

Connected and Autonomous Vehicles – a cross-jurisdictional comparison of regulatory developments

Introduction

Connected and autonomous vehicles (“CAVs”) are expected to become a reality on roads across modern economies in the near future. In 2018, the EU estimated that, provided a sufficient regulatory and enabling framework is in place, CAVs could be available on a commercial basis by 2020, and commonplace by 2030.¹ Estimates in the US are similar.² On a financial level, forecasts have suggested that by 2050, the global CAVs industry could be worth upwards of \$7 trillion,³ and that the CAV taxi market might be worth more than \$2 trillion per year by 2030.⁴

It is widely recognised that before CAVs can become commonplace, they must first be adequately and appropriately regulated. Regulating CAVs remains a significant challenge for lawmakers, and specific regulations relating to CAVs are being introduced at divergent paces globally. While many countries are seeking to position themselves as leaders in the adoption of CAVs, the UK, Germany and the United States are widely regarded as being among the frontrunners with respect to the introduction of legislation and regulations in this area.

This article compares the emerging regulatory landscape in these three jurisdictions, identifying some key areas of commonality and divergence. A comparison table is included at the end for ease of reference.

Background

The UK Government has announced its intention to “lead the way globally in embracing the safe development of driverless technology”.⁵ The Automated and Electric Vehicles Act 2018 (“AEV Act”) received Royal Assent in July 2018,⁶ there is an ongoing review of the area by the Law Commission⁷ and the UK Government has also set up a special department (the Centre for Connected and Autonomous Vehicles), aimed at ensuring the UK is a world-leader in developing and testing CAVs.⁸ There are testing schemes underway in cities such as London and Coventry, and the recently updated ‘Code of Practice for Automated Vehicle Trialling’ (“Code of Practice”)⁹ provides additional clarity as to what is expected of organisations wishing to test autonomous vehicles on the roads.

1 See https://ec.europa.eu/transport/sites/transport/files/3rd-mobility-pack/com20180283_en.pdf.

2 Beyond Speculation Automated Vehicles and Public Policy: An Action Plan for Federal, State, and Local Policymakers, Eno Center for Transportation, page 5, https://www.enotrans.org/wp-content/uploads/2017/04/AV_FINAL-1.pdf (autonomous vehicles expected to be commercially available in US before 2030).

3 See https://newsroom.intel.com/newsroom/wp-content/uploads/sites/11/2017/05/passenger-economy.pdf?cid=em-elq-26916&utm_source=elq&utm_medium=email&utm_campaign=26916&elq_cid=1494219.

4 <https://www.bloomberg.com/news/articles/2019-05-23/robo-taxi-industry-could-be-worth-2-trillion-by-2030-ubs-says>.

5 See <https://www.gov.uk/government/news/new-measures-to-help-britain-lead-the-way-in-developing-driverless-technology>.

6 See <http://www.legislation.gov.uk/ukpga/2018/18/contents/enacted>. Note although it has received Royal Assent, only certain parts of the Act are currently in force (Pt 3 s.20(2-7), s.21, s.22 and s.23. (see section 21 – Commencement). No Regulations bringing the rest of the Act into force have been made.

7 <https://www.lawcom.gov.uk/project/automated-vehicles/>

8 See <https://www.gov.uk/government/organisations/centre-for-connected-and-autonomous-vehicles>.

9 See <https://www.gov.uk/government/publications/trialling-automated-vehicle-technologies-in-public>.

In Germany, the Autonomous Vehicle Bill (“AVB”) came into force in June 2017, modifying the existing Road Traffic Act and defining the requirements for “highly and fully automated vehicles”.¹⁰ Various public testing projects are underway in Germany. For example, new public areas for testing CAVs or autonomous e-shuttles exist in the city centres of Berlin, Frankfurt and Hamburg.¹¹ In addition, a digital test bed has been established on federal motorway A9 in Bavaria.¹² The Federal Ministry of Transport and Digital Infrastructure is also providing funding to a cross-border project between Germany, France and Luxembourg. The aim of this project is the testing of automated and connected driving in combination with intelligent transport systems and under real-life conditions.¹³

In the United States, the National Highway Traffic Safety Administration (NHTSA) has developed a Federal Automated Vehicles Policy¹⁴ and issued guidance to States on automated vehicle safety entitled “A Vision for Safety 2.0”, outlining best practices for State-level legislation.¹⁵ However, there is currently no specific legislation relating to CAVs at Federal level, and there has been divergent regulatory development at State level, with certain states such as California taking a lead with respect to the introduction of regulations. California currently has dozens of companies approved for testing automated vehicles with a driver, while Waymo is currently the only approved company for testing without a driver.¹⁶

Interesting features arising from comparison

A review of the comparison table illustrates that regulation of CAVs is an area still in development. Definitions of CAVs vary widely regarding their specificity, and regulatory change and policy development is happening at pace. Trials are regulated

to a greater or lesser extent depending on the jurisdiction, and there is a similarly mixed approach to the regulation of issues of liability for CAVs. Two areas of particular interest are: (i) the requirement for CAVs to be fitted with a data storage device (referred to herein for ease of reference as a “black box”) to record certain data, and (ii) the differing approaches in the UK, California and Germany to liability.

