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Submitted to **Law Commission Consultation on Automated Vehicles: Passenger services and public transport**

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About you

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Operator licensing: a single national system

Consultation Question 1: Do you agree that Highly Automated Road Passenger Services (HARPS) should be subject to a single national system of operator licensing?

Yes

Please explain your answer::

Quite apart from the legal and socio-economic arguments for consolidation into a single scheme (which are already laid out well in the report), it is also important from a technical perspective. There would be significant costs if apps and websites used for booking have to be adapted to suit regulations for specific regions or classes of vehicle, but the cost would be of an entirely different order of magnitude if the vehicle itself, including the control system, had to be re-engineered, as any safety-critical system needs extensive safety analysis and testing in response to any modifications, and the complexity of automated vehicles means that the cost and time involved in meeting differing requirements (e.g. for turning circle, self-diagnosis of faults, post-accident response, user interface, protocol for picking up passengers etc.) would be extremely high. It is therefore essential that no control system changes are needed to allow deployment in a new area, reconfiguration of the interior to add an extra seat etc. This standardisation should be done on an international level where possible, and UK law should not differ from any international regulations or standard that may emerge unless there is a clear and compelling reason.

It should be ensured that licensing regulations for HARPS are not seen as being overly lenient or stringent relative to the manually-driven vehicles they will be in competition with. A consolidated, standardised system provides an opportunity to ensure a level playing field for all.

Consultation Question 2: Do you agree that there should be a national scheme of basic safety standards for operating a HARPS?

Yes

Please explain your answer::

See answer to question 1 - safety is a major component of licensing schemes, and therefore it would not be possible to have standardised licensing requirements without standardised operational safety requirements

Operator licensing: scope and content

Consultation Question 3: Do you agree that a HARPS operator licence should be required by any business which:

Yes

Please explain your answer: :

Only concern I have is over the option of a user-in-charge being merely in line of sight of the vehicle. This raises two questions: does having a view of the vehicle mean they also have a view of surrounding hazards that is comparable to a 'driver's eye view' (or at least are capable of assuming such a position when the system requires them to take over control or provide some other response, e.g. by entering vehicle if required); and do they have ability to take control of the vehicle in circumstances that an on-board user-in-charge would be expected to (i.e. have appropriate controls)? If not, they should not be regarded as a user in charge, and the vehicle should be viewed as a HARPS.

There are some situations where mere line of sight would be acceptable without becoming a HARPS (e.g. driver of a taxi getting out to use a remote parking system), but there may be other permutations where it is not feasible to act as user-in-charge while outside the vehicle (e.g. if line of sight is achieved by following the vehicle on a motorway).

Consultation Question 4: Is the concept of "carrying passengers for hire or reward" sufficiently clear?

Yes

Please explain your answer::

Existing definition and case law provide a reasonable level of clarity. Amending the definition would require new case law to be built up to find legal tests that clarify grey areas that were unforeseen during drafting.

Consultation Question 5: We seek views on whether there should be exemptions for community or other services which would otherwise be within the scope of HARPS operator licensing.

Please share your views::

It is difficult to imagine operators of community bus services having the necessary skills and processes to ensure HARPS are operated safely, this being a far more complex and technical task than operating a traditional minibus. It would therefore be more feasible for them to either continue to use manual drivers or to contract out the service to a professional operator.

However, this question should be revisited in the future; whilst early adopters of pioneering technology often have to have technical skills to operate and maintain the systems (for example, early cars and early computers), and therefore legislation should ensure competence when there are safety implications, it is typically the case that such technology becomes more user-friendly over time, with increased reliability and performance and simpler user interfaces. There could be a time when HARPS become no more difficult to operate than a mobile phone, making operation by community services without a full operators licence appropriate.

Consultation Question 6: We seek views on whether there should be statutory provisions to enable the Secretary of State to exempt specified trials from the needs for a HARPS operator license (or to modify licence provisions for such trials).

