenario that may run indefinitely it does not seem acceptable to allow commercial operators to get exemption from safety requirements indefinitely. This could erode public trust in the management of remote driving technology if safety standards are lowered compared to conventional driving.* [TRL]

*There should be a distinction between trialling and real-world use, if some exemptions are put in place for the purpose of trials then it would be under defined circumstances and will be different from the regular operation.* [PACTS]

*The exemptions appear suited to the testing of new and emerging technology only at this stage.* [Charles Puckle]

#### Maintaining safety for trials

C.36 Several respondents stressed the importance of maintaining safety standards, even for trials:

*We are more concerned about the adequacy of current regulations than with delays to trials … . Whilst some modifications to regulations may be needed for practical reasons, in principle any trials should work at least within the levels of safety assured by existing regulation, not any relaxation*. [Sustrans]

*We do not believe in stifling innovation, but safety must be taken into account before any further exemptions are considered … . A safety case must be supplied and a strong case for being exempt from the requirements of the*

*construction and use regulations should be provided by the developer who wishes to trial the vehicle* [RoSPA]

*PACTS strongly suggests that all the basic type approval standards should be maintained for remote-driven vehicles and the highest standards of safety systems available in the market should be mandated on the base vehicle to be used for remote driving.* [PACTS]

C.37 DAC Beachcroft argued strongly that construction and use regulations should extend to trials and if remote driving is not compliant with them the safety of the very activity should be questioned:

*We maintain that a 'safety first' approach is of paramount importance. The Road Vehicle (Construction and Use) Regulations 1986 exist to promote safety on our roads, and they should extend to trials and demonstrations of remote driving, except where exemptions already exist for specialist and novel categories of vehicle … . Regulations 104, 109 and 110 were designed to keep road users safe, and the fact that remote driving (as opposed to remote supervision of automated vehicles in a testing environment) would conflict with them indicates that remote driving is inherently unsafe.*

### Pavement pods and the exemption procedure

C.38 Starship explained that to trial its personal delivery devices (PDDs) the company had entered into agreements with local authorities. It did not consider exemptions from construction and use regulations necessary as it did not regard PDDs as "vehicles". However, Starship stressed that if PDDs were to be seen as "vehicles" in law, it would object to them being subject to construction and use regulations. Instead, Starship proposed that primary legislation "clearly defines PDDs (and similar devices) as separate to motor vehicles":

*Starship considers that the most effective national framework for the regulation of PDDs (and similar devices) can be achieved through the introduction of primary legislation that clearly defines PDDs (and similar devices) as separate to motor vehicles. If PDDs were to be considered motor vehicles, the RVCU Regulations would place onerous restrictions on devices that pose far less risk and travel at far lower speeds than conventional vehicles.*

C.39 If primary legislation was not possible, Starship suggested a possible short-term measure along the lines of the exemptions provided to e-scooters trials:

*Starship notes that some of the current E-Scooter Trials in the UK have been made possible due to a subsisting VSO – for example, the Oxfordshire Trial was subject to the conditions under the E-Scooter Trial Order 2022 … . Importantly, E-Scooters are not considered vehicles under the scheme and it is not necessary to register the E-Scooter with the DVLA.* [Starship]

C.40 Starship went on the say that "an application for a VSO might be a possible short-term option regarding the operation of PDDs (including on public roads)", although its preference was for legislative reform.

## MAINTAINING CONSTRUCTION AND USE REGULATIONS

### Q4: We seek views on whether any particular construction and use provisions should be maintained in the interests of safety, even for trials and demonstrations.

C.41 A total of 18 people answered this question. Just over half (that is, 10) identified specific construction and use regulations that they thought should be maintained in the interests of safety.

C.42 Two respondents (The Royal Society for the Prevention of Accidents (RoSPA) and Starship) said that regulation 100 should be maintained in the interests of safety. This specifies that vehicles must "at all times be in such condition … . such that no danger is caused or is likely to be caused to any person in or on the vehicle … . or on a road".

C.43 Five respondents stated that regulation 104 (or a wider requirement for adequate information about a vehicle's surroundings) should be maintained in the interests of safety:

> *The importance of retaining the requirements for 'full view of the road ahead' and a fulsome and adequate definition of 'proper control' under regulation 104 is critical to the future safety of remote vehicles, whether used in trials, demonstrations or on the public highway.* [RAC Foundation]

> *We consider that Regulation 104, which requires "proper control" and a "full view of the road and traffic ahead" should be maintained, albeit the word "ahead" may sensibly be deleted. Simultaneously, the Regulation could be clarified to clarify that it would be satisfied where a remote driver is using wireless connectivity to discharge obligations, i.e., to maintain "proper control" and ensure a "full view of the road and traffic ... "* [Clyde & Co]

C.44 ITS UK similarly stated that "the principle of having adequate information about the vehicle's surroundings (but via remote monitoring) should be retained."

C.45 Five responses specifically stated that regulation 110 should be maintained in the interests of safety, either completely or in specified circumstances.[7] As NCC Group put it:

> *We would highlight that should Regulation 110 be removed, provisions must be established to ensure that remote drivers are not using a hand-held device (e.g. scrolling through Facebook) when remotely driving a vehicle, other than for the purposes of driving or operating the vehicle.*

C.46 PACTS said that all basic type approval standards should be maintained for remotely driven vehicles:

> *PACTS strongly suggests that all the basic type approval standards should be maintained for remote-driven vehicles.*

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[7] These were the NCC Group, DAC Beachcroft, the SMMT, Wayve and Clyde & Co.

### New construction and use provisions

C.47 Six respondents mentioned new construction and use provisions that should be introduced.

#### Risk mitigation

C.48 Five respondents called for remotely driven vehicles to have systems to mitigate risk. PACTS, RoSPA and the British Motorcycle Federation (BMF) referred to the need for a minimal risk manoeuvre (MRM). Trilvee referred to a "fail to minimum safe state" safety system.

C.49 PACTS said that vehicles used for remote driving "should have at least SAE level 3 autonomy":

> *Depending on the Operational Design Domain (ODD), the remotely driven vehicles should have appropriate features of Autonomous Driving Systems to perform minimal risk manoeuvres in case of any anomaly to ensure the safety of the vehicle, passenger, and other road users.*

C.50 However, in some cases, more would be required:

> *For example, the provisions for remotely driven vehicles designed to provide the shuttle service within the campus will be different from the vehicles intended to be remotely driven on motorways. Therefore, all remotely driven vehicles should have the ability to perform minimal-risk manoeuvres to avoid any unacceptable incident in case of loss of connectivity or any other system/s failure.* [PACTS]

C.51 PACTS concluded:

> *The requirements for the vehicle to be able to perform the appropriate minimal risk manoeuvres will depend on the respective Operational Design Domain and this should be mandated by the regulator.*

C.52 RoSPA suggested that, at a minimum, any vehicles used for remote driving would need to be fitted with Object and Event Detection and Response (OEDR) systems, automated emergency braking and an ADS:

> *It is difficult to envision how a vehicle without, for example, event and object detection system, autonomous emergency braking and automated driving systems could safely be trialled with a remote operator.*

C.53 TRL also mentioned a range of failsafe safety measures:

> *There should be an absolute minimum set which should exceed the safety standard for conventional vehicles. This may then specify ADAS features such as emergency stop functions, Automatic Emergency Braking, Lane Keep Assistance, etc. There may also need to be specific requirements for broad operating environments such as motorways and different use cases such as 'drop-in' remote driving.*

C.54 BMF said that any vehicle used for remote driving should have automated emergency braking. It should also be equipped with OEDR systems similar to those specified in UNECE Regulation 157 for Automated Lane Keeping Systems.

### Other suggestions

C.55 Charles Puckle suggested that remotely driven vehicles should indicate their status to other road users, have audible warnings and include lidar sensors:

> *Other drivers must be able to see and perceive that a vehicle is under remote control. This should not be by flashing lights (blue, green, red and yellow are all taken), perhaps with a fixed roof-level beacon (purple) at the top and corners of the remotely driven vehicle.*
>
> *Remote vehicles should give a distinct warning sound before and about to move from stationary - this could be on a rising pitch basis as the moment of move comes closer. Nearby persons probably need 15s of warning to move out of the way.*
>
> *Remotely driven vehicles must be fitted with level 4 LIDAR sensors to enable the driver to sense the world around them, but we need to get rid of the human drivers.*

C.56 The BMF suggested that in addition to failsafe systems, any vehicle used for remote driving should:

(1) be capable of detecting low-impact collisions to the front, rear and side, including *"*the impact from a bicycle or motorcycle filtering alongside*".*

(2) be equipped with the data recording systems described in the CCAV Code of Practice.

(3) be restricted in their operational design domain:

> *Any vehicle relying on connectivity to manage its movement must be limited to Operational Design Domains with really reliable connectivity. This is by far from being a given in large parts of the UK at present and is unlikely ever to be true for all parts of the UK.* [BMF]

(4) and give remote drivers "appropriate views of the driving environment", including "forward, rear and side views".

# Section D: Civil liability

D.1 Chapter 4 of the Issues Paper considered civil liability. We explained that a remote driver would be obliged to carry compulsory insurance against their own negligence. Furthermore, their employer would be vicariously liable for the driver's negligence and for its own fault in operating the system. However, a victim might find it difficult or complex to obtain compensation in some circumstances. We discussed potential problems if the remote driving system was designed by one organisation and operated by another; or if an organisation subcontracts for remote drivers; or if cyber-attack leads to an untraced or uninsured remote driver causing the harm. We drew a comparison with the civil liability provisions for automated vehicles in the Automated and Electric Vehicles Act 2018 (AEVA).

D.2 In Chapter 4 we asked if remote driving was likely to cause problems for victims. We discussed possible solutions in Chapter 10, at Question 20.

## PROBLEMS FOR VICTIMS

### Q5: Is remote driving likely to cause victims undue delay and expense in claiming compensation; or could it defeat claims altogether?

D.3 31 respondents answered this question, with most respondents arguing that remote driving would cause problems for victims.

### Agreement with the Issues Paper examples

D.4 Many respondents agreed that the examples discussed in Chapter 4 could make civil claims more costly, lengthy and complex:

> *Based upon the description provided in the consultation paper, we agree that it is much too complex and will discriminate against those without larger resources of time, money and skill to pursue claims. We agree that there is a risk that it could defeat claims.* [Sustrans]

> *The evidence and examples presented… indicate that in the event of an incident, remote driving is likely to cause victims undue delay and expense in claiming compensation, as a result of the multitude of organisations potentially involved in the delivery of remote driving (i.e. software providers, sub-contracted remote driving operators etc). It is important that a workable solution is devised to support timely victim compensation.* [RAC Foundation]

> *There is uncertainty as to where the line is drawn between a vehicle driving itself and when is it being remotely operated. This has huge implications for liability especially if the ERDO is different from an ASDE [authorised self-driving entity]. There is also huge potential for organisations to push responsibility for a collision to their supply chain or an individual driver which could significantly delay claims resolution.* [TRL]

> *Given that multiple parties may be responsible for different parts of the overall AV system complications, Academy of Robotics believes that this may lead to complexity in processing claims. It may be necessary to determine where the fault arose within the system before a claim can be processed. It is important to note that the hardware may also have an impact on the performance of the system.* [Academy of Robotics]

D.5 Respondents focused on three issues: latent defects (and the consequent need to consider product liability); connectivity failure and cybersecurity. We consider these in more detail below.

### Latent defects

D.6 The Issues Paper explained that where the injury is caused by a defect in the vehicle, the driver or their employer is normally liable for the accident. However, a defendant may avoid liability for "latent defects" if they show that they took all reasonable care, but despite this the defect remained hidden. We commented that in practice insurers often pay claims where a vehicle defect may be the cause of an accident due to the difficulty in proving a latent defect defence.

D.7 The British Insurance Brokers' Association (BIBA) felt that "the increased complexity of technology might lead to a shift in insurers' attitude":

> *We note that courts tend to set a high bar for a successful defence of latent defects, but the increased complexity of technology might make it difficult for drivers/users to guard against latent defects and lead to a shift in stance by the courts regarding this defence.*

D.8 The Association of Consumer Support Organisations (ACSO) represents the interests of consumers in the civil justice system. It pointed to the difficulties of pursuing claims for product liability:

> *If the driver is not to blame, liability may fall on the manufacturers and technology companies responsible for the vehicle's production and operation. If this is the case, an individual claim against a company or organisation is likely to take a significant amount of time and will be extremely complex for both the claimant and their representatives. This is a significant shift which will undoubtedly affect the claims process and could even lead to an end to the typical 'no win, no fee' arrangements between law firms and their clients.*

D.9 In a detailed response, the Association of Personal Injury Lawyers (APIL) commented on the problems caused by latent defects if "the vehicle's features were designed by one organisation and operated by another":

> *The injured party would need to bring an action against both the manufacturer and the operator, both with better resources to pursue long and complex claims. Product liability claims often result in the claimant being unsuccessful in securing compensation for their injuries due to the manufacturers' ability to fund expensive and complicated litigation both of which create an unlevelled playing field resulting in the claim being unviable for the individual claimant to pursue.*

D.10 APIL commented that problems were exacerbated by "the lack of development in product liability law regarding new technology":

> *The Office for Product Safety and Standards has recognised in a call for evidence response that the current product liability provisions have been unchanged for over 30 years. Thus, the law does not reflect new technologies such as internet-enabled devices, which are complicating how liability can be attributed when something goes wrong. It was also mentioned in the paper that the increasing use of software and emerging technologies in consumer products could make claims even more complex and challenging for consumers to understand.*

D.11 APIL pointed out that for serious injuries, the delay could prevent early access to rehabilitation therapies. For low value claims, it could be disproportionately costly for the claimant to bring a claim at all.