Requirement for CAVs to be fitted with black boxes

Certain jurisdictions require CAVs to be fitted with a black box. This is a data storage device that automatically records certain information about a vehicle’s operation.

The requirement for CAVs to be equipped with a black box has already been introduced into German law,¹⁷ despite many commentators’ previous doubts as to whether such a concept would ever be translated into legislation due to data and consumer protection issues. The data stored by the black box includes the change of vehicle control between the driver and the automated system; when the driver is prompted by the system to retake control of the vehicle; and when a technical failure of the system occurs. Some, including the Federal Assembly (*Bundesrat*), considered that, for the bill to provide legal certainty, black boxes should also record the reasons why the driver was prompted to resume control and the time lapse between the prompt and the retaking of control by the driver.¹⁸ However, these factors were not included in the law currently in force.

By contrast, in the UK there is currently no general black box requirement. However, the Code of Practice requires that automated vehicles being tested have a data recording device recording a range of details, including what mode the vehicle is in, its speed, steering, and braking command.¹⁹

10 See https://www.bmvi.de/SharedDocs/EN/Documents/DG/eight-act-amending-the-road-traffic-act.pdf?__blob=publicationFile.

11 See e.g. <https://tavf.hamburg/en/>.

12 See <https://www.bmvi.de/EN/Topics/Digital-Matters/Digital-Test-Beds/digital-test-beds.html>.

13 See <https://www.bmvi.de/EN/Topics/Digital-Matters/Digital-Test-Beds/digital-test-beds.html>.

14 See <https://www.hsdl.org/?view&did=795644>.

15 See https://www.nhtsa.gov/sites/nhtsa.dot.gov/files/documents/13069a-ads2.0_090617_v9a_tag.pdf.

16 <https://www.dmv.ca.gov/portal/dmv/detail/vr/autonomous/permit> (List of entities permitted to test Autonomous Vehicles with a driver in California); <https://www.dmv.ca.gov/portal/dmv/detail/vr/autonomous/driverless/testingpermits> (Only Waymo LLC is permitted to test Autonomous Vehicles without a driver in California)

17 See Section 63a StVG.

18 See Opinion of the Federal Assembly and Answer by the Federal Government, German Parliament Document (BT-Drucksache) 18/11534, p. 11-12.

19 For a full list, see the comparison table.

In terms of autonomous vehicles deployed for general use, the UK Law Commission's joint preliminary consultation paper on autonomous vehicles states that discussions are taking place with insurers and at EU level to standardise the data that needs to be stored following an accident and ensure that a minimum dataset is covered.²⁰

At EU level, the European Commission published a Communication²¹ in which it proposed that automated vehicles should be fitted with "event data recorders" ("EDRs") to clarify who was driving during an accident (i.e. the driver or the vehicle's autonomous system), as the actual cause of the event would be decisive for the attribution of liability. Consistent with this, the EU, as part of the revision of the General Safety Regulation for Motor Vehicles ("General Safety Regulation"), has prepared draft legislation requiring that EDRs be installed in all vehicles. Following the first reading of the European Parliament, the current proposal is that EDRs would store anonymised data from shortly before, during and immediately after an event, such as the triggering of an airbag.²² The data would include the vehicle's speed, braking, position and tilt of the vehicle on the road; the state and rate of activation of all its safety systems; 112-based eCall invehicle system, brake activation and relevant input parameters of the onboard active safety and accident avoidance systems.²³ In the current draft, the data should only be used by national authorities to conduct road safety analysis and assess the effectiveness of specific measures, without the possibility of identifying the owner or the holder of a particular vehicle on the basis of the stored data. EDRs should operate on a closed loop system, with data overwritten, and should not enable the driver or vehicle to be identified.²⁴ Should this legislation be adopted at EU level, then this approach will be followed by Germany (and other EU states). If the UK leaves the EU by 31 January 2020

as currently expected, then it will not be required to follow this approach, although based on the Law Commission's comments it seems likely to be highly influential.

California has adopted the reverse approach to the UK, with there being a black box requirement for driverless vehicles only once they reach the stage of being deployed for public use.²⁵ Under the California Code of Regulations, Title 13, section 228, CAVs must have an autonomous technology data recorder that captures and stores autonomous technology sensor data for all vehicle functions that are controlled by the autonomous technology at least 30 seconds before a collision with another vehicle, person, or other object while the vehicle is operating in autonomous mode. The data captured and stored by the autonomous technology data recorder, in a read only format, must be capable of being accessed and retrieved by a commercially available tool.

Potential Implications of Black Box use

One of the most significant consequences of fitting CAVs with black boxes may be to enable liability for accidents to be allocated more precisely. Depending on who is entitled to access the data, the existence of data from black boxes could potentially benefit drivers of automated vehicles, if they are able to prove that they were not in control of the vehicle at the time an accident occurred. The availability of black box data may also enable insurers of CAVs to more easily identify and disprove potentially fraudulent insurance claims. For manufacturers, the ability to identify where the fault that led to an accident arose may in turn enable liability to be allocated more accurately within the supply chain, making it easier for a manufacturer to recover against suppliers of specific parts or software.