Please share your views::

If trials are delivering a commercial service, many similar risks to occupant safety will apply as for normal commercial use. Although the testing organisation may be extremely competent with the technology, there are also non-technical issues involved in safeguarding transport users, protecting data, complying with local authority transport planning etc. Evidence presented to allow an exemption would therefore need to be extensive, and potentially comparable to that required to obtain a licence, making the exemption serve little purpose.

There could be an argument that the small scale of the trial minimises the exposure to risks and makes admin overheads disproportionate. However, this same argument could be made for any other limited scale deployment without new technology involved. It is therefore important that the licensing scheme is scalable such that demands can be reduced for all services with limited vehicle numbers, geographical areas or durations, not just experimental ones.

This should continue to have no effect on non-commercial trials, where members of the public should be allowed to participate in scientific studies where appropriate without undue burden, subject to safety management and ethics procedures.

Consultation Question 7: Do you agree that applicants for a HARPS operator licence should show that they:

Yes

Please explain::

Also agree with suggestion in the text that financial standing requirements could be adjusted according to vehicle size/ capacity to avoid penalising operators of many small pods

Consultation Question 8: How should a transport manager demonstrate professional competence in running an automated service?

Please share your views::

I agree with the suggestion that competence could be shown through a safety case, which could be formed on the basis of individuals with appropriate experience (both of transport management and of the technical side of AV's, not necessarily covered by the same person) or by demonstrating that appropriate training and processes are in place.

It is reasonable to expect a wide range of approaches to satisfying this for early deployments, as the industry finds its way, so flexibility must be allowed to accommodate new approaches. On the other hand, there may still need to be a level of standardisation (e.g. a common framework, possibly with some set options for combinations of evidence that would be acceptable, but with the option to propose a different safety argument if desired), to make the scheme

manageable for those who have to assess the myriad of safety cases.

Consultation Question 9: Do you agree that HARPS operators should:

Yes

Please explain::

It's worth noting that maintenance checks may vary drastically from one model of AV to the next, so it may prove difficult to issue guidance to operators. Instead, an option may be to place requirements on manufacturers to provide more detailed maintenance guidance that is bespoke for that type of vehicle. It may be found over time that the industry settles on similar implementations, at which point standardised guidance can be introduced to remove this burden from manufacturers.

Consultation Question 10: Do you agree that legislation should be amended to clarify that HARPS operators are "users" for the purposes of insurance and roadworthiness offences?

Yes

Please explain::

There needs to be an identifiable body with responsibility, and the issues are primarily operational rather than design/ manufacture

Consultation Question 11: Do you agree that HARPS operators should have a legal duty to:

Yes

Please explain::

Consultation Question 12: Do you agree that HARPS operators should be subject to additional duties to report untoward events, together with background information about miles travelled (to put these events in context)?

Yes

Please explain::

Recording miles travelled is not an onerous task and could easily be done automatically by the vehicle (including separating out any miles that were not driven autonomously). This would make statistical analysis of performance far more feasible.

The text mentions logging miles in particular ODD permutations (night, rain, snow etc.); it doesn't seem feasible to collect this manually as it would require a lot of admin and would be unlikely to be done particularly diligently, limiting the accuracy of any conclusions, but it does seem feasible for the system to automatically log data on such parameters. This would be useful to analyse accident rates, and could potentially also provide data to help inform test programmes by providing data on the types of scenarios encountered and their typical frequency.

Consultation Question 13: Do you agree that the legislation should set out broad duties, with a power to issue statutory guidance to supplement these obligations?

Yes

Please explain::

The regulatory system needs to be particularly flexible in the early years of HARPS deployment as there will be many new and unforeseen problems and solutions to adapt to.

Consultation Question 14: We invite views on whether the HARPS operator licensing agency should have powers to ensure that operators provide price information about their services.