D.12 By contrast, Starship thought existing product liability laws were adequate:

> *Where loss arises because of an issue with remote driving, the current product safety regulatory regime and product liability laws (including, but not limited to, the laws of negligence and strict liability) in the UK provides consumers and affected parties with a number of options to claim compensation.*

### Failures of connectivity

D.13 John Rainbird pointed out that as connectivity does not have absolute standards of quality it may never be possible to show that a network provider was negligent:

> *As the number of customers of a broadband provider increases, the performance can deteriorate for existing customers. Unless the network used for remote driving guarantees always to give priority to remote driving, it may never be possible to prove that their service on a particular occasion was inadequate or negligent or that they broke their contract.*

D.14 Clyde & Co made a similar point:

> *If that loss of connectivity was due to a failure of an entire telecommunication network, fault on the part of an ERDO may be especially difficult to prove. It would be unpalatable to expect an injured party to pursue a claim against a network operator, even if they could establish that a duty of care was owed to them as a road user. Nor would it be desirable for an injured party to become embroiled in multiple party litigation involving claims for contribution or indemnity as between ERDO and network supplier.*

D.15 Richard Morris thought it might be particularly difficult to allocate liability when connectivity "jittered". Here control might pass back and forth between the remote driver and the automation responsible for a minimal risk condition:

> *When the remote driver was driving the vehicle, the ERDO would have legal responsibility and their insurance would need to cover any incidents. When the communications fail, the responsibility would fall to the NUIC operator or*

*the ASDE depending on the split in roles and responsibility. The insurance policy of one or both would be responsible to cover incidents and damages. In reality, those communications will "jitter" and operational responsibility together with insurance liability would, presumably, oscillate between those organisations at the same time as the jitter.*

*The issue is similar to that of L3 handover, but magnified and confused as the repeated changes in responsibility between NUIC operator and ERDO may be random, very fast and highly unpredictable*.

D.16 The Association of British Insurers (ABI) and Thatcham Research also highlighted the possibilities for collisions in the transitions from remote to automated driving:

*There needs to be greater clarity to delineate responsibilities if a road traffic collision were to occur in the transition period between automated driving mode and remote driving mode. This is especially true if the collision were to be caused by an interruption to connectivity or a reconnection which occurs at an inopportune moment putting the ADS or remote driver in a hard-to-respond situation.*

D.17 Clyde & Co took issue with the idea that the victim should be required to prove that the ERDO failed to take reasonable care that connectivity is suitable:

*In a remote diving context, a loss of connectivity, or higher than optimal latency, might lead to accidents, absent a failure on the part of the operator to take reasonable care.*

### Cyber-attacks

D.18 Several respondents expressed concern that the victims of cyber-attacks would find it particularly difficult to claim. APIL outlined the problem:

*It would be difficult to show that the cyber-attack was a result of the remote driving organisation's negligence. The organisation could argue that they have taken all necessary steps by having cyber security software. Once again, this could result in the injured party having to pursue action against both the organisation and the software company.*

D.19 BIBA expressed concern about terrorism, as "remotely driven vehicles would be more susceptible to cyber-enabled terror attacks than conventionally driven vehicles":

*Cyber attacks may or may not be classified as terrorism which is relevant to how insurance policies operate for liability arising from use of a vehicle. For terrorism, the position is complicated and liability for compensation could rest with an insurer or the Motor Insurers' Bureau.*

D.20 The British Vehicle Rental and Leasing Association (BVRLA) worried about "the reputational damage that an incident involving a remotely driven rental vehicle could have on the industry, for example if used in a terrorist attack." They also highlighted the importance of effectively verifying customers:

*As business models evolve and there are fewer face-to-face interactions, it is essential that there is an efficient process in place that will enable companies to verify the driver without delay. We would suggest this is considered as part of any new regulations the Law Commission proposes to uphold safety.*

### Uninsured remote drivers

D.21 The possibility of cyber-attacks gives more prominence to the problem that the driver may be uninsured or untraced. Clyde & Co argued that, where the remote driver was uninsured or untraced, the Motor Insurers' Bureau (MIB) should step in as an insurer of last resort:

> *Irrespective of how remotely driven vehicles are to be regulated, a lacuna would continue to exist where uninsured or untraced claims arise from new and evolving technology such as either AVs or remotely driven vehicles.*

D.22 By contrast, the MIB had concerns about bringing uninsured remotely-driven vehicles within their remit:

> *The MIB would find it unacceptable if the design of the compensation regime for remote driving were to expose the MIB to potentially unbounded strict liability in respect of the uninsured use of remotely-driven vehicles.*
>
> *The consultation paper talks, in Chapter 6, of the difficulties for the police of investigating the full circumstances an incident on UK roads caused by a remote driver based in a foreign country. Similar problems could well occur even when the remote driver is based in the UK, possibly hundreds of miles away from the scene of the incident…. Remote drivers may therefore evade justice in circumstances where a driver who was present at the scene of the incident would be unable to. The full potential implications of this should be taken into account when deciding whether to allow remote driving.*

### Practical problems in pursuing claims

D.23 Paul Erdunast submitted a detailed five-page response analysing practical problems raised by complex or uncertain law. These include:

(1) where there are multiple parties, an adverse costs order may swallow up a claimant's damages;

(2) a liability 'gap' where there are multiple defendants and it is unclear who is at fault, and therefore difficult to prove any defendant was at fault;

(3) a situation where a negligent party may not have public liability insurance, and therefore may not have the funds to pay out a successful claim;

(4) a defendant located abroad may cause problems bringing a claim in the UK, or add to the expense and complexity of a claim causing delays; and

(5) claims may be more expensive due to the need for potentially several expert reports.

D.24 DAC Beachcroft considered how recent reforms could affect claims involving remote driving.

> *A large number of Road Traffic Accidents occurring on or after 31 May 2021 will now be progressed via the Official Injury Claim (OIC) portal process following the whiplash reforms…. A compensator must commit to a liability decision within the [30 day] period or be deemed to admit in default; and all evidence upon which the compensator wishes to rely must be exchanged in the process or be at risk of being disregarded by the court.*

D.25 They explained that 30 days is unlikely to be long enough, with a risk that the claim will be dropped from the process:

> *It would then be placed on an alternative track, and the impact of this upon the claimant is that resolution is likely to be elongated. Additionally, if the claimant was previously unrepresented they may need to secure legal representation, impacting the overall cost of the claim for both parties.*
>
> *OIC has a facility for passing claims between RTA insurers, however the system is not equipped for passing claims onto manufacturers where the incident is caused by the vehicle systems.*

## Data collection, retention and sharing

### Using data to overcome problems in establishing fault

D.26 Some developers argued that data recording could be used to overcome difficulties in establishing who was at fault:

> *Sufficient data is recorded during teleoperation to prove who was at fault, which even speeds up such disputes. This requires defining a standard for data recording and storage for remote driving. We would strongly recommend announcing plans to define such a standard as this would promote UK CAV innovation and growth.* [Imperium Drive]
>
> *We anticipate the data and extensive video recorded during our operations to be useful in determining fault and assisting in any post-incident investigation.* [Einride AB]
>
> *Our initial view is that, if sufficient requirements for data sharing are put in place, there is good potential for claims to be more streamlined given the availability of ground truth data for incidents.* [Oxbotica]

### The need for data standards

D.27 Others stressed the importance of data sharing. The ABI and Thatcham Research said that remote driving for automated vehicles "underpins the necessity for vehicle data to be shared with all relevant parties including first responders and insurers":

> *This data set should be similarly defined to what is set out within the UNECE Regulation 157 governing the use of ALKS but adapted to the features of remote driving.*

D.28 Allianz agreed that "one of the many benefits of automated vehicles will be the availability of data which could seamlessly establish the cause of an accident without having to question the road user". However, "due to past incidents involving certain vehicle manufacturers, some drivers may be concerned that their data is being used inappropriately, or being ignored and hidden in the event of a system fault". They therefore wanted to see data held by an independent body:

> *We believe that data should be held by an independent body which cannot commercialise its use. Customers need to feel confident that their data is being used for the correct purposes, and only when necessary (such as in the event of an accident, to identify the last software update and to check for potential software breaches). Access to data also needs to be open and transparent to ensure that drivers feel confident with this form of technology.*

D.29 The BVRLA also highlighted the importance of access to data for its members:

> *The ability to access data remains an important issue for members of the BVRLA. We have previously highlighted our concerns that, as vehicles become more connected and autonomous, this may start to hinder members' ability to access in-vehicle data and could mean that the owners of the data will have an unfair advantage as new mobility business models emerge. Limiting access to data will stifle innovation and affect customer choice in how and where they get their vehicles repaired/serviced etc.*

## POSSIBLE SOLUTIONS

### Q20: To claim compensation should a person:

### (1) have a right to claim compensation from the ERDO for injuries caused by a breach of the first three ERDO duties outlined above, subject to the normal law of contributory negligence?

### (2) Alternatively, should an insurer be liable irrespective of where the fault lies (in a similar way to the Automated and Electric Vehicles Act 2018)?

D.30 We provided two options for civil claims. The first would be to give victims additional rights to claim against the ERDO for breach of statutory duty if, for example, the ERDO had failed to take reasonable care to ensure that connectivity was suitable, or the vehicle had failed to come to a safe stop. The second option was for a more comprehensive strict liability regime, along the lines of the AEVA.

D.31 Although the responses did not always align with one option or the other, most of the comments favoured the AEVA approach, which was seen as simpler and easier for victims.

### Arguments in favour of Option (2): the AEVA approach

D.32 Those arguing for AEVA saw it as allowing individuals to obtain compensation without undue delay and expense:

> *The principles of the AEV Act are sound in that they seek to make it possible for individuals to obtain compensation without undue delay and expense. If the fault in fact lay with the ERDO, not fulfilling its statutory duties, the insurer*

*can pursue the ERDO. The insurer is very likely to be more resilient to the delays and costs of doing this than any individual person*. [ITS UK]

*The approach taken by AEVA is a good one and seems to work well to account for the imbalance between an individual seeking compensation and large companies that might be responsible for the technology.* [Reed Mobility]

*This seems preferable for clarity and simplicity of route to which any injured person may make a claim.* [Trilvee]

*We believe that option (2) is preferable in terms of delivering smooth and fair compensation, and this option would also be consistent with the AEVA 2018.* [Institute and Faculty of Advocates]

*2) is preferable, subject to the normal law of contributory negligence.* [BMF]

D.33 APIL argued strongly for a strict liability regime on motor insurers for remotely driven vehicles, similar to AEVA:

*Without a strict liability regime, establishing liability would be more complicated and require complex and expensive investigation and data on the collision. It would be very hard for consumers and their personal injury lawyers to have access to data that would prove who was at fault at the time of the collision or whether it was a culpable hardware/software failure or connection problem. The manufacturer or insurer would always be in a better position to access data than the injured person that has the burden of proving the guilt of the other party. We believe that strict liability is an effective way to correct the imbalance, as well as prevent disputes about whether the remote driver or the system failed at the time of the incident.*

D.34 BIBA took a similar approach:

*As intermediaries that act on behalf of our clients, we prefer option 2 because it is the best way of preserving the key principle that innocent third parties who are injured in a road traffic accident have immediate access to compensation via the insurer of the vehicle. If an investigation goes on to prove that the accident was the fault of the ERDO then the motor insurer would be entitled to subrogate against the ERDO and its insurers. What we do not want to face is the situation where an injured party cannot look to a motor insurer for compensation but must instead attempt to sue an ERDO by lodging a professional negligence or D&O claim.*

D.35 ACSO stressed that the remote driver's liability and the AEVA liability must at least be provided under the same policy:

*To prevent disputes arising about whether the driver or the automated system is to blame for the incident, insurance of the driver's liability and the insurer's liability should be provided for under the same policy. The policy should cover anything from a software defect, to a driver fault or even a cyber-attack.*