20 See https://s3-eu-west-2.amazonaws.com/lawcom-prod-storage-11jxsou24uy7q/uploads/2018/11/6.5066_LC_AV-Consultation-Paper5-November_061118_WEB-1.pdf, page 111.

21 Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee, the Committee of the Regions 'On the Road to Automated Mobility: An EU strategy for mobility of the future', Com (2018) (283).

22 [http://www.europarl.europa.eu/RegData/seance_pleniere/textes_adoptes/provisoire/2019/04-16/0391/P8_TA-PROV\(2019\)0391_EN.pdf](http://www.europarl.europa.eu/RegData/seance_pleniere/textes_adoptes/provisoire/2019/04-16/0391/P8_TA-PROV(2019)0391_EN.pdf) Recital 13, Article 6(4) and (5).

23 Above n 22, Article 6(4).

24 Above n 22, Recital 14.

25 California Code of Regulations, Title 13, §228.06(a)(6)

However, such black box requirements and the availability of black box data also raise a number of issues, including data access and data protection issues. What data will be stored by black boxes, for how long, and under what circumstances differs by jurisdiction, if regulated at all. In California, for instance, data only needs to be recorded while a car is in autonomous mode, and not if the driver is driving manually. However, it is not clear how this will be balanced against the separate requirement that the recording takes place *“at least 30 seconds before a collision”* in autonomous mode, a requirement that in theory could require recording of manual data if a collision occurs within the first thirty seconds of changing to autonomous mode.²⁶

As stated above, data protection has been at the forefront of discussions during the drafting of the AVB in Germany. One of the key points is who has access to the data recorded by the black box. It is clear that the driver of the vehicle can use the stored data to exclude liability. In addition to road traffic authorities, third parties can also request access to the data for the purposes of *“asserting, satisfying or rejecting”* legal claims relating to accidents. Many details in relation to the right to request the data are still highly debated. Further questions arise in the context of the ownership of the data; does the data belong to the driver/owner of the autonomous vehicle or the manufacturer? In this context, it also remains unclear where the data is stored and the minimum storage time.

It is also likely that much of the data collected by such devices will constitute personal data that, in the UK and Europe, will be subject to the provisions of the General Data Protection Regulation (*“GDPR”*). The new proposed General Safety Regulation currently requires that all processing of personal data be carried out in accordance with EU data protection legislation, particularly the GDPR. The GDPR contains strict rules around how personal data may be collected, what data can be used for, and to whom data can be transferred, and will need to be given careful consideration by manufacturers and insurers alike. In Germany, the Bundesrat also identified data privacy issues in relation to black box data in, for example, rental cars and cars sold after an accident. Manufacturers currently only focusing on the US are also not immune to data privacy concerns,

with California having recently introduced the California Consumer Privacy Act (*“CCPA”*), moving it closer towards the European approach to data protection.²⁷

Car manufacturers have historically considered themselves the sole arbiters of the information pertaining to their vehicles. In the changing regulatory landscape, however, data access issues are likely to arise between the individual drivers whose data is being collected, manufacturers (as the likely original data controllers), and insurers (who will want to be able to access data for the purpose of assessing claims). Managing such data access issues will require both clear contractual and practical solutions. Some insurers in Germany, California and the UK are already offering drivers a reduction in insurance premiums if they agree to allow a data recorder to collect personal data (including in relation to driving habits, and how ‘risky’ a driver is).

Many vehicles already have embedded sensors that can, among other things, call emergency services, track stolen vehicles, or alert roadside assistance in the event of a breakdown. Such technology clearly will continue to advance as cars become autonomous, including through the introduction of black boxes. Commentators from privacy groups have suggested that with such advances in technology, increased driver surveillance should be seen as *“the new normal”*.²⁸

How liability is apportioned under existing regulations

The treatment and apportionment of liability for accidents involving CAVs also varies from jurisdiction to jurisdiction.

“User liability”

By their very nature, driverless vehicles do not have a human ‘driver’ in the traditional sense. However, lawmakers have in some cases sought to address the circumstances in which a ‘user’ of these vehicles can be held liable for an accident.

The UK AEV Act does not currently contain any specific provisions relating to user liability, but the Law Commission has suggested that the legislation must be developed further to clarify the role of the ‘user-in-charge’.²⁹

26 California Code of Regulations, Title 13, Section 228.06(a)(6).

27 The CCPA comes into force in January 2020.

28 See, eg, <https://www.thetimes.co.uk/article/privacy-fear-over-mercedes-benz-that-track-drivers-every-move-m56plfnlj>.

29 Automated Vehicles: A joint preliminary consultation paper, Law Commission Consultation Paper 240.

In Germany, a user can be held liable for an accident if they have failed to fulfil their duty under Section 1b(2) of the AVB, which mandates that users must immediately retake control of the vehicle when: (1) the highly or fully automated system prompts them to do so; or (2) they recognise, or based on obvious circumstances should have recognised, that the prerequisites for intended use of the highly or fully automated system no longer apply. However, the terms “intended use” and “obvious circumstances” are not defined in the AVB and require further interpretation by the courts.

