Impacts and benefits

What are the potential applications for autonomous vehicles?

1. At Heathrow airport there are a number of areas where autonomous vehicles could see application:
   - Passengers and colleagues using them on their surface access journey to the airport
   - Transfer passengers between terminals and satellite buildings
   - Connecting passengers and colleagues around the campus.
   - Airside vehicles, those that are in the restricted zone within the security envelope, in cargo, baggage and other parts of the operation.

What are the potential user benefits and disadvantages from the deployment of autonomous vehicles?

2. The potential benefits or indeed disadvantages of deployment of autonomous vehicles are difficult to outline anywhere close to fully at this stage due to the rapid changes that have and will continued to happen in this industry. From the airport’s point of view, it is likely that there will be a continuation of the trend seen with Heathrow’s POD parking for terminal five which is both immensely popular with our passengers and has seen a saving of 100 tonnes CO2 per annum.

3. Replicating this around the campus in the future would see more passengers enjoying this new and exciting technology that provides a comfortable, quick and easy journey. Assuming that they would run more efficiently than individual vehicles there is potential for easing traffic and pollution levels around the airport.

4. In terms of wider benefits for society, a driverless future could see:
   - People spending their time more productively or enjoyably rather than driving
   - It would give enhanced mobility to those unable or unwilling to drive
   - Would enable more efficient use of highway infrastructure by increasing capacity and reducing the impact of disruption due to incidents.
   - Would have real benefits to consumer as the marginal cost of mobility would be reduced
   - Towns and cities would need less space for parking and could then choose how that space could be reclaimed.
   - On demand mobility would be achievable. This could mean car ownership reducing without an equivalent loss in the population’s mobility.
   - Improve safety of the road network by eliminating driver error.

5. However, there are also risks, a reduced cost of driving might see people continue to use and run cars as today and rather than parking them at a place of employment they send them on errands and the number of journeys goes up not down.
How much is known about the potential impact of deploying autonomous vehicles in different sectors?
6 No specific comments

How much is known about public attitudes to autonomous vehicles?
7 The general trend in US and Europe is that the public is warming to the idea of driverless vehicles though there are still concerns about safety, losing the ability to self-drive and the impact it would have on those whose livelihoods involve driving.
8 There has been some evidence that younger people are more accepting of the idea of driverless vehicles and more tuned into potential benefits whilst older members of the public tend to focus on the potential downsides.
9 A recent study can be found at https://www.researchgate.net/publication/278744106_Public_opinion_on_automated_driving_Results_of_an_international_questionnaire_among_5000_respondents

What is the scale of the market opportunity for autonomous vehicles?
10 It is difficult to judge at this stage but it is worth noting that penetration of smartphones has risen from 20% in 2010 to about 70% in 2015. Similarly, 2% of UK households had tablets in 2012 and by 2015 that number was 54%.
11 There is an expectation with the public that autonomous vehicles will be more expensive and no-one should expect levels of penetration like we have seen in some other areas of technology. However, if the market for autonomous vehicles is centred around mobility services rather than more traditional ownership models then that may result in significantly different outcomes.

Creating an enabling environment Research and development

Is the scale of current and planned demonstration facilities for autonomous vehicles sufficiently broad and ambitious?
12 The current demonstration facilities for autonomous vehicles present good progress in the field and put the UK in a strong position on research and development globally.
13 However, there are some gaps in the current testing ecosystem as the tests do not have as much on-road mileage as other global trials, such as GoogleX in California or the Volvo DriveMe project. After two rounds of multi-million funding, the current UK trials have not yet demonstrated much in terms of practical testing, results or knowledge gathering.
14 There is a need for connected & autonomous vehicles to focus on demonstrating useful function and benefit, whether this is at a specific location or for a particular segment of the population. Therefore, an ambitious testing ecosystem should move away from demonstrating the technology and more towards solving problems and realising benefits - using technology as a catalyst for positive behaviour change.
15 There is a need for a flagship trial that should try to solve tangible, well-defined real-world problems experienced today by applying technology.