D.36 Similarly, the Royal Society for the Prevention of Accidents (RoSPA) thought that civil compensation for remote driving should mirror regulation of automated driving:

> *RoSPA believes that as several parties may be involved, for example, the remote driving capabilities are designed by one organisation and operated by another, it may be more difficult for victims to claim compensation. This is further compounded in instances where an organisation sub-contracts remote drivers in times of peak demand…*
>
> *These issues must be considered before trialling of these vehicles becomes more widespread, as it would be unfair for victims of collisions and their families, at an already difficult and upsetting time, to have to navigate a very complex system that results in delays in them receiving compensation. Not being able to bring justice and compensation would be of acute concern for the public. Failing to do so could reduce public confidence in remote driving.*

D.37 ABI and Thatcham Research appeared to favour a strict liability regime, provided that the insurer could then subrogate those at fault:

> *A person should be able to claim compensation from the ERDO's insurer for injuries sustained and, if an investigation finds that the ERDO was at fault, the insurer would be entitled to subrogate against the ERDO and its insurers. In these cases, the ERDO should be required to provide reasonable disclosure to the insurer. We believe that this situation would allow an injured party to have adequate access to compensation without the need for the individual to take on legal action against the ERDO.*

### Presumed liability

D.38 Sustrans argued that there should always be presumed liability if a remotely driven vehicle injured a cyclist or pedestrian:

> *The introduction of presumed liability into law would assist greatly. This is important because we need to encourage more people to walk and cycle and have legislation that values this. The changes to the Highway Code that have introduced a hierarchy of road users are very welcome. The hierarchy states that those that can cause the greatest harm i.e. lorries, coaches, have the greatest responsibility to reduce the danger or threat they may pose to other road users. This should also be reflected through presumed liability.*
>
> *Currently, the UK is one of only five European countries not to adopt presumed liability. Under current law a cyclist, for example, must prove that a driver has been negligent when a collision occurs and a pedestrian must prove a cyclist is negligent. Presumed liability would mean a driver of a motor vehicle would automatically be held liable in an incident involving a cyclist, while a person on a cycle would be in a case where a pedestrian is injured.*

## Arguments against full strict liability

D.39 Clyde & Co questioned whether full strict liability was an appropriate way of dealing with novel risks, such as hacking.

*Given that novel risks, such as malicious systemic hacking of vehicles or infrastructure, seem to be of an entirely different risk, we question whether a strict liability regime is an appropriate response to the harmful consequences of these malicious, possibly terrorist, risks.*

*Therefore, consideration might be given to properly funding discrete guarantee funds of last resort, such as the MIB, and/or introducing innovative reinsurance approaches modelled, for example, on the protection afforded by Pool Re for property terrorism risks.*

D.40 Shoosmiths argued that in broad terms "the legal framework for civil liability [is] fit for purpose":

*We consider that from a civil liability perspective the remote driver will be prima facie liable under existing civil liability framework (together with their employer if there is one under vicarious liability). We instead see the ERDO license as being a framework for regulatory compliance in addition to the existing civil liability framework.*

D.41 The Society of Motor Manufacturers and Traders (SMMT) appeared to favour the more limited approach of Option 1, which would make the ERDO responsible for some (but not all) injuries:

*As these are related to ERDO duties, as opposed to the dynamic driving task per se, we believe the claimant should have a right to claim compensation from the ERDO.*

# Section E: The safety challenges of remote driving

E.1 In Chapter 5 of the Issues Paper we summarised some of the safety challenges associated with remote driving. We looked at: connectivity; cybersecurity; staff training; and incident protocols. As yet there is little firm information about how these challenges can be overcome, or how safe remote driving will prove to be. The hope is that, as we gain more knowledge, standards can be developed which can guide a regulatory framework.

E.2 We asked two questions. First, we asked about additional challenges, not identified in the paper. Second, we asked how sophisticated the risk mitigation system would need to be if remote driving failed (for example through loss of connectivity).

### SAFETY CHALLENGES

**Q6: We have identified that any system to regulate beyond line-of-sight driving needs to consider the following:**

**(1) the adequacy of the communication network;**

**(2) cybersecurity;**

**(3) workstation layouts;**

**(4) staff training;**

**(5) staff health, fitness and vetting;**

**(6) staff attention and rest periods; and**

**(7) incident protocols.**

**Apart from the above, are there any additional challenges to consider?**

E.3 Stakeholders gave a wide variety of responses to this question. Many provided more detail on the issues we identified. The 5G Association, for example, provided extensive detail on issues related to connectivity. Others raised new issues, such as communicating with other road users.

### Driver detachment

E.4 Some stakeholders mentioned the problem of detachment. Sustrans, for example, noted that conventional drivers risk bodily harm in the event of a collision, which encourages them "to maintain concentration":

> *It is difficult to see how this can be replicated in remote driving. Remote drivers will have even less motivation to drive well to minimise risk to their own bodily safety.*

E.5 Sustrans commented that this increased the risk that vehicles could be used as weapons:

> *Remote driving could be used as a weapon, much more easily and casually than normal driving, with no risk of bodily harm to the driver. This applies not*

*only in the extreme circumstance of terrorism as noted in the consultation paper, but from other and more likely potential misuses of the system for example by individuals suffering mental ill-health, remote drivers who have a grudge against their ERDO as an employer, or even by individual remote drivers just 'having a bad day' and taking out their aggression.*

### Situational awareness

E.6 TRL highlighted the need for human factor research on issues such as "how much time should be set aside for the remote driver to get orientated and attain situation awareness". In a similar vein, the Parliamentary Advisory Council for Transport Safety (PACTS) felt that attention should be given to the psychological aspects of remote driving, such as situational awareness and threat detection.

E.7 The Motor Insurers' Bureau (MIB) highlighted that some cues would not be available to a remote driver:

> *The instincts of an in-vehicle driver reacting to a wealth of fleeting sensations, for instance a movement caught in peripheral vision or the sound of something out of sight – and the direction from which it comes – can surely never be replicated remotely. Even smell can alert the driver to a situation that requires reaction – for instance a safety-critical fault such as an engine fire in the vehicle itself. Some aspects of weather and road conditions, such as side-winds and slippery surfaces, will cause in-vehicle drivers to drive more cautiously but may not be sensed by remote drivers.*

### Workstations

E.8 There was some discussion of workstation design. StreetDrone thought that the adequacy of a remote driving workstation should be considered in light of the "required level of functional safety to ensure the relevant accuracy and reliability of commands passed to the vehicle". As such "the rig itself has to be designed with ISO 26262 functional safety intent or equivalent to ensure the vehicle is not operated with a gaming controller or similar."

E.9 DAC Beachcroft highlighted that health and safety regulations would apply to remote operations. The Health and Safety (Display Screen Equipment) Regulations 1992 not only impose duties in relation to the layout of a workstation but "also require eyesight testing and monitoring for employees". Furthermore, regulation 13 of the Management of Health and Safety at Work Regulations 1999 requires employers to provide training and to consider how frequently that training should be reviewed and repeated.

### The variety of road environments

E.10 Several stakeholders mentioned the additional challenges raised by some types of road. The Mid and West Berkshire Local Access Forum mentioned routes in remote areas, where there may be multiple types of vulnerable users, but "only occasional passing spaces". They felt that regulators should be satisfied that a remotely operated vehicle should be able to interact safely with "all types of road user in the environment in which they operate".

E.11 John Rainbird highlighted the difference between highways and busy city streets. He noted that in much of the UK "local knowledge is highly desirable and in some areas indispensable". Therefore "staffing for peak periods needs to allow for sufficient remote drivers with the requisite local knowledge and experience".

### The safety of the control centre

E.12 The British Insurance Brokers' Association (BIBA) raised issues about the safety of the remote control centre itself:

> *We would add to this list disaster recovery plans, such as the power supply of premises and emergency power backup facilities, and the physical security measures to prevent unauthorised access to the building.*

### Communicating with other road users

E.13 Richard Morris noted that it might be difficult for a remote driver to communicate their intent to other road users by, for example, "waving a pedestrian across the road". Similarly John Rainbird thought it desirable for members of the public to be able to communicate with a remote driver. For example, a member of a public could warn a remote driver that there was a hidden hazard in the road ahead.

E.14 Trilvee noted that it may be worth giving further consideration to the question of whether external indicators should be in place to indicate that a vehicle is under remote control.

### Solutions and benefits

E.15 Developers thought that solutions to the safety challenges were available. Trilvee, for example, thought that any safety concerns could be overcome by better training and performance monitoring:

> *In general we believe the training, performance monitoring and oversight of the remote drivers will be significant in enhancing safe performance. While remote operation does introduce additional points of failure compared to a normal driver in a car, this can be mitigated by safety systems and then more than compensated for by using well trained, well supported, highly monitored professional drivers whose living is dependent on safe driving and working in a comfortable and safe environment with the support of a peer network.*

E.16 StreetDrone thought that there should be "some sort of dispatch sign off process at every start of shift or at regular intervals to ensure the vehicle is signed off physically and safely and ready to go".

E.17 The Mobility and Access Committee for Scotland (MACS) thought that remote driving might provide more opportunities for disabled drivers. They asked: "would there be anything within the legislation to preclude individuals who have certain conditions being employed in this field? For example individuals whose first language is British Sign Language?".

## RISK MITIGATION SYSTEMS

### Q7: If remote driving fails (through loss of connectivity, for example), how sophisticated would a risk mitigation system need to be? Would it effectively need to be an automated driving system, and regulated as such?

E.18 Many respondents to this question felt that remote driving was not feasible without a risk mitigation system to bring the vehicle to a safe stop if remote driving failed. Several went on to say that this involved an automated driving system (ADS) which would need to be authorised.

### Arguments for an automated driving system to mitigate risk

E.19 Some respondents thought that the risk mitigation system should do more than simply stop in lane. Instead, it would need the ability to pull into the side of the road. As The Royal Society for the Prevention of Accidents (RoSPA) put it:

> *RoSPA believes that as a minimum, this risk mitigation should include the vehicle being able to drive to the next convenient stopping place and pull into the side of the road. The most complex systems would drive the vehicle on a sustained basis, carrying out manoeuvres such as lane changes and would need to be regulated as automated driving systems.*

E.20 Others stressed the need for a minimal risk condition similar to that required for automated vehicles:

> *If remote driving fails the vehicle effectively becomes autonomous. It must therefore at least be capable of a minimum risk manoeuvre appropriate for the driving environment. A vehicle capable of being driven remotely in all types of road environment would effectively have to be very close to being a completely autonomous vehicle* [BMF]

> *Given the safety risks, we would want to see remote driving systems have very sophisticated risk mitigation systems in place in the event of loss of connectivity or another similar failure. This would, in effect, need to be an automated driving system and regulated as such*. [RAC Foundation]

> *The system would need to execute any required MRM to achieve a suitable MRC: it would be an ADS, and be regulated as such.* [Richard Morris]

> *To mitigate the risk of accidents, we consider that remotely operated vehicles must be capable of achieving a minimal risk condition in the absence of connectivity. Consequently, we would oppose the lawful deployment of remotely driven technology within merely conventional or assisted vehicles.* [Clyde & Co]

E.21 Starship also mentioned the need to "continue on so as to stop in a safe position":

> *Remote connection to devices can fail in situations which give rise to certain risks (e.g., the failure in the middle of a zebra crossing). Starship considers that it is fair and proportionate that any risk-mitigation system employed for*

*remotely assisted vehicles be sophisticated enough to the extent that it is effectively an ADS to enable a device/vehicle to continue on to stop in a safe position.*

### Importance of context

E.22 Other respondents thought that one should not be prescriptive about the sophistication of the risk mitigation system. Instead it should be up to the developer to show that the system was safe enough in the context. As Reed Mobility put it:

> *I don't think it necessarily needs to be this sophisticated but if a more simplistic approach is being taken, it is the responsibility of the operator to demonstrate why this simplistic system is appropriate in the context of the operating domain of the remote driving use case. This might be to do with the geographic constraints under which remote driving would be operated or the speed at which remote driving would be undertaken. It should be clear that the risk mitigation system applied is capable of responding to foreseeable hazards within the operating domain of the remote driving system.*

E.23 Similarly, Oxbotica thought that the appropriate action should depend on the circumstances:

> *In some cases it may be acceptable for the vehicle to simply apply moderate braking in response to a loss of connectivity, but in others a sophisticated MRM executed with object detection and understanding of the road layout and traffic rules may be necessary.*

E.24 The 5G Automotive Association described it as "a matter of the detailed system design". TRL drew a distinction between motorways and low speed urban driving:

> *In high-risk environments (e.g. motorway driving) the remotely operated vehicle would need an ADS capable of navigating safely off the carriageway. This would require object and event detection and response capability and have sufficient control of the vehicle to conduct the MRM. In lower risk environments (e.g. low speed urban driving) an emergency stop functionality may be permissible.*

### Specific suggestions

E.25 A few stakeholders made suggestions for how the risk mitigation should be implemented.