In California, test users must obey all applicable provisions of the Vehicle Code and local regulation whether the vehicle is in autonomous or conventional mode. Any violation of the Vehicle Code is a criminal infraction punishable by a fine, and more serious accidents could be considered reckless driving or vehicular manslaughter. At present, legislation in California does not specifically address how these rules would apply to a user in a fully automated vehicle. The SELF DRIVE Act under consideration by US Congress would standardise safety and performance requirements for Autonomous Vehicles across the US. This proposed law would pre-empt liability schemes proposed by individual states, though the Act would not pre-empt common law claims.³⁰

Owner liability

The legal owner of a driverless vehicle may also be held liable for an accident in certain circumstances. The question of owner liability is closely linked to a jurisdiction’s mandatory insurance provisions.

In the UK, the AEV Act states that owners of CAVs will only be liable in limited circumstances, such as when a driverless car is not insured. Insurance is mandatory for all vehicles in the UK under Section 143 of the Road Traffic Act 1988.³¹ While the main requirement to insure a vehicle lies with the user of the vehicle, section 144A of the Road Traffic Act 1988 provides that if a vehicle does not meet insurance requirements, the person in whose name the vehicle is registered is guilty of an offence.

Under German legislation, if the driverless car causes death, personal injury or property damage, the owner of the vehicle will be liable.³² German legislation also requires that all vehicle owners have compulsory insurance coverage.³³

In contrast, under Californian law, an owner’s liability in the event of a vehicle accident will generally be limited except in circumstances of the owner’s negligence. California Insurance Code § 11580.1 requires private passenger vehicles to be insured for not less than \$15,000 for injury or death to one person, \$30,000 for injury or death to more than one person, and \$5,000 for damage to property. In the absence of negligence, a driver’s liability is limited to these amounts.³⁴

Insurer Liability

As noted, it is mandatory to have insurance under UK law. The UK introduced a new insurance regime in the first part of the AEV Act to address CAVs. This regime clarifies that insurers will be liable for damage stemming from an accident caused by a CAV when the insured vehicle is in self-driving mode and an insured person or any other person suffers damage as a result of the accident. Depending on the circumstances, an insurer could in turn seek to bring its own claims against the manufacturer, owner or driver of the CAV, for example if the insurer considers a manufacturing fault is the underlying cause of the accident. In addition, insurers are able to exclude or limit their liability for damage caused by an insured individual making “software alterations” that they are prohibited from making under their insurance policy, or failing to install software updates that they know (or ought reasonably to know) are safety-critical.³⁵

In Germany there are no specific provisions in the legislation with regard to the liability of insurers of CAVs. However, as noted above, owners of all vehicles are required to take out insurance. Under German law, car insurance companies cannot exclude their liability for CAVs. However, they may raise their premiums based on the type of risk that they are insuring, or offer tailor-made tariffs based on the data produced by a specific vehicle.

30 See <https://www.congress.gov/115/bills/hr3388/BILLS-115hr3388rfs.pdf>.

31 There are very limited exceptions to this rule which are set out in 143(3)-(4) of the Road Traffic Act 1988.

32 Under the AVB, liability is capped as detailed in Sec. 12 (1) AVB; this does not exclude further liability under e.g. tort law.

33 Section 1 of the Law on Compulsory Insurance (“Pflichtversicherungsgesetz”).

34 California Vehicle Code section 17151(a).

35 AEV Act, Section 4. Note that in respect of damage to third parties, an insurer can only exclude liability for damages where the insured person knew software alterations were made that were prohibited under the policy.

Californian law similarly contains no specific provisions with regard to liability of insurers of CAVs. Instead, the California Legislature largely has delegated regulation of CAVs to the California Department of Motor Vehicles.³⁶ These regulations require manufacturers of CAVs to present five million dollars in the form of an instrument of insurance, a surety bond, or a certificate of self-insurance, in order to gain approval to test and commercially launch any CAV.³⁷

Manufacturer Liability

As regards manufacturer liability, current regulations in the UK, Germany and California do not specifically provide for manufacturer liability, but instead prospective claimants must rely on wider tort, product liability, or insurance legislation.

At EU-level, the Motor Insurance Directive already provides a streamlined process for compensation of victims, including where an automated vehicle is involved.³⁸ This has been implemented into both UK and German law. The insurer can then take legal action against a vehicle manufacturer under the Product Liability Directive if there is a malfunction / defect of the automated driving system, with the European Commission currently undertaking a review of whether amendments are required to this Directive to better accommodate the development of technologies such as CAVs.

In California, while there are currently no specific legislative provisions addressing this question, the groundwork has been laid for manufacturer liability by the introduction of the requirement for manufacturers to show that they have five million dollars available, before they can test and commercially launch any CAV, as discussed above.

Conclusion on Liability

Across these jurisdictions, the current tort and product liability regimes, and insurance requirements, provide reasonable coverage of potential liability issues that may arise. In the US, the introduction of proposed legislation such as the SELF DRIVE Act will serve to standardise regulations across the market, so manufacturers need not comply with disparate requirements across fifty US states. However, there remain areas where the current liability and insurance regime within the EU may give rise to uncertainty, including in relation to liability arising out of failures in operating software, and risks arising out of potential cybercrime, network failures and programming choices.³⁹ It remains to be seen what other gaps may be identified once CAVs enter series production and become more widely adapted to real-life scenarios.