Yes

Please explain::

It seems reasonable to allow market forces to regulate fares provided customers are provided with clear information. The only potential issue is if a monopoly emerges, e.g. if a HARPS operator is able to put traditional bus/ taxi firms in the area out of business, but there are no other HARPS operators in the territory. As complex and expensive technology tends to favour small numbers of large companies, rather than many small businesses, regulators will need some means to ensure a monopoly does not emerge, or if it does, that prices are controlled

Yes

Please explain::

This seems like a reasonable response, although there should be potential to give warnings or apply less severe penalties for less severe infringements

Consultation Question 15: Who should administer the system of HARPS operator licensing?

Please share your views::

There are precedents within the transport industry both for having the same regulator for manufacture and operation, or for having separate regulators. It would be a challenge for the regulator of the ADS to understand all the operational aspects and the challenges of dealing with local depots, but difficult for an existing transport operator to understand the technology. Either approach is therefore possible, but relies on sharing of knowledge and recruiting the right people.

Consultation Question 16: We welcome observations on how far our provisional proposals may be relevant to transport of freight.

Please share your views::

Requirements for maintenance of freight vehicles should be similar, so similar regulations and guidance could be used. Issues around passenger safeguarding would of course be irrelevant (replaced with concerns around theft of goods and transporting hazardous loads), as would the requirements for fair advertising of prices (as payment would presumably be according to a very different business model), but concerns about the safety of other road users, and the disruption they may face, are similar for freight applications

Privately-owned passenger-only vehicles

Consultation Question 17: Do you agree that those making "passenger-only" vehicles available to the public should be licensed as HARPS operators unless the arrangement provides a vehicle for exclusive use for an initial period of at least six months?

Yes

Please explain::

The approach outlined seems reasonable based on current use models and predictions of how autonomous vehicles will be used. However, it should be regularly reviewed as practical experience is gained, since unexpected methods of deployment and unintended consequences of new technology are predictably unpredictable. Six months' initial rental period seems like a plausible cut-off provisionally, but it may prove necessary to further calibrate it (if anything it seems on the long side, as there may be many reasons to rent for shorter durations without wishing to be limited to HARPS, which would presumably cost a lot to have sat on your drive like a private vehicle). Experience may indeed prove that private individuals are not able to maintain such vehicles safely, provide suitable remote supervision etc., and that the only acceptable solution is a professionally-maintained and operated HARPS

Consultation Question 18: Do you agree that where a vehicle which is not operated by a HARPS licence-holder is authorised for use without a user-in-charge, the registered keeper should be responsible for:

Yes

Please explain::

Consultation Question 19: Do you agree that there should be a statutory presumption that the registered keeper is the person who keeps the vehicle?

Yes

Please explain::

Consultation Question 20: We seek views on whether:

Please share your views::

It is difficult to say whether it would be acceptable for a private individual to assume responsibility for operating a fully-driverless vehicle, as this depends upon how onerous this duty is. It may be expected that early implementations of the technology require more skill to operate, with it then becoming progressively more user-friendly (in line with the evolution of other new technologies such as the computer or the motor car). The safer option would be to limit operational and maintenance responsibilities to a professional operator until it becomes clear that it is reasonable to provide the option of transferring this responsibility to a private individual; this point may be reached before deployment based on information from trials, or after.

It's difficult to provide a definitive answer to either sub-question, as there is not enough data about how reasonable or onerous the transferred responsibilities would be to carry out. However, a scheme to sub-contract out these duties, as described in question 21, would make transferring responsibility to hirers much more feasible - the analogy I would make is having the option to hire a car with or without insurance under typical current agreements; it is then a commercial choice for the hirer whether it is more favourable to accept the policy that comes with the vehicle or to shop around

Please share your views::

See answer to sub-question 1; it's difficult to envisage it being appropriate for private individuals to assume responsibility for early implementations of HARPS, unless they are required to contract the management out to a professional company. Once HARPS become more established, it may become simpler to act as an operator, at which point it may be possible to transfer responsibilities to an individual if these are laid out clearly

Consultation Question 21: Do you agree that for passenger-only vehicles which are not operated as HARPS, the legislation should include a regulation-making power to require registered keepers to have in place a contract for supervision and maintenance services with a licensed provider?

