UK testing ecosystem for connected and autonomous vehicles - response form

The call for evidence is available at:
www.gov.uk/government/consultations/driverless-vehicle-testing-facilities-call-for-evidence

The closing date for responses is 31 July 2016.

Please return completed forms to:

Centre for Connected and Autonomous Vehicles
1 Victoria Street
4th Floor, Victoria 3
London
SW1H 0ET

Email: callforevidence@ccav.gov.uk

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If you want information, including personal data, that you provide to be treated in confidence, please explain to us what information you would like to be treated as confidential and why you regard the information as confidential. If we receive a request for disclosure of the information we will take full account of your explanation, but we cannot give an assurance that confidentiality can be maintained in all circumstances. An automatic confidentiality disclaimer generated by your IT system will not, of itself, be regarded as binding on the department.

I want my response to be treated as confidential ☐

Comments: Click here to enter text.
29 July 2016

Centre for Connected and Autonomous Vehicles
1 Victoria Street
4th Floor, Victoria 3
London
SW1H 0ET

Dear Sir/Madam,

IET response to UK testing ecosystem for connected and autonomous vehicles

The IET is Europe’s largest professional engineering and technology organisation. The members represent a wide range of expertise, from technical experts to business leaders, encompassing a wealth of professional experience and knowledge.

This response has been compiled on behalf of the IET Board of Trustees by the IET’s Transport Policy Panel.

If the IET can be of any further assistance please do not hesitate to contact me.

Yours faithfully,

Paul Davies
Head of Policy
Questions

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Question 1

Are the proposed characteristics of an ambitious testing ecosystem correct? Where are the errors, gaps, and opportunities? (see section 4.2)

- The paper focuses mostly on urban environment when it should include interurban and high speed roads.

- Human Factors (both of users and of “bystanders”) considerations are underrepresented. User requirements and acceptance should also be considered. User acceptance beyond the niche enthusiasts cannot be assumed (similar to electric vehicles – there are lessons that can be learned from their adoption).

- It is unclear how a new facility would complement and help assist existing trials and projects if C-CAV chooses to focus its efforts in one location. The focus should be on real road testing and less on the pre-road trials phases. This will be done (covertly) by manufacturers.
• Citizens are already very interested in automated vehicles, albeit a little un-informed. Good local support from the road authority and the public will be vital and marketing needs to be a core activity of the testing facility.

• The physical site infrastructure should also have existing detector (and other) technology available in order to carry out thorough ground comparative testing to determine accuracy of results.

• The presumption that a ‘varied and distributed offer’ is the right approach needs thorough evaluation to ensure that it achieves adequate scale to be of significance. A model could be assessed, where a set of smaller projects feed an integrator project that verifies and validated the overall concept.

• There is no mention of a regulatory authority (c.f. CAA for aircraft) or a standards organisation, except in reference to Cyber and Security. There is also no mention of access to test vehicles (a library of general purpose vehicles is mentioned – what does this mean?) and how to manage IP between parties. The provision of test instrumentation systems also needs clarification (maybe covered by the ‘data catalyst’ but not clear what that is).

• If all levels of the supply chain are to benefit, there needs to be both virtual and physical environments in which to test their offerings.

• Testing and validation of safety critical systems and software is a major challenge and cost, and is a major opportunity for support and learning from other sectors and particular from the aerospace sector.

• Further work is required to define the real nature of virtual validation and verification capabilities, in particular the degree to which these facilities should be developed and operated independently from manufacturers in order to recognise public concerns arising from recent well publicised issues in the motor industry.

• It is critical that such an environment is fully accessible to developers at a reasonable cost. We would anticipate that wherever possible, use should be made of the wide range of testing ecosystems available within the UK, not necessarily all within the automotive environment. These could include communications / connectivity test facilities for example, those operated on behalf of the MOD by QinetiQ and other Defence Suppliers, rail and aerospace facilities particularly those that enable the in depth testing and validation of software based components and sub subsystems. Does the facility need to handle HGVs and freight traffic as well as cars as this increases the physical scale needed?