Future developments to monitor

The regulation of CAVs remains a fast-changing and developing area. For instance, the UK Law Commission published a first consultation paper on 28 November 2018, considering safety assurance together with civil and criminal liability.⁴⁰ Its second consultation paper on automated road passenger services was published on 16 October 2019,⁴¹ and a third consultation paper is due to be published in 2020, drawing on responses to both of its previous papers in order to formulate overarching proposals on the way forward. The Law Commission will not, however, produce its final report and recommendations until March 2021.⁴²

36 https://www.dmv.ca.gov/portal/wcm/connect/a6ea01e0-072f-4f93-aa6c-e12b844443cc/DriverlessAV_Adopted_Regulatory_Text.pdf?MOD=AJPERES&CVID=

37 Ibid.

38 <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32009L0103>.

39 See "A common EU approach to liability rules and insurance for connected and autonomous vehicles" [http://www.europarl.europa.eu/RegData/etudes/STUD/2018/615635/EPRS_STU\(2018\)615635_EN.pdf](http://www.europarl.europa.eu/RegData/etudes/STUD/2018/615635/EPRS_STU(2018)615635_EN.pdf).

40 See https://s3-eu-west-2.amazonaws.com/lawcom-prod-storage-11jsxou24uy7q/uploads/2018/11/6.5066_LC_AV-Consultation-Paper-5-November_061118_WEB-1.pdf.

41 See <https://s3-eu-west-2.amazonaws.com/lawcom-prod-storage-11jsxou24uy7q/uploads/2019/10/Automated-Vehicles-summary-of-consultation-paper-final.pdf>.

42 See <https://www.lawcom.gov.uk/project/automated-vehicles/>.

At EU-level, the European Commission made several proposals in its Communication 'Strategy for Mobility of the Future'.⁴³ It also announced plans to issue further guidance on the Product Liability Directive in mid-2019, although at the date of writing this has yet to be released. The new EU Regulation 2018/858 on type approval and market surveillance of vehicles will also come into force in Germany in 2020. While this is not CAV-specific, the extended post-market surveillance duties of manufacturers will be particularly relevant for CAVs because the amount of gathered data transmitted to the vehicle backend (theoretically) allows manufacturers to know of a problem in almost real time.

From a US perspective, the SELF DRIVE Act, which has been under consideration by the US Congress since 2017, would provide uniform standards to manufacturers of CAVs. A set of uniform standards for safety and performance of CAVs would reduce manufacturer compliance costs and be a substantial step towards the opening of the US market for the commercial sale of CAVs.

Conclusion

The development of CAVs is part of a widespread technological change sweeping the world, as the development of new technologies such as AI revolutionise the role that technology can play in our lives. Ultimately, consumer confidence in CAVs will be key to ensuring their widespread adoption. Our review shows that policy-makers and regulators in Germany, the UK and California are alive to both the potential and the risks that can arise out of such game-changing technology, and they are adapting regulatory frameworks at pace. As with all technologies, there remain risks and areas of concern that need further development or consideration. How to balance data protection against the volume of data required to be collected for CAVS to function is one such area⁴⁴. Other areas include cybersecurity, consumer protection, safety assurance schemes and how to adapt road rules to artificial intelligence. Manufacturers and others in the supply chain should therefore continue to proactively engage with the various consultations and policy development initiatives taking place, to ensure that a regulatory framework is in place that can optimally balance risks against the potential benefits of CAVs, and help provide an important part of the framework for this new era of transportation.

⁴³ Op cit. footnote 21.

⁴⁴ While this article has focussed on black boxes, concerns also arise in terms of data collected by autonomous vehicles on its surrounding environment, as discussed by our data protection team here: <https://www.whitecase.com/publications/article/dashcams-and-autonomous-vehicles-dodging-legal-handmines-eu>.

	United Kingdom	Germany	United States (California)
Legislative and Regulatory Framework			
Key Legislation	Automated and Electric Vehicles Act 2018 (“AEV Act”).	Eighth Amendment Act to the Road Traffic Act ⁴⁵ (Straßenverkehrsgesetz, “StVG”).	California Vehicle Code sections 38750 and 38755, together with implementing regulations found in the California Code of Regulations (the “Regulations”), Title 13, Sections 227-228 .
Is legislation standalone?	Yes.	No.	No.
Definition of “automated vehicles”	<p>Vehicles that “drive themselves”.</p> <p>The Secretary of State prepares (and keeps up to date) a list of all such vehicles. The list may identify vehicles by type, by reference to information recorded in a registration document or in any other way (Section 1(1) - 1(2) AEV Act).</p> <p>No such list has currently been published.</p>	<p>A “vehicle with highly or fully automated function” is defined as a vehicle which has technical equipment that (Section 1a (2) ss. 2 StVG):⁴⁶</p> <p>(1) after activation, is able to perform the driving task – including longitudinal and lateral control;</p> <p>(2) is able to comply with traffic regulations during the highly or fully automated driving mode;</p> <p>(3) can be manually overridden or deactivated by the driver at any time;</p> <p>(4) is able to recognize the necessity of manual vehicle control by the driver;</p> <p>(5) is able to visually, acoustically, tactilely or otherwise perceptibly prompt the driver, within a sufficient time period, to retake control of the vehicle; and</p> <p>(6) notifies of use that is contrary to the system description.</p> <p>In addition to these requirements, Section 1a (3) StVG refers to applicable international regulations as well as EU type approvals.</p>	<p>“Autonomous vehicle” means “any vehicle equipped with autonomous technology”⁴⁷ that has been integrated into that vehicle” (Section 38750 of the Vehicle Code)</p> <p>In a testing context, section 228 of the Regulations defines “autonomous vehicle” as:</p> <p>(b) “<i>any vehicle equipped with technology that is a combination of both hardware and software that has the capability of performing the dynamic driving task without the active physical control or monitoring of a natural person, excluding vehicles equipped with one or more systems that enhance safety or provide driver assistance but are not capable of driving or operating the vehicle without the active physical control or monitoring of a human.</i>”</p>

