Urban Transport Group: Evidence submission

Self-driving vehicles

Transport Committee

August 2022

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Content

1. Introduction

1.1. The Urban Transport Group (UTG) represents the seven largest city region strategic transport bodies in England, which, between them, serve over twenty million people in Greater Manchester (Transport for Greater Manchester), London (Transport for London), the Liverpool City Region (Merseytravel), Tyne and Wear (Nexus), the Sheffield City Region (South Yorkshire Mayoral Combined Authority), the West Midlands (Transport for West Midlands) and West Yorkshire (West Yorkshire Combined Authority).

1.2. We also have the following associate members: Tees Valley Combined Authority, Strathclyde Partnership for Transport, West of England Combined Authority, Nottingham City Council, Translink (Northern Ireland) and Transport for Wales.

1.3. Our members plan, procure, provide and promote public transport in Britain's largest city regions, with the aim of delivering integrated transport networks accessible to all.

2. Overview

2.1. We welcome the Transport Committee's inquiry into self-driving vehicles. We will refer to self-driving vehicles as CAVs (connected and autonomous vehicles) for ease.

2.2. CAV technology can – and is - being applied to private cars, public transport, commercial vehicles and more in-between. Numerous trials are underway, including a ground-breaking trial of full-size autonomous buses on a 14-mile route in Scotland.

2.3. However, progressing further with the roll-out of CAVs poses considerable challenges, particularly given uncertainty as to how the technology will evolve; the extent to which it will be accepted; and how able it is to handle complex and unpredictable urban environments.

2.4. For this reason, developers are focusing CAV trials on more predictable, constrained tasks and environments that vehicles can handle now, or soon (e.g. running on segregated portions of highways, set routes between two points, or in defined spaces like airports or university campuses).

2.5. This makes public transport services a natural candidate for early automation, given that services typically follow predictable routes and can use infrastructure designed to segregate them from other traffic.

2.6. There are considerable infrastructure implications for any shift to CAVs, not least those associated with what could be a lengthy (or indefinite) period where CAVs mix with conventional vehicles.

2.7. Infrastructure requirements may include segregated portions of highway; better standards of highway maintenance; signage to enable safe sharing of the road; charging points served by a decarbonised electricity supply; and high levels of digital connectivity.

2.8. Uncertainty as to what CAVs will need makes future proofing streets difficult. This is compounded by funding constraints at local government level which make strategic forward planning particularly challenging.

2.9. In planning for CAVs, it will be important not to repeat mistakes of the past and instead ensure that streets prioritise the needs of people, over those of vehicles. Walking, cycling and public transport will always be the greenest, healthiest and most efficient means of transporting large volumes of people and CAV technology should be used to complement and enhance the attractiveness of these modes, rather than undermine them.

2.10. In our response we argue that, to harness transport innovation of any kind, city regions need a legal and regulatory framework that supports five key foundations: agile and devolved governance to support and protect wider goals for people and place; long-term funding certainty giving space to plan strategically and creatively; key standards set nationally, with the scope to go above and beyond locally; open data, shared safely to inform decision making; and freedom to test new approaches on the ground.

2.11. CAV technology has the potential to bring environmental and safety benefits but, to achieve these, its introduction must be managed in such a way as to protect the wider public good. Local authorities are well placed to make sure the necessary safeguards are in place, but to do so they must be given the powers to regulate CAV-based passenger services operating in their areas.

3. Response

Likely uses, including private cars, public transport and commercial vehicles

3.1. CAV technology can be applied to all of the above uses, and more in-between – for example, connected and autonomous shared cars (e.g. as part of car club fleets); taxis and PHVs; public sector fleets (like road sweepers); and drones (e.g. delivering medical supplies to hard to reach locations).

3.2. Indeed, CAV technology is already being deployed across a wide range of uses.

3.3. Private cars are increasingly connected and many operate with features that include a degree of connectivity and autonomy, from smart phone integration to lane-keeping technology.

3.4. In respect of public transport – outside of road-based modes - automation/driverless systems are relatively common on metro networks around the world, with the first dating back over 40 years.