Questions 2
Do you support a flagship testing facility?

- Yes ☒
- No ☐
- Not sure ☐

**Question 2a**

If yes, what should it look like and what should it do?

- In principle we agree with the need for a flagship testing facility; however, a testing facility alone cannot achieve the goals set out in the call for evidence. Replication in a sterile physical test environment is going to be costly on both space and investment and fairly impractical in the UK. This suggests the need for significant investment into synthetic environments and progressive, controlled validation on exiting motorways and roads.

- We would welcome a facility with a physical infrastructure representing both urban and rural environments, readily accessible to developers with limited on-site laboratories (these could be more virtual) with high quality connectivity to enable access to manufacturers facilities for software upgrades etc.

- The facility would need to be operated independently by skilled and experienced test engineers, supporting trials and test planning, safety and security (including cyber) of the facility, and general data gathering and analysis (not product specific data which could be subject to IP). Its focus should be product validation and approval at sub-systems and vehicle levels for example, leading to “type approval” prior to use on UK infrastructure.

- Other activities could include infrastructure systems test and validation, human performance evaluation, and forensic capability for incident analysis and examination. Much of the UK output of cars is exported; therefore the facility must be capable of being switched between Right hand and Left hand drive conurbations. Similarly road signs will need to mirror the intended country of operations.

- Road surfaces will need to vary again with export markets e.g. cobbled streets. Bridges and a wide range of traffic furniture will be needed to demonstrate that the cars will be able to cope. We suggest that a high-precision (mm) tracking of all vehicles, pedestrians, trailers etc. is needed.

- To encourage commercial use, secure and private facilities for companies to store, modify, repair and develop their cars would be advantageous. As this is also intended for connected vehicles, the ability to disrupt, jam or spoof satellite navigation (such as GPS and Galileo) needs to be tested, from a safety point of view, to assess how the vehicles act.

- Similarly, disrupting mobile phone coverage will be an essential test. Such jamming or disruption will mean the facility has to be sited well away from the general public or any services that rely on them.
• The testing should be by the proposing consortia (maybe with some provision for government oversight and access to data). So, the facility becomes an “umbrella” or “platform” or “socket” for testing with support and central branding/interfacing with media.

• The government can assist consortia and manufacturers through the use of grants and funded competitions as it is doing now. That way the precise plan for the development and testing will be carefully thought about in advance and government can see what will be done.

• A Human Factors Testing Facility should be available to determine impact of proposed services and technology. Demonstration of Level 4 SAE capabilities for autonomous vehicles should be a minimum requirement.

• There is a growing list of places to test AV’s in controlled environments so the UK has to offer a unique platform for testing with a clear line of site to real business opportunities in mobility. An engagement framework for other industry such as vehicle manufacturers, OEMs, App. developers etc. should be developed in order for them to use the facility.

• US, Mainland Europe and China all have facilities so there is a risk that UK could just duplicate other facilities around the world. Amongst the points noted above, the facility can expand on the below points;

1. A facility that can combine real world and virtual testing;
2. A facility designed to move beyond the small scale interesting AV pilots and create experiments that are specifically designed to scale to deployment. Parking could be an example where if the vehicle to infrastructure interfaces could be standardised it could accelerate deployment but it needs to go beyond the small scale experimental demonstrations. Are there places where placing additional controls on human driven vehicles could accelerate AV deployment;
3. What is the optimal solution for communication (V2x vs. V2I) that can accelerate autonomy;
4. How can Connected enable autonomy when conventional wisdom says that it really can’t until all the vehicles are connected;
5. Define how the infrastructure can be changed to favour AV operation. E.g LUTZ & GATEway eliminate interaction with human driven vehicles but how might road infrastructure and V2x better enable AV’s;
6. How can technology development and UK public policy intersect to accelerate AV’s;
7. Examine the impact on emissions of auto vehicles. Will automation equate to electro-mobility? Will it generate more journeys in the short term?