⁴⁵ Link is to an unofficial English translation.

⁴⁶ As can be seen by no. (4) and (5), this definition of “highly or fully automated” used by the German lawmaker does not correspond to the commonly-used Society of Automotive Engineers (“SAE”) levels. SAE defines 6 levels of autonomous vehicles, from 0 (fully manual) to 5 (fully autonomous). See <https://www.sae.org/news/2019/01/sae-updates-j3016-automated-driving-graphic>.

⁴⁷ where “autonomous technology” means “technology that has the capability to drive a vehicle without the active physical control or monitoring by a human operator.”

	United Kingdom	Germany	United States (California)
Can this definition be altered or supplemented?	Yes. The Secretary of State can publish a revised list. ⁴⁸	Yes, by amendments to the Road Traffic Act. In addition, it is flexible as it only provides for a general framework and the manufacturer is the party that defines the parameters of the automated system.	Yes. The Vehicle Code can be altered by the California legislature . The Regulations can be revised by the DMV.
Is there a specific Regulator for automated vehicles?	Yes. The Centre for Connected and Autonomous Vehicles ("CCAV") works across government to support the market for connected automated vehicles in the UK. Bodies such as the Vehicle Certification Agency and the Driver and Vehicle Licensing Agency are also expected to continue their relevant regulatory functions in respect of automated vehicles.	No. The Federal Motor Transport Authority (Kraftfahrt-Bundesamt, "KBA") remains responsible for the approval of new vehicle types and parts.	No. All vehicles in California are regulated by the Department of Motor Vehicles , and must meet certain vehicle safety requirements of the Federal Department of Transportation.
Proposed changes to the regulatory framework	The Law Commission of England and Wales are currently undertaking a review of the legal framework surrounding automated vehicles. A final report with recommendations is expected by March 2021 .	In November 2017, the Federal Government published its Report on the Implementation of the Automated and Connected Driving Strategy . ("Implementation Report") The Report states that in the future, the automated functions of the vehicle must be taken into account for the purposes of driver training and testing . Germany also supports the introduction of automated vehicle rules at UNECE level.	In April 2019 , the DMV issued a new set of proposed regulations regarding the testing and deployment of autonomous delivery vehicles (i.e., small commercial trucks) weighing less than 10,001 pounds. In May 2019, the DMV held a public workshop to gather and discuss input on the development of the regulations. The agency plans to issue these regulations by the end of 2019.

48 Section 1(3) AEV Act.

	United Kingdom	Germany	United States (California)
Government guidance or policy documents	The CCAV Code of Practice for Automated Vehicle Trialling regulates all automated vehicle trials conducted in the UK.	The 2015 Federal Government Strategy for Automated and Connected Driving and the Implementation Report provide a concise insight on the plans of the Federal Government. An Ethics Commission on Automated and Connected Driving has also been established, and has published a Report on Automated and Connected Driving in June 2017: In September 2017, the Federal Government also published its Action Plan , which is based on the Commission's Report	The DMV provided a "Statement of Reasons" with the issuance of s227 and 228 of the Regulations, as required by law. ⁴⁹
Use of Automated Vehicles			
Are automated vehicles currently permitted on the roads?	Yes, but only for trial purposes.	Yes.	Yes.
Is a permit required to drive an automated vehicle?	No. However, the Law Commission notes that specialised permits could be put in place in the future. Furthermore, they also consider whether drivers will instead be offered voluntary training courses that are incentivised through insurance discounts.	No. As stated above, the Federal Government is considering introducing the automated functions of a vehicle in driver training and testing.	Yes. There are separate permits for testing and post-testing deployment . The DMV maintains a list of companies that have been approved for testing AVs with a driver in California.

⁴⁹ The Initial Statement of Reasons can be found at https://www.dmv.ca.gov/portal/wcm/connect/1ba842c8-c3c9-4204-affb-698d248b8a14/avidmt_InitialStatementofReasons.pdf?MOD=AJPERES&CVID= and the Final Statement of Reasons can be found at https://www.dmv.ca.gov/portal/wcm/connect/e11d4dd0-e5ec-453f-8861-41bf8656a69c/DriverlessAV_Final_Statement_of_Reasons.pdf?MOD=AJPERES.