E.26 Imperium Drive felt that any remotely driving vehicle must have a "safe stop" risk mitigation system built according to UN Regulation 157. They went on to suggest:

> *Predefined "Hazard Zones" (geofences) may be defined by the road transport operator or the local governing council, which define locations where the vehicle is not allowed to come to a standstill during an MRM; i.e. the vehicle must continue in an autonomous fashion until outside of the Hazard Zone……*

*For non-"Hazard Zones", a maximum idle time, e.g. 15min, may be defined by the network operator. If a vehicle performs an MRM the ERDO must ensure the vehicle is moved within this time limit.*

E.27 The Academy of Robotics argued that it would be sufficient to park, halt or steer the vehicle for a range of 10 to 15 metres:

> *A suitable risk mitigation system would not need to meet Level 5 standards of autonomous driving, but could be a simplistic navigation where it uses camera, distance sensors and its last-known position, data packets from the remote connection to park/halt or steer the vehicle in the safest possible manner up to a range of 10-15 metres.*

E.28 John Rainbird thought that unless remote driving is restricted to the operational design domain (ODD) of the ADS then the only option of the ADS would be to stop. In a similar vein, Trilvee said that the appropriate mitigation would be a "controlled stop in path": "in our case that results in an e-stop, i.e. activate hazards, brake firmly and hold course".

E.29 The Tony Blair Institute for Global Change thought that any risk mitigation should involve alerting other drivers of any issues with a remotely driven vehicle:

> *operational tools can be used to help communicate remote driving failures to other drivers on the road, such as lights or signage to signal teleoperation or the failure of remote driving capabilities. Combined with educational resources, these tools can help make other drivers aware of potential issues.*

### Complications with using an ADS during remote driving

E.30 Both Trilvee and the Society of Motor Manufacturers and Traders (SMMT) argued that adding an ADS to remote driving operations may introduce complications. Trilvee noted that a full ADS would need to be in constant operation, ready to take over:

> *In our pure remote driving case an additional automated system could be added, but it would need to be constantly monitored to ensure the automated system is working and ready to take over in the event of failure of the remote driving systems thus effectively requiring a full ADS to be constantly in operation as well as the remote driving systems. Such ADS would also need careful design to ensure it does not inappropriately intervene in remote driving operations.*

E.31 The SMMT also pointed out that "a full MRM can only be performed when the automated driving system is activated":

> *Suggestions that an automated driving system-type MRM could be performed even when a remote human driver is carrying out the dynamic driving task ignore the fact that the automated driving system is no longer activated.*
>
> *As such, at any given time, there must be a clear distinction between the vehicle driving itself, in which case the automated driving system will perform risk mitigation, or the human driver, whether onboard or offboard, being*

*responsible for the driving task and any necessary risk mitigation. The two are mutually exclusive.*

# Section F: Remote driving from abroad

F.1 In Chapter 6 of the Issues Paper we raised the possibility that vehicles may be driven on British roads by a remote driver based in another jurisdiction. If this were to happen, it may be more difficult to hold wrongdoers to account for their actions.

F.2 We asked stakeholders two questions about this topic. First, we asked for views on how the problems raised by remote driving from outside the jurisdiction can be addressed. Second, we asked stakeholders whether remote driving from abroad should be prohibited.

F.3 In Chapter 8 we gave a brief overview of remote driving legislation in five other jurisdictions: the United States, Germany, Japan, Australia and Finland. We then asked stakeholders to share their experience of how remote driving is regulated abroad. This question received only two answers, and we deal with it briefly here.

## ADDRESSING PROBLEMS RAISED BY REMOTE DRIVING FROM ABROAD

### Q8: We welcome views on how the problems raised by remote driving from outside the jurisdiction can be addressed

F.4 Of the 24 respondents that answered this question, most expressed reservations about whether the problems raised by remote driving from outside the jurisdiction could be addressed. Instead, many respondents felt that remote driving from abroad should be prohibited:

> *We see no way that they can be addressed satisfactorily.* [Sustrans]
>
> *There are no readily identifiable ways of mitigating many of the problems around remote driving from outside the UK, and for this reason it should certainly be prohibited.* [MIB]
>
> *Don't try.* [BMF]
>
> *Given [that] there is currently neither international regulation nor consensus on remote driving, we do not think it is possible to effectively address the problems associated with remote driving from abroad.* [SMMT]

F.5 The Unite the Union automation committee also told us that remote driving from abroad should be prohibited.

F.6 PACTS said remote driving from abroad "could be catastrophic from a safety point of view". They pointed to a list of issues, including the qualification of drivers, variable driving regimes, reliable connectivity, ensuring accountability and liability in case of an incident.

F.7 Disabled groups also raised concerns:

*Referring to remote driving on roads in Great Britain from outside the UK, MACS would have concerns about operators not fully understanding the Highway Code; for example there may be different rules regarding the different types of crossings we have in Great Britain. Would operators know the rules in relation to uncontrolled crossings where pedestrians step out onto the crossing etc?* [MACS]

### Solutions

F.8 A few respondents suggested ways to address the issues with remote driving from abroad. Starship highlighted that licensing, clarity on ERDO liability and physical presence of an ERDO within the jurisdiction might be desirable:[8]

> *Starship intends to maintain a presence within the UK and agrees that registered ERDOs should maintain a physical presence in the jurisdiction their autonomous or remotely controlled devices operate in.*

F.9 Trilvee thought that the issue might be addressed by:

> *a properly licensed ERDO with appropriate additional training (e.g. road signage, driving on the opposite side of the road to which they are familiar) and clear liability (in a jurisdiction where the UK can take legal action / with established extradition).*

F.10 ITS UK felt that the problem was "intractable" in the short term. However, in the future an international solution could be found:

> *This problem will arise in all countries eventually, and one solution could be a "remote driving license" internationally agreed and enforced.*

F.11 Similarly, the Academy of Robotics pointed to possible international agreements:

> *Protocols, training courses, licence types, operational limits and penalties for breaches need to be consistent and unified across the relevant jurisdictions for this to be considered as a practical option. This would require implementation of bi-lateral or multilateral agreements and frameworks to be put in place between different government stakeholders and adequate provision for supervision and maintenance of such regulation across these jurisdictions.*

F.12 The 5G Automotive Association felt that regulations aimed at automated driving may prove useful, including the UNECE's work on Automated Lane Keeping Systems and the German Government's regulation of "autonomous" driving, passed in 2022.

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[8] Starship distinguished their own operations from those of remote driving, noting "Starship's position that it provides remote assistance to PDDs as opposed to 'driving' them remotely, and that core operations are specifically focused on travelling by pavement."

## PROHIBITING DRIVING FROM ABROAD

### Q9: Should remote driving on roads in Great Britain from outside the UK be prohibited?

F.13 Most respondents who answered this question said "yes". Out of 29 responses, 18 (62%) answered "yes", three "no" and eight "other".

### Agreement

F.14 Some respondents considered the prospect of remote driving from abroad to be fundamentally dangerous. DAC Beachcroft wrote:

> *The notion of allowing remote driving from outside the jurisdiction would make a fundamentally unsafe operation even more dangerous. We are surprised the questions even have to be asked.*

F.15 Other responses highlighted problems of detachment and a lack of familiarity with local driving rules, together with problems of accountability and public trust:

> *In remote driving there is no safety risk to the driver if they cause a collision. Without threat of legal recourse, there is no accountability for an international remote driver to drive a vehicle safely. There is a serious risk of eroding public trust in the technology if there is no one to hold accountable should remote driving seriously impact public safety.* [TRL]

> *In addition to the difficulties highlighted there may be practical and enforcement considerations with proving a vehicle is being driven from abroad ... . We can also envisage situations where a remote driver is driving vehicles in different jurisdictions in quick succession further increasing the risk of confusion and potentially dangerous mistakes.* [TfL]

> *This introduces excessive risks for a new technology and driving paradigm where the safety requirements are not clear.* [Oxbotica]

F.16 StreetDrone distinguished between remote driving and remote assistance:

> *Given the issues discussed in terms of ability to monitor compliance as well as the ability for abroad teleoperation to meet the required latency levels for full remote driving we would support prohibiting full remote driving from abroad, however believe the role of remote assistance could potentially be carried out from a non-UK location which may require further analysis.*

### Disagreement

F.17 Three developers responded "no": Imperium Drive, Wayve and Starship. Imperium Drive commented:

> *No, if the ERDO is willing to take full responsibility for their remote drivers outside the UK, then prohibition is not required.*

F.18 Wayve thought remote driving from abroad should be permitted for AV operations where the operator provides adequate evidence of safety:

*We believe that remote driving from outside the UK should be permitted in the case of NUIC AV operation, assuming that the ERDO and NUIC Operator evidence in their safety case operations for inspection, and satisfy insurance requirements. We don't believe this should be ruled out if safety, facile claims, and liability can be guaranteed.* [Wayve]

F.19 Wayve recognised that if remote driving were performed from abroad, the operator would have to put in place measures to reduce latency and train staff:

> *It is essential that staff are trained for driving in the UK, including the Highway Code and cultural driving considerations. It may also be necessary for the remote driver to communicate with occupants – so language may also be a consideration.*

F.20 Starship felt that appropriate ERDO licensing could solve most of the issues with remote driving from abroad.

### Other

F.21 Trilvee answered "other" because they thought that, in some circumstances, remote driving from abroad might be feasible, especially from similar jurisdictions:

> *Certainly one would not want to exclude non-UK but closely related jurisdictions such as the Isle of Man and Channel Islands from being part of any wider UK network and Trilvee has successfully demonstrated remotely driving a vehicle in another jurisdiction (Malta) from its offices in London.*

#### Prohibition in the short term

F.22 Most of the "other" responses thought that initially there might need to be some sort of prohibition. However, in the longer term remote driving from abroad might be possible:

> *In the short term, yes. In the longer term, internationally agreed protocols and standards may well make it a safe option.* [ITS UK]

> *Due to the serious concerns ranging from law enforcement and different driving cultures to driver licensing and complications with extradition raised in Chapter 6 of the Issues Paper, remote driving on roads in Great Britain from outside the UK should be prohibited until such a time when there are international consensus, standards and regulation.* [SMMT]

## REGULATION IN OTHER JURISDICTIONS

### Q10: We would be grateful if stakeholders could inform us about their experience of how remote driving is regulated abroad.

F.23 Only a few respondents mentioned regulations in other jurisdictions.

F.24 The 5G Automotive Association highlighted that tele-operation driving (ToD) is allowed as part of current testing regimes for automated vehicles. They highlighted the Dutch Exceptional Transport Exemptions Decree (BOEV) and the Dutch Experimentation Law on Self-driving Vehicles which allows for the testing of vehicles with no human fallback driver present in the vehicle. The 5G Automotive Association also mentioned

that Belgium has a Code of Practice for autonomous vehicles which allows for tele-operation.

F.25 DAC Beachcroft gave a lengthy response highlighting developments in related areas. These included the regulation of autonomous shipping; EU civil liability reforms; and US developments in relation to the liability of “autonomous” vehicles.

F.26 Starship noted in their response that Pavement Delivery Devices (PDDs) allowed to operate in Finland and Estonia. They also noted that many US states have made provisions in legislation to permit their use.

# Section G: Short-term reform

G.1 In Chapter 9 of the Issues Paper, we considered how the problems highlighted in earlier chapters of the Issues Paper could be addressed without the need for primary legislation. We described how the Secretary of State for Transport has flexible powers to amend the Road Vehicles (Construction and Use) Regulations 1988 and provide exemptions from them. We asked stakeholders whether the Road Vehicles (Authorisation of Special Types)(General) Order 2003 should be amended and whether any changes to construction and use regulation were needed to enable the safe introduction of remote driving.

G.2 Furthermore, the Secretary of State can provide guidance on exemptions though amendments to the Highway Code. We asked whether the provisions of the CCAV Code of Practice relating to remote driving should be added to the Highway Code.

### AMENDING THE GENERAL ORDER

**Q11: Should the Road Vehicles (Authorisation of Special Types) (General) Order 2003 be amended?**

**In particular, we welcome views on whether amendments should:**

**1) specify that regulation 104 is satisfied if the driver of a special vehicle has a view of the road ahead through a screen, provided that appropriate steps have been taken to ensure safety;**

**2) specify that regulation 107 is satisfied by remote supervision, provided that the user has taken appropriate steps to prevent interference with the vehicle;**

**3) make any exemptions contingent on the user obtaining written consent from the road authority to use the vehicle on a particular road; and**

**4) permit trials and demonstrations with a commercial element to them?**

G.3 In all, 23 respondents answered this question. Some provided answers even though they favoured long-term reform or remained unconvinced about the feasibility and safety of remote driving. Furthermore, most respondents did not answer all four parts of this question but selected individual parts.

