Joint AESIN & ITS UK Response to the call for evidence on developing the automated vehicles regulatory framework

1. Introduction

This response is a joint submission on behalf Intelligent Transport Systems UK (ITS UK), the Automotive Electronic Systems Innovation Network (AESIN) and the respective members of both organisations.

About AESIN

AESIN is a collaborative response to the Automotive Sector Revolution in complex Electronic & Software Systems driving innovation for Electric, Connected and Automated mobility. AESIN provides platforms for members to discuss, share and collaborate. AESIN members are active in building collaborations and contributing to thought leadership via our conferences, plenaries, webinars, workshops, special interest groups and AESIN's strengthening links to the best UK academics for deep tech.

About Intelligent Transport Systems UK

Intelligent Transport Systems UK (ITS UK) is the national industry association for transport technology, representing a sector worth £3.2 billion, supporting 45,000 jobs and providing £500 million in tax revenue each year. We provide a national platform to support the roll out of technology for a cleaner, safer and more effective transport network, both at home and abroad.

ITS UK has 200+ members, from both the private and public sector, covering all sizes and disciplines, with members working in areas like smart ticketing, mobility as a service (MaaS), integrated transport, real time passenger information, public transport services, traffic management and enforcement, demand responsive transport, road user charging, connected and autonomous vehicles, and much more.

We would be happy to provide further information on the submission provided below. If this would be of use, please email ITS UK Public Affairs & PR Manager Eduardo Pitts, at eduardo.pitts@its-uk.org.

We have sought to answer the key questions of pertinence to the sectors we represent.

Q3: In your view, what do you think will be the designs of self-driving vehicles deployed in the next 5 years?

With regards to the designs, the core technology will still be based on a sensor suite comprising of cameras, radar and LiDAR. The challenge for the sector is about how to optimise and reduce the number of sensors deployed. Current efforts are being made in reducing the physical footprint of sensors to better integrate them in a vehicle. This can be either smaller sensors or different sensor modalities integrated e.g. LiDAR with camera in a single package.

The other major aspect of design is the software for perception and control. Evolution will be very much on the compression of AI, and advancement of compute platforms that can realistically be embedded on a vehicle for long term deployment in a commercial context.

Q4: In your view, do you expect any designs to be specific to the UK, and why?

Where the UK has specific competence is in the design and development of the software for perception and control over the past decade. The UK is also strong on vehicle-integration and all the design aspects this relates to.

In terms of hardware, e.g. compute and sensors, the UK appears to be lagging, although there are interesting developments in radar and ultrasonic sensing. There can be more if potential incumbents in defence and aerospace could justify competing in the automotive domain. This would require a realistic return over a 5-year period, something not achieved yet.

Q5: In your view, what do you think will be the use-cases of self-driving vehicles deployed in the next 5 years in the UK?

The use cases for self-driving vehicles are not likely to radically change from those we have seen proposed by Government and industry. Whilst there is still significant focus on the private motor vehicle, there remain limits in what can be achieved within the next five years. Therefore, it is more likely that operational design domains that offer greater levels of 'control' and predictability will see the earlier introduction of self-driving functionality, such as ports, industrial parks, construction sites, airport transfers and other managed environments.

Use cases are likely to include the management of freight cargo (trailers, containers and yard operations), mass transit of people (particularly bus services operating on fixed or semi-segregated routes), and high-risk activities (such as cones deployment on live carriages or movement of materials on construction sites). In addition, we are likely to see the continued development of last-mile delivery robots operating in low-speed, pedestrianised or campus-style environments, as well as geofenced self-driving taxi or ride-handling services supported by remote monitoring. These use cases provide more clearly defined operational boundaries and risk profiles, which make them more suitable for near-term deployment (subject to proper regulatory frameworks).

Q7: In your view, what types of evidence should form the basis of an authorisation application?

Safety case anchored in a robust ODD-specific hazard analysis

- The evidence base should begin with a structured hazard and risk analysis tailored to the complexity of software-defined ADS.
- The analysis must be explicitly linked to the vehicle's defined Operational Design Domain (ODD), identifying environmental and operational hazards (e.g., adverse weather, sensor limitations, dynamic traffic conditions).

- Frameworks such as SOTIF (ISO 21448) should be used to account for both known and unknown unsafe system behaviours, showing how the ADS handles ambiguous or degraded-information scenarios.