	United Kingdom	Germany	United States (California)
Must a “driver” be present in the vehicle?	<p>No.</p> <p>However, during trials it is a legal requirement that there is a safety driver or safety operator ready and able to override the vehicle, although they do not necessarily have to be in the vehicle.</p>	<p>Yes.</p> <p>A human driver must be present in the vehicle. Section 1a (4) StVG provides that for the purposes of the law, “driver” is defined as someone who activates the highly or fully automated driving function and deploys it for vehicle control within the scope of the intended use of the system, even if they do not actually drive the vehicle.</p>	<p>No.</p> <p>Section 227 of the Regulations (governing deployment for testing purposes) provide for the testing of automated vehicles on public roads both with a test driver and without. See 13 CCR § 227.26; 13 CCR § 227.38.</p> <p>Section 228 leaves open the possibility that a vehicle could be approved for public deployment for commercial or recreational use without a driver being required to be present during operation of the vehicle.</p> <p>Despite the possibility for driverless testing, commercial, and recreational use, at this time the California Vehicle Code requires that all autonomous vehicles are capable of being controlled or stopped by a human operator. California Vehicle Code § 387500(c)(C)-(D),</p> <p>Currently, driverless testing programs require the presence of a remote operator capable of taking control of or stopping the vehicle. 13 CCR § 227.38(b).</p>

	United Kingdom	Germany	United States (California)
Driver Liability			
What level of attention must drivers maintain when driving an automated vehicle?	<p>No specific provisions, although road users owe a legal duty of care to all other road users.</p> <p>However, the Law Commission is considering whether the UK ought to adopt the UNECE recommendation to create a set of principles defining “permissible secondary activities”.</p> <p>The Law Commission has also suggested introducing a requirement that a “user-in-charge” be qualified and remain fit to drive while the vehicle is driving itself.</p>	<p>Under Section 1b (1) StVG, the driver may divert their attention from traffic and vehicle control during deployment of the highly or fully automated function. However, the driver must remain sufficiently alert so that they can comply with the duties under subsection 2. Subsection 2 provides that the driver must immediately retake control of the vehicle in the following situations:</p> <p>(1) When the highly or fully automated system prompts him/her to do so; or</p> <p>(2) If they recognize, or based on obvious circumstances should have recognized, that the prerequisites for the intended use of the highly or fully automated system no longer exist.</p>	<p>Under Section 227.32(c) of the Regulations, a test driver must “<i>obey all provisions of the Vehicle Code and local regulation applicable to the operation of motor vehicles whether the vehicle is in autonomous mode or conventional mode, except when necessary for the safety of the vehicle’s occupants and/or other road users.</i>”</p> <p>Generally, a driver is defined as someone “<i>in actual physical control of a vehicle</i>” under the Vehicle Code. It is expected that on deployment, for vehicles that have the option of driver control (e.g., with AV systems that can be turned off) the driver will be capable of doing so in the event that a need arises for the driver to take control of the vehicle during testing.</p>
In what circumstances is a driver liable for damage/injury caused by an automated vehicle?	<p>No specific rules in place.</p> <p>However, the Law Commission suggests that there be a new category of a ‘user of a highly operated vehicle’ (“user-in-charge”). It suggests that the ‘user-in-charge’ should not be considered a ‘driver’ while the vehicle is driving itself and legislation must develop to clarify the role of a user-in-charge.</p>	<p>A driver will be liable for an accident if they do not fulfil the duties under Section 1b (2) StVG (as above).</p> <p>However, the terms “<i>intended use</i>” and “<i>obvious circumstances</i>” require further interpretation by the courts.</p>	<p>The violation of any provision of the Vehicle Code is a criminal infraction under California law, punishable by a fine.</p> <p>In the event of damage/serious injury or death as a result of an infraction, there is the possibility for criminal prosecution for reckless driving (serious injury or property damage) or vehicular manslaughter (death). Violation of the vehicle code could also be considered “<i>per se negligence</i>” under California’s civil common law, and could be the basis for civil liability in the event of injury/death.</p>