### Q11(1): Regulation 104

G.4 This received the most responses. Many stakeholders felt that simply requiring "a view of the road ahead" would not be sufficient for remote driving. Several stressed the importance of a wider field of view, including 360-degree vision:

> *It is not sufficient to just have a view of the road ahead. At a minimum, field of view must provide visibility required to safely conduct all manoeuvres.* [TRL]

> *If remote driving is to be considered, a 360-degree view will be crucial to safety. Increasing all round visibility is an important factor in road safety, as recognised in our direct vision standard for HGVs. Furthermore, we would expect the remote driver to have a view internally and externally (including of*

*the exterior of the vehicle) as a conventional driver situated in the vehicle would.* [TfL]

*In my opinion, regulation 104 is too simplistic, even before we consider it for remote operations. Current type approval requires that mirrors (or rear-view cameras + screens) are required for almost all vehicles. Common sense suggests that this is for safety – specifically so the driver knows what is happening behind the vehicle, so Regulation 104 is obviously inadequate as it only requires a view of the road ahead…. A child emerging from a school or from behind an ice-cream van in a layby are obvious cases where attention to the roadside [is] crucial to safety.* [Richard Morris]

G.5 Others mentioned the need for wider sensory information. Charles Puckle felt that remote drivers "need to be in a fully immersive simulation where they can fully sense the world around the operated vehicle":

*The remote driver needs to work within a lidar-measured environment, with sound so that they can hear what is going on around the remotely operated vehicle. Lidar also solves the problem of loss of visibility due to darkness (daylight or fog) or haze.*

G.6 Sustrans referred to "other sounds, smells and haptics":

*The view of the road ahead will be insufficient and as observed in the consultation paper, other sounds, smells and haptics will be necessary to ensure safety for other road users. Careful trials should be undertaken to determine the best balance between types of information, and the best amount of information.*

G.7 Transport for London (TfL) mentioned elements of driving which are not just visual "such as ambulance sirens or a tyre blow out". They suggested "that further research is undertaken as to the minimum amount of data required in order to ensure 'safe driving' for example haptic and auditory feedback".

### Q11(2): Regulation 107

G.8 This part of the question received fewer responses. Starship agreed with the proposal. Others suggested possible amendments. For example, Richard Morris said

*It can be satisfied by remote supervision but a certain minimum level of monitoring must be established to be acceptable. I suggest that 360 degree video coverage, audio feed and intrusion detection be part of that minimum. If the remote monitoring by a human is not continuous (such as when one person monitors multiple vehicles) then automatic systems must alert the person when potential interference is suspected or there is a clear threat.*

G.9 The Academy of Robotics thought that a 360-degree field of view was needed for a remote vehicle to be "attended". Furthermore:

*Additional safety measures to be considered could include options to remotely inform authorities or trigger anti-vandalism and theft safety measures.*

### Q11(3) Obtaining written consent from the road authority

G.10 Clyde & Co commented that “the requirement to obtain written consent from a Highway Authority would not appear especially onerous”. However, Oxbotica disagreed:

> *We do not think (3) is appropriate, as this will create a significant burden for the testing of AVs (as well as testing of remote driving). Local authorities will often not have the expertise to evaluate the safety of a trial involving remote driving, and this represents a departure from the current conventions for testing prototype vehicles.*

G.11 Wayve pointed out that if remote driving was being used as part of a NUIC operation, the operational design domain would already have approval:

> *If using remote driving for NUIC operation, this should not require a separate approval but be approved in the ODD, as part of authorisation.*

### Q11(4): Permitting trials and demonstration with a commercial element

#### Support for trials with a commercial element

G.12 Responses to this part of the question were mixed. Several developers agreed that the STGO should be amended to permit trials and demonstrations with a commercial element to them:

> *Yes, current uses under a STGO (Special Types General Order) only extend to, testing, demonstration, delivery on sale and proceeding to or returning from a manufacturer. If we are using the route of the Special vehicle for early commercial applications this may need to change. In addition current provisions state "A relevant vehicle that is used on roads must not carry any load or transport goods or burden" for testing and trials of delivery services this would be an issue and would require amendment.* [StreetDrone]

> *Amendment (4) would be particularly helpful when an automated service is being trialled in a way that is integrated with an existing commercial service such as a delivery service.* [Oxbotica]

G.13 Starship also agreed that the STGO should be amended to permit trials with a commercial element. Pointing to market forecasts on the effect of connected and autonomous vehicles on the economy, Starship commented:

> *It is Starship’s view that permitting trials with a commercial element will encourage investment and innovation in the UK*.

G.14 PACTS said it was supportive of trials with a commercial element, but only if “the safety cases are published and approved by independent safety experts”.

#### Concerns and disagreement

G.15 The RAC Foundation disagreed with using exemptions and thought that primary legislation was required:

*No, as such provisions introduce additional uncertainties into the law and risks unsafe developers proceeding with remote driving. Primary legislation is required.*

G.16 TfL also disagreed, pointing to potential confusion between a trial and deployment:

*Public safety should be the key consideration, and if commercial trials are permitted this could encourage companies to deploy vehicles before they are ready.*

*It could also create confusion as to when something is a trial and when it is a deployment. If the requirements for full deployment of remote driving are higher than those for trialling, it is possible that unscrupulous operators will try and avoid regulation by claiming they are trialling.*

G.17 Richard Morris also mentioned the difficulty of distinguishing between trials and deployment:

*There may well be a desire by some organisations to avoid certain aspects of approval / licencing by obscuring commercial services under the cloak of trials and demonstrations. Applying certain conditions to the permit could alleviate this but care would be required to ensure prevention of abuse. One aspect may be to time limit the trials and demonstration period. However, even this might be unsuitable under some circumstances (such as providing passenger services for a rare or one-off event).*

G.18 Clyde & Co thought that trials should be of a defined duration, for example, “not exceeding 12 months”:

*To proceed otherwise may be perceived as prematurely giving the "green light" to remote driving, without having first developed a regulatory structure able to support its safe deployment.*

## ADDING PROVISIONS OF THE CCAV CODE TO THE HIGHWAY CODE

### Q12: Should any provisions of the CCAV Code of Practice relating to remote driving be added to the Highway Code?

G.19 In the Issues Paper we noted that the Highway Code, unlike the CCAV code of practice, has a legal status. Although it is not legally binding, the courts must take it into account. We asked if this was a potential way forward.

G.20 Of the 24 stakeholders that answered this question seven answered “yes”, five answered “no” and 12 responded with “other”.

#### Agreement

G.21 Some developers thought that giving the CCAV code greater status would facilitate the growth of remote driving:

*Yes as it would allow remote driving companies to expand their operations beyond trials. We would strongly recommend announcing plans to make this*

*addition as this would promote UK CAV innovation and growth.* [Imperium Drive]

*Including provisions from the CCAV code of practice for remote driving would reduce and clarify liability concerns for operators and insurers and encourage wider adoption of the technology. It would also help to raise awareness around the legislation for the technology with the wider public supporting the concomitant progress of regulation and innovation*. [Academy of Robotics]

G.22 Oxbotica could "not see any drawbacks to this action" but thought that the Code should be changed:

*The statement in the CoP requiring that "the remote-control system is able to deliver the same level of safety as having a driver inside of the vehicle" should be amended to state that "the remote-controlled trial is able to deliver the same level of safety as having a driver inside of the vehicle". This is key as trials (almost by definition) rely on operational measures to assure safety*.

G.23 Similarly, Starship supported the proposal:

*It would give local authorities greater clarification as to the legality of remote-controlled vehicle trials, improve safety amongst remote-controlled vehicle trials and be in line with a liability regime whereby victims can seek compensation efficiently from an insurer of a remotely controlled vehicle*.

G.24 Starship also though that the Highway Code would be an appropriate place to detail the varying requirements applicable to 'non-vehicles' such as PDDs.

### Telling other road users how to interact with remote drivers

G.25 John Rainbird thought adding the provisions to the Highway Code would help indicate to other road users how they should interact with remotely driven vehicles. He mentioned several scenarios which could be clarified including the following:

*A human driver is waiting in a minor road to turn right into the main road. A vehicle with a remote driver is waiting in the minor road opposite to turn to his right into the major road. Two human drivers could communicate as to who moves first. Is there any way for the remote driver and the human driver to communicate, will there be a protocol, or will the outcome be left to chance?*

G.26 In a similar vein, ITS UK thought such additions could begin to inform drivers about remote driving:

*This would make a useful start on habituating road users to the concepts and foster public awareness and informed debate.*

### Disagreement

G.27 Others felt that adding the CCAV Code of Practice guidance to the Highway Code was inappropriate or unnecessary. The RAC Foundation thought that the Code of Practice should be given more weight, but did not think that the Highway Code was the right place for this:

*The CCAV Code of Practice could be given more weight by being made statutory guidance, but the Highway Code does not appear to be the right natural home for this guidance other than being a way to make human drivers aware that they might be sharing the road with vehicles being driven remotely – an extremely novel and potentially frightening concept.*

G.28 Richard Morris said that the Code of Practice had to be read in context:

*No. The text used in the Code of Practice is unhelpful unless read with a full understanding of the implications.*

G.29 Respondents thought that the Highway Code and the CCAV Code of Practice were fundamentally different:

*The highway code defines the rules of the road, applicable to humans whether in the vehicle or remotely driving the vehicle. We don't see why aspects of a guidance document should be incorporated into the Highway Code.* [Wayve]

*We struggle to understand why elements within a guidance document for trialling ought to be incorporated into The Highway Code, which is nominally the rulebook for motorists using "deployed" vehicles (as well as for cyclists and pedestrians, road and boat safety*). [SMMT]

*The Highway Code is intended for reading by the general public and adding further guidance for what is likely to be a fairly small audience is not necessarily appropriate. Aspects of the current CCAV CoP should undoubtedly constitute guidance for full road use, not just trials, but perhaps statutory guidance for ERDOs would be a better place for it.* [BMF]

G.30 Furthermore, both Trilvee and the Society of Motor Manufacturers and Traders (SMMT) pointed out that the CCAV Code only applied to automated vehicles and not to remote driving trials that had no automated driving element.

*As currently written there is ambiguity as to the intended scope of the provisions relating to remote driving: As well as the provisions being within a code of practice for Automated Vehicle trialling, the opening paragraph on remote operation refers to "Those looking to undertake a remote-controlled trial of an automated vehicle on public roads…"* [Trilvee]

*We are concerned that remote driving may be confused and conflated with automated driving. While it is right for the Code of Practice to include a section on trialling vehicles with an offboard driver, as remote driving could be used as an adjunct to automated driving, we believe remote driving, particularly of the pure-play type, deserves its own official guidance for trialling.* [SMMT]

G.31 DAC Beachcroft objected on the basis that they thought remote driving should be prohibited:

*No. We have already said that we believe remote driving should not be allowed on a road or other public place.*

## CHANGES TO CONSTRUCTION AND USE

### Q13: Are changes needed to construction and use regulation to enable the safe introduction of remote driving?

G.32 Out of 15 respondents who answered this question, four said "yes" and 11 answered "other".

### Agreement

G.33 Sustrans, ITS UK, Shoosmiths and Clyde & Co gave "yes" responses. Sustrans said:

> *Whilst this may not be possible through changes to the construction and use regulations, there should be additional rules governing the behaviour of remote drivers in their control centres, to minimise the risk of distractions.*

### Concern that remote driving requires a full legislative framework

G.34 On the other hand, several respondents expressed concern about simply amending construction and use regulations without having a full legislative framework in place. Charles Puckle commented:

> *Remote drivers must be licensed. They must operate the vehicle from an immersive environment with full redundancy should the primary wireless connection fail.*

G.35 Both Shoosmiths and the RAC Foundation pointed out that simply amending construction and use regulations would not provide sufficient enforcement powers:

> *Similar to what might occur if a remotely operated vehicle is operated from abroad, the potential consequence for road users for operators' regulatory failings requires a licensed ERDO in the same manner as the increased regulatory risk of heavy good vehicle operators requires an operator licence.* [Shoosmiths]

> *Because new construction and use regulations would not provide regulators with powers to inspect remote-control centres, or to apply regulatory sanctions, nor would they change the system of civil or criminal accountability, we believe primary legislation as well as changes to construction and use regulations, are required*. [RAC Foundation]

G.36 Clyde & Co recommended "a single application to lawfully permit remote driving, which encompasses all appropriate exemptions" rather than the limited exemptions suggested in the Issues Paper.