Yes

Please explain::

This seems reasonable, at least for early deployments. As the technology becomes more robust and user-friendly over time, it may be possible for individuals to maintain and operate their own vehicles, but new technology typically needs more oversight and more skilled support, making it appropriate to require a professional service to be procured to support operation

Consultation Question 22: We welcome views on whether peer-to-peer lending and group arrangements relating to highly automated passenger-only vehicles might create any loopholes in our proposed system of regulation.

Yes

Please explain :

I agree with the approach outlined - peer to peer lending would present similar risks in terms of operation, maintenance, insurance etc., as a commercial service as described previously, so it should not be possible to use the 'sharing economy' to bypass HARPS operator regulations

Consultation Question 23: We seek views on whether the safety assurance agency proposed in Consultation Paper 1 should be under a duty to ensure that consumers are given the information they need to take informed decisions about the ongoing costs of owning automated vehicles.

Please share your views::

There needs to be careful consideration of how costs are managed for software updates, as consumers will be trapped with no choice but to update the vehicle, particularly if failure to install updates is made an offence. The presence of a legal obligation to update the vehicle would present a strong case for strict price regulation, in the same way as how the cost of an MOT is regulated (and kept to a comparatively low level where traders have little or no profit margin), whereas annual services and repairs are not regulated.

There is an argument that any need to update the autonomous system for is due to a limitation that was present at the time of manufacture, and that the manufacturer rather than the consumer should be responsible for rectification, particularly where there are safety or legal compliance issues. This could be seen as analogous to vehicle recalls for modifications as a result of safety defects, the rectification of which consumers would not be required to contribute to.

If users are required to contribute to updates, the price should therefore be strictly regulated as there is no other way to ensure it is not used to make excessive profit. This should include a limit on the maximum cost per year as well as per update (to prevent manufacturers splitting updates into multiple smaller instalments to get around the limitation). However, if the update is due to an inherent fault with the design or manufacture (as opposed to improving the spec beyond that originally advertised), and there is a safety aspect (which will typically be the case for AV control systems), it would be inappropriate for consumers to bear the cost, as it would disincentivise applying robust engineering in the first place, and reward poor systems

Accessibility

Consultation Question 24: We seek views on how regulation can best promote the accessibility of Highly Automated Road Passenger Services (HARPS)? In particular, we seek views on the key benefits and concerns that regulation should address.

Please share your views::

Agree with comments in the paper, nothing further to add

Consultation Question 25: We provisionally propose that the protections against discrimination and duties to make reasonable adjustments that apply to land transport service providers under section 29 of the Equality Act 2010 should be extended to operators of HARPS. Do you agree?

Yes

Please explain::

Extending the legislation to HARPS seems reasonable based on the description of the law given in the document, and would ensure consistency with other transport modes. However, I must qualify this feedback by declaring no expertise on equality legislation, and therefore no information to draw on besides what is in the consultation document

Consultation Question 26: We seek views on how regulation could address the challenges posed by the absence of a driver, and the crucial role drivers play in order to deliver safe and accessible journeys. For example, should provision be made for:

Yes

Please explain::

As an aside, para 6.50, and footnote 503, refer to AI continuing to learn whilst in use; this is not necessarily true. There are many AI systems in other industries that are capable of continuous learning, but to the best of my knowledge all autonomous vehicle projects to date have used neural networks that are trained with suitable data before use, and then the weights of the neurons remain constant in use. In theory it must be possible to have sufficient confidence in an artificial neural network that learns in service - after all, human drivers rely on biological neural networks that continue to learn whilst driving. However, live learning would not be acceptable for safety-critical systems in the foreseeable future, as it is not possible to verify that the vehicle will behave correctly either through analysis of the design or through testing. This is not directly relevant to question 26 that follows the text, but is something I thought worth clarifying to avoid any misconceptions affecting future legislation.