Clear safety goals, system requirements, and design methodology

- Applications should set out top-level safety goals, derived directly from the hazard analysis, and explain the engineering philosophy underpinning them.
- Each safety goal should map to mitigation strategies and verification criteria so the regulator can see how safety claims are evidenced.
- The ADS developer should outline the system requirements and the development methodology (including design assurance processes) to demonstrate traceability from concept to implementation to validation.

Comprehensive multi-layer testing strategy

- Evidence must show that ADS safety is validated through a hybrid testing strategy, covering: virtual simulation, closed-track proving-ground tests, and public-road trials.
- The application should justify how tests are allocated across these methods, demonstrating an understanding of their strengths and limitations, and how they complement one another.

Simulation-led safety evidence with proven toolchain credibility

- Because real-world mileage cannot expose the ADS to all rare and edge-case hazards, the primary evidence base should come from simulation.
- The applicant must provide evidence of simulation toolchain credibility, including: (1) Physically accurate models of vehicle dynamics, weather, road users, illumination, and sensor physics. (2) Documentation demonstrating how virtual sensor models (e.g., LiDAR, radar, cameras) match real-world performance characteristics. (3) Referenceable internal documents (e.g., Simulation Handbooks, Validation Guidelines) to maintain an auditable evidence trail.
- The regulator must also see evidence of (1) Data and release management controls ensuring every test result is traceable and reproducible, (2) Competency management proving that only qualified personnel configure and run safety-critical simulations.

Correlated physical testing to validate the simulation environment

- Simulation results must be validated through targeted physical tests, ensuring alignment between virtual predictions and real-world behaviour.
- This includes comparing: (1) Virtual vs. physical sensor readings on calibration targets, (2) Real-world vs. simulated weather impacts (e.g., rain, fog, occlusion, sensor noise), (3) Vehicle-level dynamic responses under controlled conditions.
- The goal is to show that simulation is not standalone, but part of a closed validation loop tied back to the physical world.

Evidence from on-road vehicle-level trials

- Public-road testing evidence should present both: Lagging indicators — disengagements, Minimum Risk Manoeuvre (MRM) activations, incident logs with root-cause analysis; Leading indicators — Time-To-Collision (TTC) breaches, hard-braking events, lateral clearance margins.
- Together these metrics show not just the absence of accidents, but how consistently the ADS maintains a safe operating buffer.

Independent third-party assessment to support regulatory confidence

- The application should include an Independent Assessment Report from an accredited Technical Service.
- This external review should cover simulation toolchain integrity, evidence adequacy, and methodological soundness, allowing the regulator to focus on high-level scrutiny while relying on specialist technical assurance.

Q8: In your view, what evidence gathered at the vehicle type approval stage, if any, should be used to support an authorisation decision?

Government should take a measured and informed view on how to ensure type approval at launch and throughout life-time operation. Cited below are some of the key technical standards that are used in industry that need to be considered for type approval evidencing.

- Compliance with core component/process standards already exercised in type approval—e.g., ISO 26262 (functional safety), ISO 21448 (SOTIF), ISO 16750 (environmental), ISO 11452 (EMC), AEC-Q100/200 (reliability)—should be re-used to evidence baseline robustness of perception subsystems.
- Perception-specific conformance artefacts (e.g., DIN/SAE Spec 91471 for LiDAR performance, IEEE 1937.1 LiDAR data/API, ISO 23150 sensor-to-fusion interface, ISO 16505 camera monitor systems) can directly support authorisation claims on sensing and data paths.
- UNECE alignment from type approval should be referenced in the application (where applicable) to avoid duplication and ensure consistency with UK's presumption toward harmonisation.

Q9: In your view, do you think geofencing or environmental mapping have a role in operational design domain (ODD) approval, and why?

Yes. Geofencing and environmental mapping are critical to managing the risk between the defined operational design domain (ODD) and the vehicle's actual capability. Without a clearly specified and enforceable ODD, there is a risk that vehicle may stray into environments for which it has not been validated, potentially leading to unsafe behaviour or operational disruption (e.g. coming to a controlled stop in a location that obstructs a live carriageway).

Geofencing is particularly important where vehicles operate near jurisdictional or administrative boundaries. Cross-border movements - for example between devolved administrations or between the UK and neighbouring jurisdictions - may involve differences in legislation, policy frameworks or approval regimes. The ODD boundaries should therefore be sufficiently robust to account for such variations, ensuring vehicles do not inadvertently operate in areas where regulatory approval, infrastructure compatibility or operational assumptions differ.