G.37 DAC Beachcroft felt that no changes would be able to make the basic proposition of remote driving "safe":

> *The key word in the question is "safe": our strong view is that remote driving on a road or other public place cannot be made safe.*

# Section H: Regulation in the longer-term

H.1 In Chapter 10 of the Issues Paper, we provisionally proposed a new licensing scheme for the organisation behind remote driving. We referred to this organisation as the Entity for Remote Driving Operation or "ERDO". There was widespread support for ERDO licensing. For example, when we asked whether an ERDO should be required to submit a safety case, out of 22 people who responded, 21 agreed and only one person said "other".

### SUPPORT FOR ERDO LICENSING

H.2 Support for a new licensing system came from developers, safety groups and others:

> *I believe it would be helpful for there to be a clearly identified entity that is responsible for remote driving and that can be held accountable if issues arise with its implementation.* [Reed Mobility]

> *I think we would certainly support this as a way of ensuring minimum levels of safety and assurance for remote driving.* [StreetDrone]

> *Licensing the ERDO ensures adequate legislative oversight for the safe introduction of the technology on UK roads while also providing assurance to various stakeholders that necessary due diligence on the ERDO have been performed. We strongly recommend announcing plans for such a licensing regime as this would be helpful to promote innovation and growth in the UK CAV sector and take a leading role globally.* [Imperium Drive]

> *We do not plan to contract out our remote operations at this time, but such framing could enable future business models or commercial operations which do not exist today, and hence we support this position.* [Einride AB]

> *The vehicle should only be driven either conventionally by the qualified human driver present within the vehicle, or in the case of remote driving, it must be operated by a licensed ERDO located within the UK.* [PACTS]

> *The potential consequence for road users for operators' regulatory failings requires a licensed ERDO in the same manner as the increased regulatory risk of heavy good vehicle operators requires an operator license.* [Shoosmiths]

### Minimising duplication with NUIC Operator licensing

H.3 In the Issues Paper, we suggested that the regulation of remote driving should be as similar as possible to NUIC operation, so that they can be combined with the minimum of duplication. The Society of Motor Manufacturers and Traders (SMMT) agreed with this approach:

> *We believe it is useful for regulations on remote driving and no-user-in-charge (NUIC) automated vehicle operations to be as similar as possible, not least so*

*that they offer the option of being combined with minimum duplication. Furthermore, as the concept of NUIC operator licensing has been well thought through and set out in the Law Commissions' final report on automated vehicles regulatory review, it makes sense to draw on the principles behind the recommended NUIC operator licensing system and apply them, where appropriate, to regulating ERDO.*

H.4 Others went further, suggesting that the two roles could be combined under a single licence where remote driving supports automated vehicles' operation:

> *Depending on what if any use cases are permitted and the technology required for a safe stop it may be possible to incorporate this with NUIC operator, rather than adding additional terminology… There is a real risk over accountability, particularly given this is a developing area and all the relevant considerations may not yet be apparent.* [TFL]

> *While the market is young, we envisage an ERDO combined with a NUIC Operator in the management of NUIC AVs. The licensing regime should support this. As we have already highlighted, we also see licensing of NUIC recovery remote driving as distinct from remote driving for full journeys.* [Wayve]

> *If [vehicles] are self-driving, the NUIC Operator should be permitted to operate remote driving (potentially by allowing a single approval process for authorisation as both ERDO and NUICO).* [Oxbotica]

H.5 Trilvee said "ERDOs can be a simple extension of NUICs (perhaps NUIC-R)".

### Disagreement

H.6 Those who disagreed with ERDO licensing argued that remote driving would be regulated under AV licensing. DAC Beachcroft said:

> *There is no need for this. The only acceptable remote supervision / driving will be AVs in a testing environment and slow moving remotely driven conventional vehicles in a purpose-designed location.*

H.7 In both cases, they thought responsibilities should fall on the ASDE: "introducing another (unnecessary) entity would only add confusion and increase the risk of expensive satellite litigation".

H.8 In a similar vein, Richard Morris thought that remote driving should only be allowed where when used in conjunction with automation, "so there will always be a NUIC operator":

> *The activities of the NUIC operator should encompass the appropriate activities of a remote assistance operator where remote assistance is deployed. Having a separate ERDO would add confusion over responsibilities, especially when connectivity is glitchy and unreliable.*

### Concerns about accountability

H.9 Those answering "other" expressed concerns about the different organisations involved in automated driving, and the scope for disputes if something goes wrong. As TRL put it:

> *An ASDE may argue it was the failure of the ERDO to monitor the vehicle, whereas an ERDO may argue that the ADS was in direct control of the vehicle at the time of the incident. This may lead to significant delay in victims from claiming compensation.*

H.10 TRL suggested a data storage system for remote operation "to record and flag status changes, e.g., remote driver contacted, remote driver takes control of the dynamic driving task, remote driving connection lost, etc".

H.11 The Academy of Robotics "noted that complexity may arise in defining the ERDO when multiple companies may be involved in the system".

## NOMENCLATURE

### Q14: To distinguish clearly between organisational and individual responsibilities, should the organisation behind remote driving be referred to with new terminology, as an Entity for Remote Driving Operation (or ERDO)?

H.12 In Question 14 we asked about the name of the new organisation. Of the 27 people who responded, 20 (74%) said yes, two said no and five made other comments.

H.13 Several respondents favoured the title because it distinguished clearly between the individual driver and the organisation:

> *The distinction between organisational and individual responsibilities is real, and it would be helpful to refer to the organisational entity with a generic name, such as ERDO.* [John Rainbird]

> *Given that the term operator could be confusing in relation to remote driving, RoSPA agrees with the proposal for the organisation behind remote driving to be referred to as an Entity for Remote Driving Operation (ERDO).* [RoSPA]

> *We agree with the suggestion… that "entity" refers to a corporate entity rather than an individual and "operation" refers to an organisation that uses and operates vehicles rather than develops or manufactures them.* [SMMT]

H.14 Others thought it was helpful to distinguish the role of remote driving provider from that of self-driving technology companies:

> *Yes, as it helps to separate the technology provider and the operator in case they are different.* [Imperium Drive]

## AN OFFENCE TO DRIVE BEYOND LINE-OF-SIGHT WITHOUT AN ERDO LICENCE

### Q15(1): Should primary legislation make it an offence to drive (or cause or permit a person to drive) a vehicle beyond line-of-sight unless the vehicle is overseen by a licensed ERDO?

### Q15(2): For these purposes, is it appropriate to define a "beyond line-of-sight" driver as one who relies on connectivity to see all or part of the driving environment?

H.15 Again, this received substantial support. Of the 24 people who responded to Q15(1), 21 (88%) said yes and three made other comments. Of the 21 people who responded to Q15(2), 17 (81%) said yes and four made other comments. No one disagreed.

### Agreement

H.16 Those who agreed thought ERDO licensing would promote safety and industry investment. They also said the licensing system would need to be supported by a criminal offence to ensure compliance:

> *Yes, we agree that primary legislation should make it an offence to drive (or cause or permit a person to drive) a vehicle beyond line of sight unless the vehicle is overseen by a licensed ERDO. This aligns with proposed regulation for NUIC automated vehicles.* [SMMT]

> *Yes, primary legislation should make it an offence to drive a vehicle remotely beyond the line of sight without a legally authorised ERDO license.* [PACTS]

### Trials

H.17 Trilvee agreed with the general approach:

> *Once the licensing regime is in place making it an offence is reasonable and we encourage appropriate regulation of this space to discourage bad actors who could compromise the reputation of remote driving.*

H.18 However, Trilvee also asked about "the transition from the current unregulated environment to the licenced operator model":

> *Current participants and potential new entrants should be given good notice and, preferentially, consulted as to the nature and standards of the appropriate licensing regime.*

H.19 They also asked about trialling: "would trialling be outside of the scope of the licensing regime or would the licensing regime have more limited scope and standards for trialling?".

H.20 Oxbotica asked for specific exemptions for trials so that:

> *We can trial AVs with remote safety drivers (without requiring registration as an ERDO or NUICO, or requiring that our prototype vehicles are type approved).*

### Scope

H.21 John Rainbird also asked about where the offence would apply, raising questions about public and unadopted roads and other public places.

### Defining 'beyond line-of-sight'

H.22 In the Issues Paper, we said that anyone who relied on wireless connectivity to see all or part of the driving environment should be considered as driving "beyond line-of-sight". Most respondents agreed:

> *We agree with this definition. As we mentioned in paragraph 10 above, it is important to distinguish remote driving from driver assistance features that involve remotely manoeuvring a vehicle within line of sight.* [SMMT]

H.23 However, in a detailed discussion, Oxbotica asked for regulations and well-defined exemptions to deal with the various combinations of wired and wireless connectivity and visual line-of-sight/beyond line-of-sight driving.

H.24 Richard Morris suggested it would be helpful to refer to 'radio based communications' instead of 'connectivity':

> *Let us consider a vehicle being driven by an on-board human driver with poor or no direct vision of the road. An example could be a piece of mobile machinery (such as mobile crane) with gross blind spots… . These may use or indeed completely rely upon external cameras feeding internal displays to give the driver adequate vision. The cameras are "connected" to the screens, so the driver is relying on that "connectivity". The robustness of that direct, hard-wired connectivity is likely to be high, so I propose that it should not be covered by terminology intended for remote operations.*

## ERDO REQUIREMENTS

### Q16: To obtain a licence, should an ERDO be required to show that it:

### (1) is of good repute;

### (2) has appropriate financial standing;

### (3) conducts its operation within Great Britain; and

### (4) is professionally competent to run the service?

H.25 The proposed requirements were strongly supported. Out of 22 respondents who answered this question, 19 respondents (86%) thought an ERDO should be of good repute; have appropriate financial standing; and be professionally competent. Slightly fewer, 17 (77%), thought an ERDO should conduct its operations within Great Britain. Those who disagreed generally did so on the basis that there was no need for a separate system of ERDO licensing.

### Agreement

H.26 Those who agreed did so on the basis of parity with NUIC licensing. As the SMMT said:

*We agree with all of the above, as they draw from the proposed NUIC operator licensing system for automated vehicles and are equally appropriate for ERDO licensing.*

### Clear definitions

H.27 Most of the comments pointed to the need for clear definitions – particularly of terms such as "good repute" and "professionally competent":

*Criteria to support these areas would be needed.* [BIBA]

*The definition of having a 'good repute' need to be clarified.* [PACTS]

*Academy of Robotics would welcome greater clarity on how potentially subjective terms like "good repute", appropriate financial standing and professionally competent are defined. The criteria may need to be more specific including factors such as company turnover, letters of reference, vetting or a background checking process.* [Academy of Robotics]

*The term 'professionally competent' is rather loose, understandably so due to the emerging nature of this field and limited real-world experience. Scope for clearer definition on this would be helpful*. [Trilvee]

### Appropriate financial standing

H.28 ITS UK said that "we should learn from the bus and coach sector and regulate in a way which does not burden small operators unreasonably". StreetDrone suggested that "when considering financial standing it would be important to consider the level of insurance cover".

### Conducting operations within Great Britain

H.29 Some developers queried this requirement. Starship agreed that ERDOs should be "required to register an entity within the UK to give regulators and the public direct access to ERDOs". However, it would be "disproportionate that all operations should be conducted within Great Britain". "A large part of its operation is conducted within Great Britain" but:

*A small part of Starship's UK operations are conducted abroad where Starship has back-up RAs [remote assistants] who are able to intervene where a safety concern requires a human to control some aspects of the dynamic driving task. An even smaller minority of activity conducted abroad involves remote operation (as opposed to remote assistance).*

H.30 Trilvee also wanted there to be scope to place some of its operations abroad:

*It may be beneficial for a licensed ERDO to have the scope to operate internationally (including operations in GB remote operating in another country, which we have recently demonstrated) provided further conditions are met. So conducting operations in GB certainly, but not exclusively.*

H.31 Einride thought that there should be "appropriate provisions to appoint a designated agent or other legal entity within the UK if the ERDO is a non-UK based company".

H.32 Others sought clarification of what the requirement would entail. The British Insurance Brokers' Association (BIBA) asked "would 'conducts its operation within GB' mean it must be registered in the UK as a legal entity or just run its operation from within GB?". Similarly, John Rainbird asked:

> *Suppose that a company does business in Great Britain (GB) but its head office is in a foreign jurisdiction and it has a coordination centre in GB but nothing called a regional or local office: would that be sufficient to qualify?*

H.33 The British Motorcycle Federation asked: "Are we talking about operations in England and Wales, Great Britain or the United Kingdom?"

## THE SAFETY CASE

### Q17: Should an ERDO be required to submit a safety case to show how it will operate remotely driven vehicles safely?

H.34 There was overwhelming support for the proposal that an ERDO should submit a safety case. Of the 22 people who responded to this question, 21 (95%) said yes and one made other comments. No one disagreed.