As far as Q26 itself goes, there may be many functionalities to aid passengers with disabilities that can be incorporated into the vehicle without requiring human assistance. The proposal for co-design would not result in prohibitive costs, although some form of regulation may be needed to ensure corners are not cut. However, it is widely regarded that the principles of 'inclusive design' benefit all users by making systems easier to interact with (e.g. making interfaces suitable for visually-impaired users will tend to make them clearer for those with good eyesight by forcing de-cluttering, use of clear colours etc.) and will therefore also be an advantage to service providers (e.g. making the service more popular, speeding up throughput at entry points). Some forms of modification may be more challenging; for example, fitting fully-automated wheelchair ramps may be plausible for larger vehicles, but would be very expensive for large fleets of small pods, and the extra size and weight would impact upon energy efficiency. It may therefore be better to have only a proportion of such fleets having modifications like this, with the booking app used to summon them where needed.

Yes

Please explain::

Using the principles of inclusive design, as described in sub-question 1 above, will make the service easier to interact with. However, there are likely to be situations where human help is needed; often this could be provided remotely, in a similar manner to the 'Help Points' found at railway stations, although a video link and/ or on screen guidance could be provided in addition.

There should always be a means for the operator to communicate with passengers, and also for passengers to communicate with the operator. This is important whether the passenger is alone in a small pod or surrounded by passengers in a large vehicle.

Yes

Please explain::

The infinite diversity in the disabilities users could have, and therefore the support they could need, means that human help on location is likely to be needed sometimes, which may require a pool of staff able to be dispatched as required; automated systems are poor at adapting to unusual situations, both in terms of hardware and software, and could only be designed/ programmed/ trained to accommodate the more commonplace needs. Major terminals can be more easily supported by staff, but door-to-door service would make this more challenging and introduce significant costs.

More generally, the assumption that AV's will improve mobility for disabled people may not prove to be correct; it may be the case that taxis remain a better option for some disabled people. The cost of the driver is a significant proportion of the price per mile, but installing and maintaining the autonomous system in an AV, not to mention covering the original development costs, will also add a significant cost above the price of the basic physical vehicle. Whilst it may potentially be possible to make autonomous pods cheaper per mile than taxis, it's difficult to argue with any certainty that they would be cheaper by such a margin that they would become the best option for every possible use case. It will require significant breakthroughs in both AI and assistance robotics, beyond what is currently foreseeable, to make a fully-automated service suitable for all, and passengers who require assistance at remote locations may be a use case where taxis continue to have an advantage over HARPS.

Consultation Question 27: We seek views on whether national minimum standards of accessibility for HARPS should be developed and what such standards should cover.

Please share your views::

In general, standardisation makes systems significantly easier to interact with once users are familiar with them, although this can increase anxiety on first use if it feels to the newcomer like the rest of the world knows what to do, so the emphasis should be just as much upon making it easy to work out what to do on first use.

As noted in the document, there is a risk of standardisation stifling innovation, which is a major concern for HARPS as we don't even know what such services will look like at this point, and may introduce unintended consequences by standardising using desk-based assumptions and data from limited-scale trials. Standardisation of interfaces is therefore desirable at some point, but we are currently nowhere near knowing what solutions we should standardise upon, and therefore this is not an option for the foreseeable future. A more viable approach could be to standardise outcomes rather than solutions (i.e. make it solution-agnostic) by listing what needs should be considered when designing a service, but leaving it to the provider to come up with solutions to accommodate those needs

Consultation Question 28: We seek views on whether operators of HARPS should have data reporting requirements regarding usage by older and disabled people, and what type of data may be required.