3.5. For road-based passenger transport, The Law Commission has conducted an extensive review of the potential legal framework for what it terms 'Highly Automated Passenger Services (HARPS). HARPS are self-driving vehicles capable of carrying passengers or travelling empty with no human driver on board. The UTG response to this consultation can be found here.

3.6. Real-world trials of CAV public transport are also planned or underway, for example, the CAVForth project in Scotland which will roll out five autonomous, full-size buses to operate a 14-mile route[1].

3.7. For commercial vehicles, robot food and package delivery pods are already navigating urban streets, for example in Milton Keynes, whilst driverless grocery delivery vans have also been trialled, both in Milton Keynes and London.

3.8. Progressing with the roll-out of CAV technology poses considerable challenges, however, not least those associated with handling complex and unpredictable urban environments.

[1] https://www.cavforth.com/

3.9. For this reason, developers are looking particularly at ‘operational design domains’ and geo-fencing. This involves focusing CAV applications on more predictable, constrained tasks and environments that vehicles can handle now, or soon (e.g. running on segregated portions of highways, set routes between two points, or in defined spaces like airports or university campuses).

3.10. This makes public transport services a natural candidate for early automation, given that they typically follow predictable routes and can use infrastructure designed to segregate them from other traffic.

3.11. A key consideration as CAV technology develops should be to ensure that smaller, less efficient vehicle formats (like AV taxis and PHVs) do not crowd out walking, cycling and more efficient shared and mass transit modes. Public transport, walking and cycling represent the most efficient use of road space, cut congestion and bring benefits to health, the environment, society and the economy.

Progress of research and trials in the UK and abroad

3.12. As noted above, connected and autonomous features are already becoming integrated into existing vehicles – millions of vehicles on the road have internet connectivity, whilst features such as automatic starters, gearboxes and wipers; emergency braking; cruise control; lane assist and parking assist are common place.

3.13. The next level of connected vehicles will be able to communicate with each other, with infrastructure and across borders. Developments in AI and machine learning could even see vehicles learning and evolving based on their collective experiences.

3.14. Numerous trials and demonstrations are underway in the UK and around the world, but these present an entirely different prospect to large-scale deployment around which there are still many uncertainties – from the regulatory environment to affordability and from the ability of the technology to manage complex urban environments to the achievement of public acceptance.

3.15. It should be mandatory to consult with local and transport authorities before launching trials of CAV services in their areas. Currently, the CCAV/DfT Code of Practice notes that trialling organisations ‘should’ rather than ‘must’ speak with them. Local and city authorities should be key stakeholders given that the development of CAV passenger services in particular will have direct consequences for the existing transport network and for communities.

Potential implications for infrastructure, both physical and digital

3.16. There are considerable infrastructure implications for any shift to CAVs, not least those associated with what could be a lengthy (or indefinite) period where CAVs mix with conventional vehicles.

3.17. In this environment, the full benefits of CAVs would not be realised as they would be unable to adopt the driving styles that would maximise traffic flow and would be faced with unpredictable human counterparts.

3.18. CAVs may therefore need to be separated in some way from conventional vehicles (e.g. dedicated lanes for autonomous buses) and/or all existing features (parking, speed bumps, road signs etc) would need to be retained for conventional vehicles and maybe even added to in order to ensure that streets can be shared safely.

3.19. In planning infrastructure for CAVs, it will be important to ensure that we do not repeat the mistakes of the past in clearing the way for motor traffic at the expense of pedestrians and cyclists. Streets, particularly in urban environments, should prioritise people over vehicles and should deliver a pleasant public realm.

3.20. Parking is another consideration – CAVs will no longer need to remain at or near their destination having dropped of their passengers but they will need to go somewhere and cannot be allowed to endlessly circulate around road networks waiting for passengers or goods.

3.21. There will also need to be a decarbonised energy supply and charging network to supply what is likely to be an all-electric fleet.