16 Public communication and engagement should not be an afterthought. Communicating the merits and how CAVs may fit into our transport system to the public is required. This should be about communicating the potential benefits to the wider population and not just within specialist industries.

Is the Government doing enough to fund research and development on autonomous vehicles, and to stimulate others to do so? Should it be doing more to coordinate UK actions?

17 The funding that has so far been made available via CCAV and Innovate UK is welcome as it is enabling organisations to undertake valuable research and development in this area. However, many companies operating in this field, especially smaller companies or start-ups, are facing a lot of uncertainty that might threaten their viability and innovation capacity long term.

18 Companies do not know in what environment (funding, regulatory, safety, design, standards) they will be operating in 2, 5, 10 years from today. One way to introduce some certainty is to provide funding stream(s) which are approved, hypothecated, well-defined and guaranteed. In light of the Brexit vote and general uncertainty faced by companies based in the UK, anything that would add certainty and stimulate innovation is welcome.

19 To date, it appears that the majority of funding has focussed heavily on the technology without much investment into the practical usage of the vehicles. A move towards funding for controlled on road testing, focused on delivery, would be recommended and then real world use that is solving real world problems.

20 It is also vital that any research and development that the Government is funding is aimed at achieving strategic goals and realising benefits for the wider transport network. For example, better connectivity and integration between public and private modes of transport or more efficient usage of the road network.

How effective are Innovate UK and the CCAV in this area?

21 No further view beyond response to previous question.

Is the environment for small and medium-sized enterprises (SMEs) working in this sector sufficiently enabling? Real world operation

22 No view.

Will successful deployment of autonomous vehicles require changes to digital or physical infrastructure?

23 Both digital and physical infrastructure will have to undergo improvements in order for autonomous vehicles to operate safely on the UK’s roads.
For example, roads, signs, lines, junctions, design and signals will all need to be audited to ensure they are accurate and can be understood by an autonomous vehicle in all weather and light conditions. The increased connectivity of autonomous vehicles will also lead to significant changes to digital infrastructure to ensure vehicles can communicate with signals, and other road users, but also in order to keep data secure. Design standards such as Design Manual for Roads and Bridges would need to be reviewed.

**How might a move from current levels of highly automated vehicles to their extensive deployment best be managed? What do you see as the key milestones?**

25 No view

**Does the Government have an effective approach on data and cybersecurity in this sector?**

26 Heathrow is not in a position to comment on the Government’s general approach to cyber security at this stage, certainly in terms of technical details. It is understood that research into the current state of security in this area is currently being undertaken with more work to be done.

27 We do view the potential security impact of having driverless (and even unoccupied) vehicles operating airside, having access to forecourts or even the terminals themselves as being an area that should be considered and explored further.

**Are further revisions needed to insurance, regulation and legislation in the UK to create an enabling environment for autonomous vehicles?**

28 No view

**What, if any, ethical issues need to be addressed in the substitution of human judgement in the control of vehicles by algorithms and Artificial Intelligence?**

29 No view

**Wider governance**

**What does the proposed Modern Transport Bill need to deliver?**

30 Firstly, funding so that the current climate of opportunity can be turned into outcomes and progress. There is a need to balance between freedom and regulation is essential. It also should have clear objectives linked to Government’s overall transport and infrastructure strategy, so that new technology and trials are solving real world problems not just a showcase.

**How effective is the UK’s education system in delivering people with the right skills to support the autonomous vehicles sector?**

31 No view

**Is the Government’s strategy and work in this area sufficiently wide-reaching? Does it take into account the opportunities that autonomous vehicles offer in a wide range of areas, not just on the road?**
32 The Government needs to be clear how it sees the role of CAVs in the UK transport network and what outcomes and benefits it is seeking to achieve through their promotion and introduction. This will enable prioritisation of the most important benefits to its overall strategy.

*What are the implications of exit from the European Union for research and development and the autonomous vehicle industry in the UK? Are specific actions from the Government needed to support or protect the autonomous vehicles sector in the short term or after the terms of Brexit have been negotiated?*

33 The most pressing implications would be the continuation or replacement of current funding, knowledge sharing and collaboration.

*26 October 2016*