Other

Please explain :

Not an area of expertise, but a better solution may be to fund surveys of the public, capturing both HARPS users and non-users, once such services are in operation. Requirements for operators to collect data on usage by disabled people could result in excessive admin overheads, inaccurate data leading to wrong decisions, failure to capture data on non-users and GDPR issues in capturing very sensitive information about users, not to mention the difficulty in identifying disabilities (would they be expected to ask people face to face? Or to guess from their behaviour? Or would users have to self-declare when signing up to the app? None of these methods seem acceptable or accurate)

Regulatory tools to control congestion and cruising

Consultation Question 29: We seek views on whether the law on traffic regulation orders needs specific changes to respond to the challenges of HARPS.

Please share your views::

It partly depends upon who the TRO is aimed at. If it is banning manual drivers from certain areas so they can be designated as autonomous-only, the notification requirements should be similar to non-HARPS TROs, as it is necessary for the public to be made aware so they can follow the order. As noted there may be opportunities to streamline this process - the requirement to advertise in the local press seems to hold little value given how low readership is for local newspapers these days!

However, if the TRO is banning an autonomous vehicle from a certain area, there is less need to consult with the wider public (it may be more appropriate to consult with HARPS operators in terms of the effect on their route planning), and no need to directly notify the public, as obedience of the TRO will depend upon a machine-readable version being conveyed to the vehicle in some way. For all foreseeable HARPS implementations, this could be done via mapping, although it may be worth considering dedicated roadside infrastructure such as wireless communication or signs that the vehicle is required to be able to recognise (which may or may not be intelligible to human eyes) - requiring TROs to be communicated via maps is only a complete solution if all HARPS are required to use maps, and it is theoretically possible for HARPS to operate safely without maps (in the same way that humans can), even if this permutation currently seems unlikely.

The machine-readable TROs should be considered as part of a wider challenge, as it is important to also develop a standardised means to communicate temporary changes to traffic flows (e.g. road closures, lane closures, contraflow or temporary one-way systems due to roadworks, accidents or major events). It may be possible to include all such traffic updates in the same format

Consultation Question 30: We welcome views on possible barriers to adapting existing parking provisions and charges to deal with the introduction of HARPS.

No

Please explain::

The existing wording of section 122 appears to be sufficiently broad to cover parking charges relating to HARPS, and there seems no more reason to explicitly refer to HARPS-related applications as there is to refer to specific existing applications. Furthermore, HARPS may be used in ways that are currently unexpected and may present unforeseen challenges regarding road and parking prices, making more prescriptive regulations impractical, especially as any omissions could be interpreted to show the intent to exclude them if other equivalent approaches have been included. The existing wording therefore appears appropriate.

As a side note, it's worth considering whether road pricing is the best way to prevent cruising to avoid parking fines, as this could unfairly distort the market for or against particular methods of travel. It should be mandated that the control systems for HARPS are only permitted to cause the vehicle to travel on roads if that travel directly relates to the conveyance of persons or goods (i.e. whilst transporting the persons or goods, whilst travelling to a destination where the service has been summoned, whilst travelling to a plausible parking location, or whilst travelling to an approved pick-up point equivalent to a current taxi rank). HARPS cannot undertake other journeys unless programmed or trained to do so, and to programme or train them to do so would result in enforcement action. Whilst it wouldn't be possible to detect every transgression, if a pattern of non-compliant behaviour is consistent enough over a vehicle type or fleet to cause perceptible traffic issues, it would be clear enough to police

Consultation Question 31: We seek views on the appropriate balance between road pricing and parking charges to ensure the successful deployment of HARPS.

Please share your views::

It would be reasonable for cars to pay significantly more per hour for driving on roads than for parking, since they occupy more tarmac (due to the need to allow error margins and stopping distance) and cause more wear and tear whilst moving – as noted, this is the opposite to the current balance. However, as with the examples of unpopular road pricing proposals given in the report, care needs to be taken to ensure that the public do not feel they are being forced to pay a stealth tax .