In summary, geofencing and mapping are not just tools, but core components of risk governance and regulatory assurance with the authorisation framework.

Q10: In your view, are there any specific authorisation requirements relating to the vehicle that should, or should not, be included, and why?

Based on our previously published reports on UK sensors capability and the future landscape, we propose the following.

- ODD self-awareness and enforcement: the AV shall detect when external conditions (e.g., rain/fog intensity, luminance, road surface states) exceed declared sensing capability and execute a safe strategy (transition demand/Minimum Risk Manoeuvre).
- Minimum perception performance & durability: declare and verify thresholds for camera dynamic range/LED flicker robustness, radar interference resilience, LiDAR eye-safety and weather performance, tested against recognised methods/standards (e.g., HDR/flare metrics, ASTM E2938, ASTM E2540/E1709).
- Validated sensor-fusion interface and timing: conformance with ISO 23150 for logical interfaces and evidence of calibration/synchronisation robustness under environmental stress and over lifetime.
- Model–reality correlation: maintain correlation baselines that link authorisation-time simulation claims to physical tests for key object materials/reflectances (VRUs) and adverse conditions, with evidenced and traceable change control for updates.
- UK supply-chain transparency (where relevant): for high-risk perception components, declare provenance and lifecycle support (important given current UK manufacturing gaps), to ensure maintainability across service life.

Q19: In your view, what processes should be in place to ensure that authorised vehicles continue to meet the legal safety standard over time?

This is a key question as it is necessary to ensure that long-term deployment and operation of a vehicle or fleet of vehicles are still compliant. We propose the following:

- In-use monitoring aligned to UNECE ISMR concepts, with initial/short-term/periodic reporting channels to VCA and clear triggers when safety-relevant occurrences emerge (keeping consistency with UK's approach outlined in the Call for Evidence).
- Continuous correlation loops: when software/sensor updates change perception performance, re-run representative e.g. OpenSCENARIO/OpenODD test suites and re-sample targeted physical tests to protect validity; manage via controlled data/release management.
- Degradation & drift surveillance: track perception KPIs (e.g., Time To Collision (TTC) margin breaches, radar interference rates, camera over-/under-exposure events) and compare field distributions to authorisation baselines

- Transparency on changes – evidence required: when expanding ODD or altering sensor stacks, supply concise ‘delta-safety cases’ showing hazard/risk deltas, new scenario coverage, and regression results before rollout.

Q47: In your view, how often and in which circumstances would it be appropriate for operators to use remote ADS assistance?

One of the concerns for remote assistance is the availability of connection. This should be minimised and in only the most critical cases where there is imminent harm potential, in which case there must be proof or evidence to demonstrate unequivocally that there is no escalation of risk due to a failure in the communication system or malicious interference given the potential for fleet level impact that could have catastrophic effect on highways and critical national infrastructure (CNI).

Q54: In your view, under what circumstances, if any, and considering the possible presence of passengers or goods, should remote driving be permissible for the purpose of responding to problems during NUIC journeys?

Only to bring the vehicle to a safe state to then be able to be recovered. Remote control should not be deployed for the nominal function or goal of the journey. It should be minimised as far as possible to reduce the attack or impact probability.

Q121: In your view, are there any wider considerations regarding accessibility that should be taken into account in the deployment of AVs?

AVs have a significant potential to transform the lives of those who have mobility challenges, so a like-for-like replacement of a private motor vehicle may not be conducive to this. Consideration needs to be given to a wide range of challenges, such as sight impairment or restricted mobility that mean vehicles need specific access arrangements, as well as passenger sensing and advisory (not just in the vehicle, but also outside to aid ingress and egress). They may also need to adjust their physical geometry to aid vehicle access, i.e. lowering or raising the vehicle (similar to buses) or deploying ramps or bridges to deal with curbs and other road features. Significant consideration needs to be given to how AVs aid accessibility.

Q122: In your view, which environmental mechanisms are more important for understanding the overall environmental impact of AVs, and why?

The additional carbon impact of the development, testing and operation of the AV equipment over that of a standard vehicle. The longevity of the additional equipment and if it is recyclable or can be repurposed to extend the life of the vehicle and minimise waste. If not managed effectively, there is the potential for AVs to create a greater carbon footprint or environmental impact than those of more traditional vehicles due to their additional complexity through their whole lifecycle.

AESIN & ITS UK
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