Question 2b
Where should it be?

- The involvement of Local Authorities/Road Authority is critical in the tests and public support needs to be gained, wherever the tests are carried out.

- There is a real danger of stop/start, with funding provided for small trials and corridors that are then not sustained. In order to be sustained a decision on location(s) has to be made for the real road trials at least. It will need an “office address” to be credible, maybe the physical testing ground in the consortium or the lead research institution.

- For an urban test site there are some clear advantages of London (political and technical, being a mega city). For interurban the current options are the UK CITE trial corridor in the Midlands or the A2/M2 which already had declared DfT support and funding.

- In addition, there may be a need for specific mathematical modelling/simulator/bench testing/track testing; however, it may not be commercially viable to have this pre-prepared and on hot-standby in one place. The distributed model of availability makes sense in this instance.

**Question 2c(i)**

How fast could this facility be delivered?

- A basic facility could be developed in a 3 to 5 year period, exploiting existing facilities and knowledge would be essential to maintain these challenging timescales. We recognise that there are tests already being carried out on UK roads that can be a starting point to progress the scheme quicker.

- The tests can be based at previously identified sites such as the UK CITE project in Midlands or the A2/M2 ITS corridor site in the south east. Both sites offer urban, motorway and high speed A roads locations. UK CITE project offers connection with other autonomous vehicle trials such as AUTODRIVE. A2M2 corridor will deal with multimodal transport data with links to the port of Dover, Eurotunnel, coach and freight operators. Both the UK CITE project and the A2M2 project should be delivered within 3 – 4 years as they have some maturity. Starting a new test facility from scratch would take longer.

- Currently the UK is in an advantage position through the UK CITE Project in developing this technology; we must move more rapidly so we do not lose this leading position.

**Question 2c(ii)**

How could it be delivered in stages to ensure impact in the short term?
• Build on existing projects that have been planned with distinct delivery stages (design, procure, deploy) using Agile methodology to deliver up to date technology whilst regularly reviewing user needs.

• Also develop frameworks for other industry developers and users to “plug and play”.

**Question 2d**

What would it cost (who should pay for it and how)?

• The government should develop an outline specification and make initial contact with the local authorities and road authorities involved. They should then jointly prepare a specification and tender to industry for operationally running the “facility”. The core services will be business development/outreach/marketing and press liaison; also, helping the manufacturers/consortia which wish to make use of the facility.

• The bulk of the testing work will be undertaken by the consortia/manufacturer at their own expense. Separately, the government may offer grants and competitions to encourage industry-led consortia to make use of the facility.

• Costing would be dominated by the need for physical infrastructure. Maximising use of existing facilities would help control costs.

• There are lessons that can be learned from previous testing frameworks. InnovITs Advance was not as successful as initially intended and can be examined to find routes to better practice.

**Question 2e**

What additionality to the existing offer would it provide, and how would it fit into the existing CAV testing ecosystem?

• There are existing testbed facilities in the UK and these will continue to be important. There is scope for them to collaborate to create a “flagship testbed” in addition to functioning on their own. Examples are CityCircuit at HORIBA MIRA, and public sites in Greenwich where testing is already underway. The flagship facility could offer the option of carrying out deeper testing by engaging with a wider team of experts and accessing more than one physical test environment.

• Essentially we see the facility as providing a far more rigorous and demanding environment for testing “at the limits” of system performance and reliability to match emergent technology properties and performance as well as emergent threats (eg cyber).

**Question 2f**
What role could central government play? (This call for evidence does not create an expectation of new funding)

- Setting up a “Testbed UK consortium” needs an impartial body to organise the selection and contracting. Once the initial version is in place, a board / steering group including Government is probably best way of governance.