Road pricing is not the only way to prevent vehicles from cruising whilst empty, and care should be taken to avoid artificially distorting the market in order to prevent this behaviour when it could be controlled by regulations on the vehicles themselves, preventing them from driving other than to achieve a particular transport objective. It would be expected that HARPS are engineered to be restricted to the speed limit, for example, rather than applying a speed-based pricing system to encourage vehicles to have more of a tendency to choose to obey the speed limit, so there's no reason that other antisocial behaviours, such as clogging up roads whilst cruising to avoid parking costs, shouldn't also be directly prohibited

Consultation Question 32: Should transport authorities have new statutory powers to establish road pricing schemes specifically for HARPS?

No

Please explain::

There is no immediately obvious reason why it would be justified for HARPS to pay more or less than manual vehicles to access roads and parking spaces, as the burden they place upon the infrastructure would be broadly similar. As per Q30 and Q31, distorting the market to prevent cruising empty is not a justification for differential pricing, as such behaviours should be prohibited by regulations placed upon manufacturers and/ or operators, rather than attempting to 'persuade' the vehicle to make the desired decision (which would be difficult to calibrate as each vehicle type would presumably assess the cost-benefit trade-off differently in their algorithms)

Consultation Question 33: Do you agree that the agency that licenses HARPS operators should have flexible powers to limit the number of vehicles any given operator can use within a given operational design domain?

Yes

Please explain::

It's difficult to give a maximum number of years, as it depends on what level of safety is expected (this is very much an open question, and directly affects the required mileage), the number of vehicles involved in the initial deployment and how intensively they are used. So I don't think it's possible at this point to give any more than a rule-of-thumb/ gut feeling figure, but somewhere in the region of 2 or 3 years sounds reasonable. It should be possible to extend the limitation period if concerns remain, whether relating to safety or the overall effect on the transport network (e.g. overly cautious vehicles slowing down other road users).

Other limitations should be considered beyond the number of vehicles; for example, it would be worth considering restricting the operational design domain by prohibiting use during rush hour, at night, in the fast lane of a dual carriageway etc.

It's worth noting that this initial deployment will never be sufficient to draw any statistically-significant inferences about accident rates compared to existing manual vehicles, which would need prohibitively large mileages (as previously demonstrated by RAND). Instead, the progressive deployment would act as a filter to identify grossly unacceptable performance, which could be observed at much lower mileages due to the higher frequency of incidents. This seems like a fair and proportionate approach, as it would not be possible to conduct exhaustive testing of the system on every road that it is deployed upon, and some residual risk has to be accepted.

Consultation Question 34: Do you agree that there should be no powers to impose quality restrictions on the total number of HARPS operating in a given area?

Yes

Please explain::

Free and fair competition will be vital for the evolution of the technology and for new and unforeseen services to develop. Any cap could only be based on an arbitrary guess as there is insufficient data on what the services will look like, and would result in unfair restrictions on those who are later to market (potentially creating pressure to rush vehicles to market before they are ready in order to reserve a space within the quota, which would have safety implications)

Integrating HARPS with public transport

Consultation Question 35: Do you agree that a HARPS vehicle should only be subject to bus regulation if it:

Yes

Please explain::

As an aside, it is suggested in the paper that 'trackless trains', as under test in China, would more naturally be regulated as busses rather than trains if operating in a public environment; I would suggest their ODD is most similar to trams, which would fall within the Railways and Other Guided Transport Systems (ROGS) regulations. ROGS are not exclusive to segregated routes as rail systems frequently operate in publicly-accessible areas. The only point when this becomes complicated is if a driver has to take over to steer around an obstacle as it arguably changes from a train to a bus instantly!

Care should be taken in allowing HARPS consisting of multiple vehicles in a 'train' to be regulated as busses as there are particular risks and traffic flow issues associated with long articulated vehicles, as illustrated by the controversy over 'bendy busses' in London. The route would therefore need to be properly demarcated and risk assessed, and potentially the speed limit set differently to that for other road users, as it would be for a tram. Otherwise, the suggested criteria for applying bus regulations seem reasonable

Yes

Please explain::

Consultation Question 36: We welcome views on whether any particular issues would arise from applying bus regulation to any HARPS which transports more than eight passengers, charges separate fares and does not fall within a specific exemption.