	United Kingdom	Germany	United States (California)
<p>Is there a liability cap for drivers of automated vehicles and how does this compare to liability for drivers of normal vehicles?</p>	<p>Yes.</p> <p>Section 145(4)(b) of the Road Traffic Act 1988 limits the amount of liability for the insurer/owner of an automated vehicle. This is the same cap applicable to normal (non-automated) vehicles. Insurance policies must provide unlimited cover for death/personal injury and up to £1.2 million for property damage. The use of a vehicle without insurance is a criminal offence.</p>	<p>Yes.</p> <p>In case of an accident that causes injury or death, the driver is jointly liable with the owner of the vehicle, unless they can rebut the presumption of fault provided in Section 18 (1) StVG. If the accident was caused due to the deployment of a highly or fully automated vehicle (that is not used for paid passenger transport), the liability per “event” is capped at €10 million (Section 12 (1) no. 1 2nd alternative StVG).</p>	<p>No.</p> <p>There is no liability cap for drivers of automated or non-automated vehicles. However, there are limits on criminal fines and prison time, which vary by offense.</p>
<p>Is the automated vehicle required to record driving data? If so, can this driving data be used to confirm driver liability?</p>	<p>Yes, but only at testing stage.</p> <p>The Code of Practice for testing vehicles requires a data recording device to record whether the vehicle is in manual or automated mode, vehicle speed, steering command and activation, braking command and activation, operation of lights and indicators sensor data concerning presence of other road users and objects, and remote commands.⁵⁰</p> <p>Data can be used to determine control of the vehicle at the time of an incident and provided to relevant authorities on request.</p> <p>The Law Commission report states that discussions are currently taking place with insurers and at the EU level to standardise the data that needs to be stored following an accident.</p>	<p>Yes.</p> <p>Automated vehicles must be equipped with a data storage device, i.e. a black box. The data stored includes the change of vehicle control between the driver and the highly or fully automated system; when the driver is prompted by the system to retake control of the vehicle; and when a technical failure of the system occurs.⁵¹</p> <p>Road traffic authorities and such third parties can request access to the data that intend to “<i>assert, satisfy or reject</i>” legal claims with regard to the accident.</p>	<p>Yes.</p> <p>Any autonomous vehicle deployed for public use (i.e., not at the testing phase) must have an “autonomous technology data recorder that captures and stores autonomous technology sensor data for all vehicle functions that are controlled by the autonomous technology at least 30 seconds before a collision with another vehicle, person, or other object while the vehicle is operating in autonomous mode. The data captured and stored by the autonomous technology data recorder, in a read only format, must be capable of being accessed and retrieved by a commercially available tool.”⁵²</p>

⁵⁰ See Code of Practice 5.6 and 5.7.

⁵¹ Section 63a StVG.

⁵² Under the Regulations, Title 13, Section 228.06(a)(6).

	United Kingdom	Germany	United States (California)
Owner Liability			
Are there specific provisions governing “owner” liability?	<p>Yes.</p> <p>Section 2(2) AEV Act 2018 provides for owner liability, but only in very specific circumstances. Otherwise, the insurer is directly liable and must make a secondary claim against other parties who are at fault.</p>	<p>No.</p> <p>However, under German law, the owner’s liability is governed by Section 7 (1) StVG. This provides that, if during the operation of a vehicle death, injury to person, or property damage is caused, then the owner (<i>Halter</i>) is liable.</p>	<p>No.</p>
In what circumstances is the vehicle’s owner liable for damage/injury caused by an automated vehicle?	<p>An owner is only liable where:</p> <p>(i) an automated vehicle is not insured; and</p> <p>(ii) section 143 of the Road Traffic Act 1988 (mandatory insurance provision) does not apply because of a public body exemption or because the vehicle is in the public service of the Crown.</p>	<p>If the automated vehicle causes a death, personal injury or property damage, then the owner of the vehicle will be held liable.</p>	<p>Under California’s common law, an owner’s liability is limited except in circumstances of the owner’s own negligence (e.g., negligent entrustment of the vehicle to someone unfit to drive) or where the owner has statutory liability, subject to a relatively small damage cap, where a driver acting with the owners express or implied permission causes an injury. In some circumstances, there is also potential criminal liability.</p>
Manufacturer/ Supplier Liability			
Are there specific provisions regarding the liability of manufacturers/suppliers of automated vehicles?	<p>No.</p>	<p>No.</p>	<p>No.</p>

	United Kingdom	Germany	United States (California)
Insurer Liability			
Are there specific provisions regarding liability for insurers of automated vehicles?	<p>Yes.</p> <p>Where an automated vehicle is insured and involved in an accident, the insurer is directly liable for that damage⁵³⁾, although it may seek to reclaim damages from other parties liable for the accident, such as the vehicle manufacturer.</p>	No.	No.
Are there any circumstances in which insurers can exclude liability for automated vehicles?	<p>Yes, in limited circumstances.</p> <p><i>“Liability for an automated vehicle cannot be excluded by a term of an insurance policy except as set out in Section 4 of the AEV Act.” (Section 2(6) of the AEV Act).</i></p> <p>Section 4 states that an insurance policy for automated vehicles may exclude or limit the insurer’s liability where the damage occurred as a direct result of: “(a) software alterations made by the insured person, or with the insured person’s knowledge, that are prohibited under the policy; or (b) a failure to install safety-critical software updates that the insured person knows, or reasonably ought to know, are safety-critical”.</p>	<p>No.</p> <p>Car insurance companies cannot exclude their liability for automated vehicles. Without insurance coverage, the owner/driver cannot use the vehicle. However, car insurance companies are able to raise their premiums based on the type of risk they insure. Furthermore, in the future, insurance companies will be able to offer tailor-made tariffs based on the data produced by a specific vehicle.</p>	<p>No.</p> <p>If the automated vehicle is a covered vehicle under a policy, it would not be a basis to reject a claim. All drivers in California are required to maintain an auto insurance policy. However, insurers in California are not under any obligation to offer a new policy, or renew an existing policy, to cover an automated vehicle to be used by an insured driver.</p>

53 Section 2(1) AEV Act.

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