3.22. Finally, on physical infrastructure, maintaining high quality urban realm and roads could become more costly as CAVs are introduced. CAVs may be less able to adapt to potholes[2]; they could cause more damage to road surfaces if they consistently run in the same lane positions[3]; and streets may need to be kept clear of obstructions that could cause problems for sensing technologies. The Government Actuary's Department has predicted that CAVs may also require markings, signals and signs to be maintained to a higher standard[4].

3.23. Overall, KPMG have estimated that the cost of upgrading infrastructure and maintaining roads to a high standard for CAVs will rise to £11bn by 2030. Governments at national and local level face a significant challenge in future proofing their networks in an environment that is fraught with uncertainty as to how exactly the technology will evolve and whether it will be accepted. The challenge is exacerbated by competing demands on limited council budgets and staff resources.

3.24. In terms of digital infrastructure, CAVs will require high levels of digital connectivity in order to perform to their full potential.

3.25. They will also be constantly recording a huge volume of data about their trips and the environment around them – from the behaviour of other road users to the state of road surfaces. This data could be used by local authorities to generate useful insights into travel behaviour and infrastructure maintenance requirements. That said, being able to access and make best use of this data will require data sharing agreements as well as considerable staff skills and resources to make best use of it.

3.26. Again, transport authorities face a challenge in future-proofing their roads to ensure CAVs can communicate with each other and their surroundings. The RAC Foundation[5] has highlighted that CAVs will need highly accurate and precise data and that, having installed sophisticated technology to enable this, experience from the aviation and rail sectors (where automation is more commonplace) is that maintenance costs will go up significantly.

[2] Government Actuary's Department (2017) GAD Comment: Self-Driving Cars
[3] RAC Foundation (2017) Readiness of the road network for connected and autonomous vehicles https://www. racfoundation.org/wp-content/uploads/2017/11/CAS_ Readiness_of_the_road_network_April_2017.pdf
[4] Government Actuary's Department (2017) GAD Comment: Self-Driving Cars
[5] RAC Foundation (2017) Readiness of the road network for connected and autonomous vehicles

The regulatory framework, including legal status and approval and authorisation processes

3.27. To harness transport innovation of any kind (including CAVs) city regions need five foundations to be in place:

1. Agile and devolved governance to support and protect wider goals for people and place.
2. Long-term funding certainty giving space to plan strategically and creatively.
3. Key standards set nationally, with the scope to go above and beyond locally.
4. Open data, shared safely to inform decision making.
5. Freedom to test new approaches on the ground.

3.28. These foundations (described in more detail below) should underpin the development of the regulatory framework for CAVs to ensure that transport authorities can maximise their benefits for the people and places that they serve.

Agile and devolved governance to support and protect wider goals for people and place

3.29. The legal and regulatory framework must allow for local discretion and decision making over local transport, including the ability to regulate autonomous shared vehicles in the same way as shared conventional vehicles (e.g. taxis and buses).

3.30. Currently, all CAVs in the UK require a human driver or operator (in or out of the vehicle), who can resume control of the vehicle if needed. With the deployment of CAV services on public roads, the need for a driver could eventually disappear and the focus will need to be extended to the licensing of CAV operators in addition to vehicles.

3.31. At a regional and local level, transport and city authorities should therefore be given powers to regulate specific aspects of CAV service deployment through licensing, such as the ability to place caps on numbers of services permitted to operate; use of road space; kerb management; time of operations for certain services etc. This would allow local authorities to set standards that are in line with the specific goals and priorities for the communities they serve and ensure that new services complement existing transport provision.

3.32. Authorities also need the power to prioritise certain CAV services over others – for example, they may want to license a number of smaller feeder services that connect people to high-capacity public transport networks.

Long-term funding certainty giving space to plan strategically and creatively

3.33. Local authorities need long-term funding certainty to proactively plan for CAVs and other mobility developments; invest in highway maintenance, infrastructure and future-proofing; and recruit and retain the skills they need.

3.34. This would, for example, allow the formulation of long-term, phased plans to ensure new transport developments form part of a wider vision for the places and communities served. It would also allow for the upskilling of the workforce to get the best out of the opportunities CAVs could bring around data.