Please share your views::

The description of a 'flexible service' under existing bus regulation seems appropriate for HARPS, although it's worth considering whether the specific wording on how the flexibility can be applied is sufficient (I'm not in a position to comment). In general, humans are far better at adapting to new situations than automated systems, so the flexibility of alternative routes that HARPS could take would need to be strictly limited to a geographical ODD, and acceptance testing would have to include all the possible routes that could be encountered. Care should be taken in allowing flexible routing for early implementations of HARPS; safe and acceptable performance should be shown on simple pre-defined routes before further complexity is introduced.

In terms of the service provided to the customer as part of an integrated transport network, the ability to alter routes and ticketing in response to booking on an app isn't necessarily affected by whether that vehicle has an autonomous control system or a manual driver, as humans can be given dynamic routing instructions, so regulations relating to quality and quantity of service (as opposed to safety) should be similar for conventional and automated services

Consultation Question 37: We welcome views on whether a HARPS vehicle should only be treated as a local bus service if it:

Please explain::

Only caveat is, as per my answer to Q35, trackless trains should be excluded from this as there are particular risks associated with operating long articulated vehicles in a public area that are more similar to the risks presented by trams. Otherwise I agree.

Consultation Question 38: We seek views on a new statutory scheme by which a transport authority that provides facilities for HARPS vehicles could place requirements on operators to participate in joint marketing, ticketing and information platforms.

Please share your views::

'MaaS' doesn't necessarily require vehicles to be autonomous as drivers can be directed to pick-up points via an app. Indeed there's no reason to assume HARPS will be cheaper than conventional taxis and private hire vehicles, given that the drivers are on relatively low wages and that the cost of sensors and maintenance, plus covering the original development costs, will be exceptionally high for HARPS (particularly for early implementations). So if the 'MaaS' ideal is possible to implement, should it not be implemented now with manually-driven taxis?

However, forced introduction of a single 'MaaS' system could be controversial as it would remove competition and go against the concept of the free market, placing a lot of responsibility upon agencies exercising the centralised control to get decisions right - decisions they are often poorly placed to make relative to those 'on the ground'. An alternative option would be for multiple providers of MaaS services to be in competition, which may encourage innovation, although it could undermine the 'MaaS' ideal if no competitor is able to invest sufficiently to form a complete solution and journeys end up being fragmented across providers.

It should continue to be possible for private operators to exist outside the MaaS scheme, even if this would exclude them from access to certain facilities that the authorities have created specifically for the scheme, and the lack of access to these facilities shouldn't affect the ability to compete fairly (e.g. converting a key route to only be open to those who join the 'MaaS' scheme would be unfair).

There should be caution that such 'MaaS' schemes do not interfere with technology developments or the development of innovative new types of services; it's

difficult to foresee how tightly-controlled policies on ticketing and marketing could avoid significantly impacting the latter.

There was also reference to the need to create more pleasant interchange points to encourage MaaS. Again, the ability to provide this has nothing to do with whether the vehicles are autonomous, which again begs the question why this hasn't already been done - presumably because the economics don't add up and the planning complexity would be prohibitive in many of the interchange locations. 'MaaS' represents an idealised transport system that could in theory have significant societal benefits, but very significant challenges that may prevent full realisation. If it is achievable, it is achievable without HARPS, and therefore we should not wait for autonomy as the panacea that will suddenly make it possible

Other comments

Is there any other issue within our terms of reference which we should be considering in the course of this review?

Please share your views::

Much of the paper, and indeed my responses, is based upon supposition, looking quite a long way into the future. As the emerging uses of new technology are predictably unpredictable, all the questions should be revisited regularly, particularly as more information comes to light from early HARPS deployments.