### Agreement

H.35 A wide range of respondents supported the proposal:

> *A safety case should demonstrate the intentions and the means to achieve them.* [John Rainbird]

> *RoSPA agrees that it is critical for the ERDO to submit a safety case. The organisation responsible for the remote driving should obtain a licence by proving to a regulator that their system is safe. The safety case must be a part of the assurance process.* [RoSPA]

> *Yes, and a safety assurance process should be set up by the government to assess their safety case and confirm that they are managing risk to As Low As Reasonably Practicable and complying with all relevant UK regulation.* [TRL]

> *Yes, and in the case of NUIC AVs, the interface between the NUICO and ERDO will be part of the safety case.* [Wayve]

> *If an ASDE using automated vehicles without a user a charge (NUIC) must maintain a safety case, it is difficult to understand why an ERDO should not, particularly given the additional challenge for remotely driven vehicles.* [Clyde & Co]

H.36 Imperium Drive agreed but thought "mechanisms to protect IP [intellectual property] should be in place".

### The importance of connectivity

H.37 Many respondents listed the matters which would need to be covered in the safety case. For example, the Royal Society for the Prevention of Accidents (RoSPA) commented that an ERDO:

> *would need to demonstrate how it will maintain connectivity for the entire journey; provide suitable equipment; train and supervise staff; and combat problems of boredom and inattention. It would also need to provide information on risk mitigation in the event that the system, for example, lost connectivity.*

H.38 However, RoSPA reiterated its concerns as to whether "remote vehicle operation on public roads can be performed safely":

> *Low speed remote operation may be easier in simple vehicle control terms than high-speed operation, but it should be remembered that low-speed environments tend to be the busiest, and that, in interactions in urban traffic, accurate perception of the surroundings and very fast reactions are typically needed.*

H.39 The SMMT emphasised its concerns about network failures:

> *We would like to emphasise the importance of requiring prospective ERDOs, particularly those who argue that LTE networks alone are adequate, to demonstrate in the safety case how connectivity can be assured under various circumstances. Assessment of the safety case must include a high bar for risk mitigation strategies in the event the remote driving system fails.*

H.40 Respondents also mentioned the need to address handovers – particularly to and from a driver in the vehicle:

> *Perhaps consideration should be given to the conditions which should apply if a remote driver is required to take over control from a human driver, though perhaps this should not occur while the vehicle is moving. [BMF]*

> *Furthermore, there should be a regulation that ERDO cannot intervene once the vehicle is taken over to be driven conventionally by a human driver present in the vehicle* [PACTS]

## THE DUTY OF CANDOUR

### Q18: Should an ERDO face criminal offences where misrepresentations and non-disclosure in the safety case have implications for safety?

H.41 The Automated Vehicles report recommended criminal offences if an ASDE or NUIC operator fails to disclose or misrepresents safety-critical information in its safety case. We asked if similar offences should apply here.

H.42 Of the 20 people who responded, 16 (80%) said yes and four made other comments. No one disagreed.

### Agreement

H.43 Those who agreed did so on the basis of parity with ASDE/NUIC operator offences and to promote both safety and compliance:

> *Yes, an ERDO should face criminal offences where misrepresentations and non-disclosure in the safety case have implications for safety. This is similar to the duty of candour placed on Authorised Self-Driving Entities and NUIC operators.* [SMMT]

> *A single regulatory structure overseeing both Automated Vehicles and remotely driven vehicles seems desirable, particularly where there seems to be no justification for any difference in treatment between the two different entities responsible for the dynamic driving task in the absence of a conventional driver, i.e., ASDE and ERDO.* [Clyde & CO]

> *Yes, PACTS believes that an ERDO should face criminal offence if they have deliberately misrepresented their safety case or have failed to disclose any threat to the safety of vehicles, passengers, or to other road users. Doing this they will be knowingly introducing risk to the road users and putting them in danger therefore, it should be treated as a criminal offence. This should be at least as robust as that of the disclosure requirements for black cab drivers in London.* [PACTS]

> *Clear enforcement and punitive measures are necessary to ensure compliance.* [Einride AB]

> *Yes; strongly agree. If remote driving from outside UK jurisdiction is prohibited, it should also be a criminal offence to mislead the government into believing the operation is solely within the UK, when it is not.* [TRL]

H.44 Imperium Drive agreed, "provided there are very well defined guidelines for what needs to be included in the safety case".

H.45 John Rainbird discussed possible penalties:

> *Should a culpable individual be barred from working in this or a similar business for a period of years, or (if a director) be banned from serving as a director for a period of years?*

### Other

H.46 Four respondents gave other comments. Trilvee said "Yes, if it is established such misrepresentations/nondisclosure were intentional".

H.47 Starship thought that there should be a duty of good faith rather than criminal liability. Again, it emphasised the difference between "low-weight, low-speed delivery devices/robots operating on pavements" and "large, higher speed, heavier vehicles operating on roads alongside traffic".

> *Starship recognises the need for effective regulation, especially in relation to novel technology being placed on public roads, however it is not Starship's*

*view that a duty of candour with a regulator of PDDs should be enforced through a criminal offence.*

## ERDO DUTIES

H.48 In Question 19, we sought views on a list of eight duties that should be apply to an ERDO operator. Of the 30 respondents who answered this question, a majority agreed with all the duties listed. We consider each duty separately below.

### The duty of safety

**Q19(1): Should an ERDO be under a duty to ensure that the driver is able to drive safely by:**

**(a) taking reasonable care that connectivity is suitable;**

**(b) ensuring that in the absence of connectivity or driver input, the vehicle comes to a safe stop;**

**(c) providing suitable work-stations; and**

**(d) maintaining suitable training, vetting, health checks, working hours and breaks?**

H.49 22 respondents (73%) agreed.

#### Connectivity

H.50 Several respondents thought that the duty in Q19(1)(a) should be strengthened. As Transport for West Midlands and Transport for London (TfL) said:

> *The wording in Q19)1)a) about whether an ERDO should take 'reasonable care' to ensure adequate connectivity may not be strong enough.* [TfWM]

> *Given the crucial role of connectivity in remote driving we do not feel 'taking reasonable care' is sufficiently strong as a duty. Connectivity is essential for the functioning of any remote driving.* [TfL]

H.51 The SMMT thought the wording should be amended "to require the ERDO to take reasonable care that connectivity is **adequate**, with ample headroom for contingencies, rather than merely suitable". Similarly, RoSPA proposed that it is changed to "reasonable care must be taken to ensure that connectivity is suitable for the entire journey".

#### Safe stop

H.52 From different standpoints, both Trilvee and the Parliamentary Advisory Council for Transport Safety (PACTS) asked for clarification on what constitutes a safe stop. PACTS commented:

> *A safe stop needs to consider the vehicle dynamics and the environmental circumstances, for example stopping in a live traffic lane or across a junction may not be safe.*

H.53 Richard Morris said that vehicles should do more than simply stop: "it must come to an MRC [minimal risk condition] by executing an MRMW [minimal risk manoeuvre]".

### Work-stations

H.54 Trilvee said that "the definition of what constitutes a suitable work-station should be left up to individual ERDOs as this will end up being a key element of differentiation and competitive edge".

H.55 TfL thought that ERDOs should demonstrate that the remote driver's workplace environment is appropriate – not just the immediate workstation:

> *For instance, that it is secure to prevent unauthorised intrusion, that it is free from driver distractions such as non-driving related screens, mobile phones, tablets and other devices, that the work environment is free from excessive noise, and that it is equipped with appropriate rest and welfare facilities for remote drivers.* [TfL]

## Maintenance

### Q19(2): Should an ERDO be under a duty to maintain the vehicle (including software updates and cybersecurity)?

H.56 Again, most respondents agreed, with 22 (73%) saying yes. A few respondents made additional comments. For example, Trilvee said that it should only apply "where that vehicle belongs to the ERDO and is not contracted out to a third party". Similarly, Reed Mobility said:

> *maintaining the vehicle may be a shared responsibility with the vehicle owner - but before remote driving can be enabled, there should be basic diagnostic checks to ensure the vehicle is in a suitable condition to be operated remotely*.

H.57 Starship commented that a breach of cyber security should not automatically indicate that the ERDO had failed to meet the duty.

## Loading

### Q19(3): Should an ERDO be under a duty to check that any load is safe and secure before the journey starts and that the number of passengers does not overload the vehicle?

H.58 Twenty respondents (66%) agreed. However, some developers commented that it might be difficult in practice. Imperium Drive thought that the duty should apply "where reasonably possible". Similarly, Trilvee commented that this "may be difficult in practice for some operators":

> *Taking reasonable care, for example installing an internal camera or seat sensors to check occupancy would seem appropriate but may then contravene privacy and/or data protection regulations.*

H.59 Trilvee said that in their case, however, the vehicle would be empty and unloaded while being remotely driven, so the issue would not arise.

H.60 Richard Morris said that the duty should not only apply before the journey starts, but also during the journey:

*If a human driver in a vehicle is expected to notice and correct a load which becomes loose or unsafe in some way (including catching fire), then that same responsibility should rest with the NUIC operator.*

### Insurance

#### Q19(4): Should an ERDO be under a duty to insure the vehicle?

H.61 Twenty respondents (66%) thought an ERDO should be under a duty to insure the vehicle. As the Institute and Faculty of Advocates put it:

> *The IFoA's view is that if the ERDO will largely be responsible for the safety and risk management of remote driving it is logical that they should be the party that is required to be responsible for the insurance. We would be concerned if an ERDO could transfer this responsibility to another party.*

H.62 ABI and Thatcham Research thought that an ERDO should also carry other insurance:

> *We… stress the importance of the ERDO being properly insured with relevant coverage for Director & Officers, Public Liability, Professional Indemnity, Employer's Liability as well as a Motor Policy to cover RTA liabilities depending on the services it provides.*

### Information following an incident

#### Q19(5): Should an ERDO be under a duty following an incident to provide information to other road users, the police and the regulator?

H.63 Twenty-one respondents (70%) agreed. Sustrans described this duty as "a bare minimum":

> *The issues in the consultation paper around how matters are dealt with at the scene also need to be resolved much more thoroughly.*

H.64 Trilvee said that "it may also be appropriate to have a means of speaking, via two way communication, with people next to the vehicle". This would be needed to exchange insurance details with the other driver.

H.65 Some thought the duty should extend to providing information to additional parties. Richard Morris thought that it should cover "any official accident investigation organisation" and John Rainbird suggested that "the victim(s) or their representatives be included." Similarly, Einride suggested changing the language to require the ERDO to provide "appropriate information and co-operate with investigating parties".

H.66 Others stressed the need to collect and share data:

> *the duties for item (5) should explicitly include data sharing, and include the identity of the driver, location, speed, and timestamps.* [Oxbotica]

> *Vehicle data will be crucial in determining if the vehicle was in self driving mode and therefore subject to the conditions of the Automated and Electric Vehicles Act 2018 or if it was being remotely driven. This data set should be similarly defined to what is set out within the UNECE Regulation 157*

*governing the use of ALKS but adapted to the features of remote driving.* [ABI and Thatcham Research]

### Not to impede traffic flow

### Q19(6): Should an ERDO be under a duty not to impede traffic flow by (for example) ensuring that vehicles are not left in inappropriate places?

H.67 Twenty respondents (66%) said yes. Charles Puckle said:

> *ERDO vehicles must return to an approved ERDO base at the end of each fuel/charge cycle to be inspected by the ERDO. We cannot have ERDO vehicles abandoned in the way that cycles and scooters are abandoned in Liverpool, London and other electric vehicle trial areas*.

H.68 Several developers agreed with this duty, but stressed that it should be applied reasonably, and should not be more onerous than the duty applying to conventional drivers:

> *Yes, except in emergency cases. In which case, the ERDO should be subject to the same rules as a normal vehicle owner who suffers a vehicle breakdown event under the Highway Code (Rule 276).* [Imperium Drive]

> *If a stone shatters a normal driver's windscreen or they have a tyre blowout, etc. rendering the vehicle instantly unsafe for driving, they would rightly be expected to stop firmly (hopefully engaging hazards, but probably not) and potentially impede traffic.* [Trilvee]

> *Provided appropriate time is given to retrieve the vehicle.* [StreetDrone]

> *Yes, insofar as that duty is limited to taking reasonable measures to employ technology and adherence to policy to limit such occurrences.* [Starship]

### Checking the route and paying tolls

### Q19(7): Should an ERDO be under a duty to check the route and pay any tolls and/or charges?

H.69 Twenty-one respondents (70%) agreed. TfL commented:

> *The ERDO should ensure that the proposed route of the remotely driven vehicle is appropriate for the vehicle's current height, width, weight and other dimensions, its swept path, and any load it is carrying or towing. For instance, avoiding routes where bridge and tunnel structures are lower or narrower than the dimensions of the trailer that is being towed, ensuring that turns and bends in the carriageway can be safely navigated, and considering carriageway weight restrictions.*

H.70 Mid and West Berkshire Local Access Forum thought it was important to include "a responsibility to check rural PROW [public rights of way] for passing spaces and obstructions before a vehicle is deployed".