Key standards set nationally, with the scope to go above and beyond locally

3.35. It is for government at national level to set standards around CAV safety and environmental specifications. However, local authorities need powers to go above and beyond the national baseline. As licensing authorities, they should be free to set higher standards for CAV services, as they currently do for taxi and private hire vehicles.

Open data, shared safely to inform decision making

3.36. Like other services and modes, data sharing from shared CAV fleets and passenger services should be an established and regulated process. Data sharing should form part of local licensing agreements to enable local authorities to effectively plan wider transport networks, understand travel patterns and access intelligence around road conditions and maintenance priorities.

Freedom to test new approaches on the ground

3.37. In a fast-moving new mobility environment, the government should continue to explore opportunities for anticipatory regulation and sandboxes in the transport sector, which can be introduced to test new services, including those which are not currently permitted.

3.38. The regulatory framework should be flexible enough to respond to technology as it develops and as experience of real-world implementation grows.

3.39. Crucially, regulations should give transport authorities the powers they need to act if a new mobility service or product is causing harm to the public good.

Safety and perceptions of safety, including the relationship with other road users, such as pedestrians, cyclists and conventionally driven vehicles

3.40. Safety is perhaps the most frequently cited anticipated benefit – and simultaneously – key concern around CAVs.

3.41. Semi-autonomous driving systems in 'traditional' vehicles are already improving safety. In London, for example, features such as automated emergency braking and Intelligent Speed Assistance (which helps the driver keep to the speed limit) form part of Transport for London's Bus Safety Standard, launched in 2018.

3.42. Increasing connectivity is also being used to achieve safety benefits. For example, all new cars sold in the EU are now fitted with the eCall system which automatically contacts the emergency services if a car's airbags deploy and communicates location, direction of travel, type of car and fuel used. This can reduce emergency service response times by up to 60% in built-up areas[6].

3.43. Human error is estimated to be the cause of 86% of crashes in the UK and the assumption is that once the majority of vehicles reach Level 4 - Level 5 automation, these will be eliminated[7]. Safety design features can be taken further still for driverless vehicles designed only for goods. With no driver or passengers to protect, all efforts can be focused on keeping those outside of the vehicle safe (e.g. using lighter, softer construction).

[6] https://www.carbuyer.co.uk/tips-and-advice/155428/ecall-explained

[7] Government Actuary's Department (2017) GAD Comment: Self-Driving Cars https://assets.publishing.service.gov.uk/ government/uploads/system/uploads/attachment_data/ file/643799/self-driving_cars.pdf

3.44. Conversely, safety is also perceived as a key risk surrounding CAVs, particularly in terms of public perceptions given a number of high-profile crashes and incidents.

3.45. There are legitimate concerns about CAVs with lower levels of automation where drivers are required to dip in and out of attentiveness and, as such, find it difficult to respond to an emergency in an appropriate and timely manner compared to drivers of manual cars.

3.46. For full safety benefits to be achieved, CAVs may need to operate exclusively among other self-driving vehicles, which could involve a level of segregation for a lengthy or indefinite period. It has been suggested, for example, that human drivers may pick up risky driving behaviours from CAVs, such as driving too close to other vehicles. Mixed traffic also creates uncertainties for other road users, including pedestrians and cyclists, as to how vehicles will respond to them.

3.47. That said, more segregation could result in more cities designed to move people out of the way of traffic, rather than cities which are at human scale and prioritise the movement of people, rather than vehicles. People should not have to adapt their behaviour for the convenience of vehicles. Instead, CAV technology could be used to implement lower speeds, limit access to certain areas and give priority to pedestrians and cyclists. Applications of CAV to shared and mass transit modes should also be prioritised to free up road and street space by reducing the overall number of vehicles on the road.

The role of Government and other responsible bodies, such as National Highways and local authorities

3.48. A key role of national government, as in the case of other forms of mobility, is to set safety and environmental standards for CAVs. For passenger transport services, these should include provisions for ensuring personal safety in an unsupervised space as well as around roadworthiness and vehicle design, for example.

