

**Response to Law Commissions' third consultation on Automated Vehicles  
(Law Commission Consultation Paper 252; Scottish Law Commission Discussion  
Paper 171)**

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Any personal email addresses and phone numbers have been excluded from this document. Unanswered questions have been deleted from this document.

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What is your name?

Vignesh Amur

What is the name of your organisation?

Tata Consultancy Services

Are you responding to this consultation in a personal capacity or on behalf of your organisation?

Response on behalf of organisation

**CHAPTER 5: HOW SAFE IS SAFE ENOUGH?**

**Consultation Question 4 (Paragraph 5.119)**

We welcome observations on which of the following standards is most appropriate when assessing the safety of automated vehicles:

- (a) as safe as a competent and careful human driver;
- (b) as safe as a human driver who does not cause a fault accident;
- (c) overall, safer than the average human driver.

[Respondents chose from the following options: as safe as a competent and careful human driver; as safe as a human driver who does not cause a fault accident; overall, safer than the average human driver; none of the above.]

Overall, safer than the average human driver

The standard that is most appropriate to follow is to ensure that the AV is safer than the average human driver. This needs to be the minimum standard, which should be met and thoroughly validated against prior to productionising the software. Anything below this standard would suggest posing excess threat to the passengers in the AV, other road users, & pedestrians. However, if the standard were any higher, than this would deprive public from receiving the benefit of the deployment of AVs. This is mainly the added safety benefit, as the system would be better than the average driver. Additionally, it should be considered that the more the system is deployed, the better the system becomes by continuously learning. According to research conducted by RAND Corporation, if an autonomous vehicle performs 20% better than a human driver over 100,000 lives could be saved over the next 30 years.

## **Consultation Question 5 (Paragraph 5.120)**

We welcome observations on how automated vehicles can be made as safe as reasonably practicable.

To validate level 4 or level 5 AVs, an AV will need to drive billions of miles to prove that they are as safe as a human driver. This is calculated based on the edge cases that are likely to occur in the distance travelled – you need the coverage across these scenarios to truly validate the AV. Additionally, as the hardware and software are upgraded in the vehicles, the miles are reset, and testing would have to start again. However, this is not a practical or feasible approach as testing physically on public roads would unnecessarily endanger not only the safety driver in the vehicle, but other road users. The practice of a safety driver is not always reliable especially in time-critical situations as they always need to be attentive. The time, money, & public safety mean a public road testing first approach is not the best strategy for the testing of AVs.

As the miles driven is really about the coverage of scenarios and ensuring the vehicle is exposed to the edge cases, we can conclude that it is not the number of miles that is important, but identifying and testing against these edge cases. As it is impossible for humans to identify all possible edge cases and calculate the coverage of testing for a given ODD, we need to use a data driven approach with the help of AI/ML techniques.

A viable option that is being widely accepted by the industry is to use simulation led validation paired with physical testing on proving grounds (in a controlled environment).

During development of the ADS and prior to deployment it is imperative to prioritise the use high fidelity simulation-based technology. This will allow the vehicle's software to be tested across multiple geographies and edge cases. Simulation, allows for scalability with organisations being able to test drive AV's for millions of miles a day within a simulator. The scalability gives practical solutions to achieve the coverage needed to improve the validity of the system and improve safety.

Simulation testing can be accompanied with proving ground testing, & limited public road testing. As the AV software begins to increase coverage and meets certain performance standards with a simulation first approach, the AV can be tested further on public roads to validate the software further.

## **CHAPTER 7: ASSESSING SAFETY PRE-DEPLOYMENT**

### **Consultation Question 7 (Paragraph 7.99)**

We provisionally propose that:

- (1) safety assessment should use a variety of techniques;
- (2) manufacturers/developers should submit a safety case to regulators showing why they believe that the automated driving system is safe;
- (3) regulators should:
  - (a) provide guidelines for what is in the safety case;
  - (b) audit the safety case;
  - (c) prepare guidance for manufacturers and developers on preferred standards; and

(d) carry out at least some independent tests.

Do you agree?

[Respondents chose from the following options: yes; no; other.]

Yes

Yes

Steps 1, 2, & 3 should be taken and they provide a foundation to improve the safe deployment of AVs.

1. The safety assessment should consist of:

- A well-defined ODD
- Simulation based testing across a wide variety of scenarios in a given ODD
- Tests from a controlled environment to validate the simulation

2. In the safety case, manufacturers should:

- Provide details of standardised key metrics tracked through the course of development
- Provide evidence of standards used and adopted in the development of the system
- Showcase simulation results and test data

3. Regulators should carry out independent tests:

- Using standard scenarios and test cases for a given ODD through simulation
- Physically test the vehicles across a subset of the above scenarios to validate the simulation results

### **Consultation Question 8 (Paragraph 7.100)**

We seek views on whether an approval authority that intends to use a scenario database as part of the testing procedure should consult road user groups on the range of scenarios to be included.

Consulting road user groups on the range of scenarios should be included.

Applying mathematical modelling to a scenario database will provide a high-level of coverage and uncover different edge cases which need to be tested.

However, it may not provide complete coverage and sometimes unique edge cases, or situations may be missed. Thereby, road users should be consulted as it offers a more complete picture based on personal experiences. However, a wider approach should be taken with other stakeholders being consulted such as Highway Authorities, Police, Insurance companies and breakdown companies.

## **CHAPTER 8: INITIAL APPROVALS AND CATEGORISATION – PROPOSALS**

### **Consultation Question 16 (Paragraph 8.83)**

We seek views on whether the regulator that classifies vehicles as self-driving should have power to allow their deployment in limited numbers, so as to gather further data on their safety in real world conditions.

Regulators that classify a vehicle as a self-driving vehicle should have the power to deploy AVs in limited numbers only if the self-driving system has shown that it can meet a certain threshold through simulation testing and controlled environment testing. Once this has been met, limited numbers can be deployed as it is necessary to gather further data from public deployment to further the advancement of the system.

## **CHAPTER 11: INVESTIGATING TRAFFIC INFRACTIONS AND COLLISIONS**

### **Consultation Question 26 (Paragraph 11.82)**

We provisionally propose that the UK Government should establish a forum for collaboration on the application of road rules to self-driving vehicles.

Do you agree?

[Respondents chose from the following options: yes; no; other.]

Yes

Yes, The UK Government should establish a forum for collaboration on the application of road rules of self-driving vehicles.

A collaborative approach to establishing road rules is beneficial to all. A collaboration between DVLA, local government, highway authorities, industry experts, manufacturers, insurance companies, legal entities etc. will provide a more complete picture. This will allow the UK government to obtain the view of all stakeholders in a balanced and collaborative manner ensuring that they have timely visibility of the future landscape.