- All the above points reinforce the benefit of the central “testing ecosystem”, provided that it is seen as much more than a technical test environment but a means of designing, validating and verifying the System of Systems model to which all stakeholders agree to aspire.

- With a joined-up approach, the issues that need managing by way of public relations and confidence building will be exposed, understood and shared by all participants; central government should play a leading role in providing a platform for best practice.

**Question 2g**

Do you wish to express an early interest in being a partner in its funding and delivery?

X Yes ☐ No

- The IET can help facilitate debate and bring stakeholders together. Leadership is required on what the desired end-state is for CAV technology, and a “roadmap” will help understand how to deliver this.

- The IET can help publicise the opportunity and later on the availability of the technology, both in the UK and internationally.

**Question 3**

How have other countries responded to similar challenges and priorities? Are there any lessons to be learned and applied in the UK?

- Other countries experiences are clearly valuable, but we should recognise that UK environments and metrological aspects will cause a range of differing needs and test requirements

- Examples of international test sites include:
  - West Sweden,
  - In the US UMTRI has just developed an InnovITS ADVANCE like “city circuit” for R&D,
  - In the US six regional unmanned aircraft research centres have been established\(^1\).
  - Automotive Campus, Helmond, Netherlands,

\(^1\) [https://www.faa.gov/news/updates/?newsId=75399](https://www.faa.gov/news/updates/?newsId=75399)
- A9 Autobahn, Germany,
- DriveMe test site, Gothenburg, Sweden,
- MCity, American Center for Mobility both in SE Michigan,
- Aachen in Germany.

- Most of these examples offer some controlled, but still are very similar to real world environment, for C-AV testing.

- Any UK facility will need to recognise there is stiff competition and will need to offer unique capabilities. Other cities are also getting into the picture with their own plans to enable AV’s (Gothenburg, Singapore, Tokyo, with announcements in the US expected soon).

**Question 4**

We are currently exploring options for communications activities to increase awareness and understanding of the benefits of Connected and Autonomous Vehicle technologies. What support do you think government should offer in helping to raise awareness and communicate the benefits of these technologies?

- The recently published Tech Savvy report from the IET called for a well-thought-out public engagement programme led by Government and industry to highlight the potential of new technologies to address some of society’s biggest challenges, such as the ageing population and an overstretched public health system. At the same time, this programme should also address some of the concerns people have about the potential negative outcomes of a technology-reliant society.²

- The public acceptability of the risks associated with different forms of autonomy and connectivity, and ultimately the perceptions of the safety of CAV must also be addressed. For this, the insurance sector could be the driver of the requirements for the technology, the infrastructure, and the verification for sub-systems and their interoperability within the larger system. It would be valuable to engage the insurance sector from the start.

- The government-funded on street activity in Bristol, Milton Keynes, Greenwich and Coventry are probably the best ways of communicating effectively and positively with citizens – seeing the trials being carried out locally is a valuable engagement tool.

- Some of the best opportunities are through data driven demonstrations that can become teaching opportunities. LUTZ and GATEway both offer opportunities to educate the public on how AV’s work and the technology deployment challenges. Improving public awareness of AV technology is a challenge that needs to be addressed as there is growing confusion between SAE Level 2 features offered by OEM’s today and the fully autonomous Level 4/5 vehicles which are being developed.

• Government should focus on explaining the benefits at the individual level and address the need for long term planning to introduce CAV solutions onto the existing transport infrastructure, clearly safety will be uppermost in people’s minds and greater efforts to communicate the safety and mobility benefits would be a key focus. There is also a need to explain how such systems will be managed and policed and how aspects such as insurance will operate.

• Once it is possible, the public sector can also instil confidence by switching to CAV fleets wherever possible – similar approach to Alcolock technology in Sweden have been taken.

Thank you for taking the time to let us have your views. We do not intend to acknowledge receipt of individual responses unless you tick the box below.

Please acknowledge this reply ☐