3.49. Local licensing authorities should also be free to set higher standards as they see fit, in line with local needs and priorities. These could be around safety, type of vehicle, extent of data sharing, customer service and integration with other modes.

3.50. Transport authorities, in partnership with central government (and ideally vehicle manufacturers and service providers), are best placed to steer the introduction of CAVs in a direction that maximises the benefits to people, safety, the environment and the economy. Their input is also necessary to ensure that CAV development complements existing transport options and is informed by real-world infrastructure requirements and constraints.

3.51. By setting out what is acceptable and what outcomes they want to see, transport authorities also give confidence to investors who will gain a good idea of what they will need to do in order to be welcomed into a city. In doing so, cities can remain ‘open for business’ and attractive to innovators whilst at the same time ensuring that CAV developers understand the rules they must play by.

Potential effects on car ownership, vehicle taxation and decarbonisation in the car market

3.52. CAVs can be seen as forming part of a wider transition towards a future that is Connected, Autonomous, Shared and Electric (CASE for short)[8]. Application of the CASE model to CAVs will be important to ensure they develop in a way that does not contribute to more congestion and pollution and instead prioritises shared forms of mobility (public transport, pooled cars, freight consolidation).

3.53. A study from UC Davis[9] found that CAVs operating without electrification or a sharing model would lead to a 20% increase in vehicle miles and growing carbon emissions. Meanwhile, electric CAVs, combined with more public transport use, ride sharing, walking and cycling could reduce car travel by 50% by 2050 and dramatically reduce carbon emissions when combined with a decarbonised electricity supply.

3.54. To maximise the benefits, walking, cycling and zero emission public transport should be prioritised as they will always be the greenest and most efficient means of transporting large numbers of people from A to B.

3.55. Without careful planning and investment in walking, cycling, public transport and shared mobility, there is a danger that the ease and comfort offered by more individualised CAV formats (particularly if they take users from door to door) could replace trips made by more sustainable and healthy modes, leaving behind a skeleton public transport network and leading to more individual vehicles on the road.

3.56. As part of efforts to counter these risks, CAV technology could be used to improve the public transport offer and increase its appeal over more individualised vehicles, particularly in respect of affordability and availability. Driverless, electrically powered vehicles could dramatically reduce overheads, making public transport more affordable and making more routes and services viable throughout the day and night at increased frequencies. Improved connectivity (with or without automation) could also see more flexible and dynamic routing to respond to demand.

3.57. In respect of decarbonisation, if CAVs are electrically powered they will emit very little air pollution. Even particulates from tyre wear could be reduced if CAVs are able to employ smoother driving styles. If CAVs are able to use optimal eco-driving styles, they could also reduce energy consumption by between 5% and 20%[10].

3.58. That said, research[11] has predicted that the majority of energy efficiency gains are likely to come from better coordination and connectivity between vehicles and infrastructure, rather than automation in itself. This connectivity is expected to assist in streamlining traffic flow, eco-routing, optimising network capacity and reducing congestion.

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[8] Designing in diversity for our transport, infrastructure and services', Presentation by J. Beard at Smarter Travel Live! Conference, Liverpool, October 2018.
[9] Fulton, Mason and Meroux (2017) Three Revolutions in Urban Transportation https://its.ucdavis.edu/research/ publications/?frame=https%3A%2F%2Fitspubs.ucdavis. edu%2Findex.php%2Fresearch%2Fpublications%2Fpublicati on-detail%2F%3Fpub_id%3D2723
[10] Wadud, MacKenzie and Leiby (2016) Help or Hindrance? The travel, energy and carbon impacts of highly automated vehicles, Transportation Research Part A, Vol.86, http://dx.doi.org/10.1016/j.tra.2015.12.001
[11] Institute of Mechanical Engineers, Low CVP, University of Leeds (2016) Automated Vehicles: Automatically Low Carbon?

Further reading

3.59. For more information and detail around this response, please refer to our report 'Automatic for the people? Issues and options for transport authorities on connected and autonomous vehicles'.