### Responding to the regulator's request for information

#### Q19(8): Should an ERDO be under a duty to respond to the regulator's requests for information about the safety of remote driving?

H.71 Twenty respondents (66%) agreed. RoSPA welcomed this duty:

> *In particular, we would welcome the duty to respond to the regulator's requests for information about the safety of remote driving, given how little is currently known about the safety of this. Information about collisions and injuries should be shared. These incidents could be investigated by the newly formed Road Safety Investigation Branch.*

H.72 Reed Mobility said that the ERDO should keep data on the safety of their remote driving operations – "perhaps with a requirement that basic anonymised data is shared with a regulator":

> *For example, the number of collisions / near misses observed, the number of times remote driving was terminated due to connectivity problems; the number of emergency stops that were required by the remote driver due to unforeseen hazards etc.* [Reed Mobility]

H.73 Similarly, TfL commented that to provide information in case of an incident, there would need to be a duty to record and retain data:

> This would of course need to *be* balanced with privacy and in line with *General Data Protection Regulation (GDPR) requirements.*

H.74 By contrast, Wayve expressed concerns about the overlapping duties and entities:

> *This would include the NUIC operator/CASDO/ASDE in the case of NUIC AVs. It will therefore be necessary to make a distinction between the various entities' responsibilities. This is yet another example that illustrates the challenge of considering an ERDO for extended remote driving versus use in NUIC operation.*

### Other duties?

#### Q19(9): Should an ERDO be under any other duties not mentioned above?

H.75 Many respondents used this opportunity to highlight some of the duties discussed above. However, a few mentioned additional duties. The MIB, for example, mentioned the need "to ensure the physical protection of any ERDO control room", for example, against fire. The British Motorcycle Federation mentioned the need "to ensure any child passengers are seated correctly".

H.76 TfL mentioned the need "to ensure that the vehicle has sufficient fuel for the proposed route". They also stressed the importance of drug and alcohol checks:

> *Given the police will not be able to undertake roadside checks of remote drivers, for example they will be unable to breathalyse them, the ERDO may need to ensure and be able to evidence that their drivers are not compromised through either drugs or alcohol.*

### The overlap with NUIC licensing

H.77 More generally, two respondents raised the overlap with NUIC licensing:

> *We understand the logic of drawing on the recommendations for NUIC operator licensing, however this list illustrates clearly that there may be overlaps, which of course can lead to a lack of clarity. Is there a proposed hierarchy, for example if a vehicle can be operated both as a NUIC and by a remote driver and two separate organisations are fulfilling these roles, which organisation would be responsible for insuring it or paying tolls and charges?* [TfL]

> *We agree with these responsibilities but we think they need further consideration alongside NUIC operator responsibilities in the context of NUIC AV operation. To this list of duties, we would also add: (e) to report to the NUiCO concerns with remote operation of the vehicle, and near-misses if the ERDO is different from the NUiCO.* [Wayve]

## CIVIL CLAIMS

### Q20

H.78 Question 20 asked about reforming civil liability for remote driving. Our analysis of Question 20 can be found in Section D where we consider civil liability in further detail.

## REGULATORY SANCTIONS

### Q21: Should the regulator have power to impose a range of sanctions on an ERDO, including improvement notices, civil penalties and (in serious cases) withdrawal of licence?

H.79 There was widespread support for giving the ERDO a range of regulatory sanctions. Out of 22 responses, 21 (95%) said yes and one made other comments. No one disagreed.

### Agreement

H.80 SMMT and RoSPA agreed on the basis that similar sanctions can be imposed on an ASDE and NUIC operator. Respondents also saw robust sanctions as crucial to maintaining safety:

> *Yes, PACTS would suggest that the regulator should have the power to impose sanctions, penalties, and withdrawal of licences if an ERDO is in breach of regulations or operational requirements that may put the vehicle, passenger, and other road users at risk.* [PACTS]

> *Yes, the regulator should have power to impose a range of sanctions. In the interest of safety we would prefer to see licences suspended while investigations are conducted rather than the other way round.* [TfL]

H.81 Trilvee argued for an emphasis on learning rather than penalties:

> *It should be borne in mind that this is a nascent field and the industry will be developing best practices as it evolves and learns. Having a sensible, learning*

*driven approach to foster a reporting and information sharing culture similar to the airline industry would seem like the best balance.*

### Other comments

H.82 John Rainbird suggested an additional sanction, to bar people from working in the industry:

> *In serious cases, should the regulator also have the power to ban an individual from participating in a similar business for a period of years, or (if a director) from serving as a director for a period of years?*

H.83 Shoosmiths suggested there should be criminal sanctions against an ERDO that failed to identify the remote driver:

> *Consideration should be given as to potential criminal sanctions for failing to provide details of the remote driver who was operating the vehicle in the same way that the existing regulatory framework places criminal liability on employers who fail to identify drivers who are caught breaching speed regulations.*

H.84 Starship mentioned the importance of an appeals process.

## INSPECTION POWERS

### Q22: Should the regulator have powers to inspect remote operation centres, both in the event of a problem and more generally?

H.85 There was widespread support for a power to inspect remote operation centres. Out of the 23 responses, 21 (91%) agreed and two made other comments. No one disagreed.

### Agreement

H.86 Respondents saw inspection powers as necessary for effective enforcement:

> *Yes, the regulator should be given powers to inspect remote operation centres, both in the event of a problem and more generally. This should be part of continuous surveillance of remote driving operations.* [SMMT]

> *The regulator and enforcement agencies need the powers, as well as the resources and skills, needed to effectively enforce the adoption of safety and security standards.* [NCC Group]

> *Yes, planned and unannounced inspections should be undertaken and there should be powers to inspect all records and to withdraw the license if appropriate. Premises should also be inspected before a licence is granted.* [TfL]

### A proportionate approach

H.87 Several developers agreed, provided that the powers were used proportionately:

*Yes, although we consider that regulator powers should be reasonable and proportionate in the circumstances*. [Starship]

*Yes, when the inspection relates to the operations of the ERDO such as following remote driver rest times, workstation guidelines etc. and not related to the technology/product development.* [Imperium Drive]

*Definitely in the event of a problem. In general it also seems like a good idea provided that such inspection regimes are not too regular/onerous.* [Trilvee]

H.88 Both Starship and Einride AB thought that the regulator should give advance notice of visits.

## AN IMMUNITY FOR INDIVIDUAL DRIVERS FOR MATTERS OUTSIDE THEIR CONTROL

### Q23(1): Should the law provide individuals who drive beyond line-of-sight with an immunity from being prosecuted for any issues concerned with roadworthiness, loading and seat belts which are beyond the driver's knowledge and control?

H.89 In the Issues Paper we noted that under the current law drivers bear heavy responsibilities, not only for dynamic driving but also for loading, the condition of the vehicle and ensuring that children wear seat belts. In some cases, these issues will be outside the driver's knowledge or control. In these cases, we thought that the individual driver should be given a statutory immunity. Instead, the ERDO would need to discharge the responsibility in another way.

H.90 Most people agreed. Of 23 responses, 16 (70%) said yes, one said no and six made other comments.

### Agreement

H.91 Respondents agreed that where issues were dealt with by the ERDO in another way, the individual driver should not be blame for matters outside their control:

*The individual driver may have no way of knowing that the tyres are bald, the number plate is obscured, or a lamp housing is cracked. They will not be in a position to check the roof-rack or the load. They are also unable to fit a child in the appropriate car seat. As the paper states, the ERDO will need to find other ways to fulfil these duties, the remote driver cannot be blamed.* [RoSPA]

H.92 The RAC Foundation agreed "so long as the liability is transferred to the appropriate party, presumably the ERDO". Similarly, BIBA agreed "subject to the quid pro quo of imposing strict liability upon an ERDO":

*It would then be for the ERDO to consider alternative methods of discharging the duties otherwise imposed upon conventional drivers.*

H.93 Starship pointed out that their remote assistants were "not engaged during the loading process, nor are they responsible for checking that the PDD is roadworthy before the journey begins". Instead, that was a company responsibility. Starship therefore considered it appropriate that remote assistants should be given the proposed immunity.

### Only if the issue is outside the driver's knowledge or control

H.94 Several respondents stressed that in some cases, the individual driver may be aware of the problem and have control over it. In these cases, the immunity should not apply:

> *Thanks to technology, it is not inconceivable that the remote driver could be aware of unfastened seat belts or insecure load, just as an onboard driver today is made aware of unfastened passenger seat belts or an unclosed boot lid through warnings via the instrument cluster. Upon being notified, the remote driver could instruct the passenger via a specially-fitted two-way in-vehicle communication system (i.e. speaker and microphone) to fasten the seat belt. Sensors and in-vehicle cameras could verify that this has been done before the remote driver is allowed to proceed with driving.* [SMMT]

> *Not automatically, perhaps in exceptional circumstances. Remote drivers must not perform the driving task where there are indications that roadworthiness, loading etc. have been compromised.* [BMF]

> *If as we have suggested the remote driver has visibility of the inside of the vehicle, we see no reason why they should not be able to check seat belts are on prior to the departure. They may also have additional aids, which will notify them about problems with the vehicle, for example tyre pressure. These warnings should obviously be heeded and acted upon.* [TfL]

H.95 PACTS emphasised that the immunity should only apply to a remote driver. Once the vehicle had been handed over to a driver present in the vehicle, then responsibility for complying with all the rules of the road would rest with the driver.

### Disagreement

H.96 DAC Beachcroft disagreed on that basis that:

> *If you permit this sort of immunity, it removes a further control over safety issues. If the remote driver is exposed to this liability, the controls remain in place.*

## A COMPETENT AND CAREFUL DRIVER DEFENCE

### Q23(2): Should the law provide individuals who drive beyond line-of-sight with a defence to a driving charge if a competent and careful driver in the same circumstances could not have avoided the offence?

H.97 Most people agreed with this proposal. Of 21 responses, 16 (76%) people said yes, one said no and four made other comments.

### Qualified agreement

H.98 Several respondents agreed but stressed that care would be needed to understand what went wrong. Reed Mobility pointed out issues which would need to be considered:

> *Great why a collision occurred and whether this includes consideration of the set-up of the remote driving apparatus (E.g. did it give the remote driver*

*sufficient field of view, resolution, refresh rate etc. to be able to drive safely?), the training of the remote driver (E.g. were they competent to be remote driving the vehicle in the prevailing circumstances of the incident?) and driving decisions made by the remote driver (E.g. choice of route, speed, following distance etc.).*

H.99 Similarly, Clyde & Co wrote:

> *For the defence to be available, we consider that - as a precondition - evidence must demonstrate failures within the remote driving system - for example, network connectivity- that meant a competent and careful driver could not have avoided the offence in the prevailing circumstances. The defence should not need to be available without evidence of such failure, given that the offences of driving without due care and attention, and dangerous driving, both require that the way the offender drives "falls [far] below what would be expected of a competent and careful driver."*

### Disagreement

H.100 DAC Beachcroft disagreed on that basis that:

> *Remote drivers should be treated as in-vehicle drivers. There are minimum standards built into these offences. The law is well-established on this point, and it would risk the safety of other road users to alter it.*

H.101 Richard Morris suggested that “there should be no driving charges as the remote assistant should not have responsibility for the DDT”.

# Appendix 1: Respondents

5G Automotive Association
Academy of Robotics
Allianz
Association of British Insurers (ABI) and Thatcham Research
Association of Consumer Support Organisations (ACSO)
Association of Personal Injury Lawyers (APIL)
British Insurance Brokers' Association (BIBA)
British Motorcyclists Federation (BMF)
British Vehicle Rental and Leasing Association (BVRLA)
Charles Puckle
Clyde & Co
DAC Beachcroft
Disabled Persons Transport Advisory Committee (DPTAC)
Einride AB (Einride)
Imperium Drive
Institute and Faculty of Actuaries
ITS United Kingdom (ITS UK)
John Rainbird
Mid and West Berkshire Local Access Forum
Mobility and Access Committee for Scotland (MACS)
Motor Insurers' Bureau (MIB)
NCC Group
Oxbotica
Parliamentary Advisory Council for Transport Safety (PACTS)
Paul Erdunast
RAC Foundation
Reed Mobility
Richard Morris
Royal Society for the Prevention of Accidents (RoSPA)
Shoosmiths
Society of Motor Manufacturers and Traders (SMMT)
Starship
StreetDrone
Sustrans
Tony Blair Institute for Global Change
Transport for London (TfL)
Transport for West Midlands (TfWM)
Transport Scotland
Trilvee
TRL
Wayve