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Peer reviewed version

Liability for Road Accidents Caused by Driverless Cars

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Introduction

> Sally was coming down the lake road, so I waved to her and called her by name. I always liked to see Sally. I liked all of them, you understand, but Sally's the prettiest one of the lot.[1]

Before you ask: Jake, our narrator, isn't talking about a woman. Sally is a car. And not just any car. To resume Jake's narration: 'Sally was a 2045 convertible with a… positronic motor. She had the cleanest, finest lines I've ever seen on any model, but none. For five years, she'd been my favourite…. In all that time, there'd never been a human being behind her wheel. Not one.'[2]

Sally, you'll have guessed, is a *driverless* car, a creation of science fiction ('SF') - in fact, the eponymous heroine of Isaac Asimov's short story *Sally*, published in 1953. That makes it possibly the first self-driving vehicle in the SF canon, the precursor to more celebrated examples like the Batmobile, *Knight Rider*'s KITT and *Total Recall*'s Johnny Cab.[3] Cars with a computer 'brain' that can drive themselves have become a familiar SF trope.

But autonomous vehicles ('AVs') can no longer be considered as just the product of speculative fiction.[4] In 1961, the 'Stanford Cart' was able to navigate around obstacles through the use of cameras and an on-board computer. Admittedly, it took 15 to 20 minutes to plan and execute every one-metre move, but it was a start. Significant further development had to wait until the new millennium, when the US military (through its Defense Advanced Research Projects Agency) established a challenge race for AVs, open to all comers, across the Mojave Desert. In the first challenge, none of the entries made it to the finish line; second time around, five vehicles completed the course.

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[1] Isaac Asimov, 'Sally' (1953) 2:3 *Fantastic* 34 at 35.

[2] Ibid 36.

[3] See respectively online: https://en.wikipedia.org/wiki/Batmobile; https://en.wikipedia.org/wiki/KITT; https://talkingpointz.com/johnny-cab/. All online materials referenced in this article were available to access on 21 June 2019.

[4] The examples in the text are sourced from Alex Davies, 'The WIRED guide to self-driving cars' (13 December 2018) online: https://www.wired.com/story/guide-self-driving-cars/.

In 2010, an adapted mass-market hatchback, a Prius, succeeded in self-navigating 1000 miles of California roads, fulfilling a commission by Google founder, Larry Page. The market potential of AVs was now becoming obvious, and manufacturers began to sell models with more and more autonomous driving features, as well as to design new fully autonomous vehicles like Toyota's ePalette, conceived as being able to provide a range of functions other than transportation, including mobile office or retail space, mobile medical clinics and mobile restaurants.[5]

Developmental Accidents

Putting these AVs on the roads, and especially into situations of potential conflict with other road users, has proved far from straightforward. The process of development and testing has been beset with problems, with a succession of accidents, near-misses and other types of failure. In June 2016, a Tesla test driver died in Florida in the first fatal crash involving a vehicle in autopilot mode. The autopilot sensors on the vehicle were not designed to, and did not, identify a truck crossing the highway ahead and drove into it without reducing velocity or applying the braking system. The National Transportation Safety Board accident report recorded that the probable cause of the accident was the truck driver's failure to yield the right of way to the car, combined with the car driver's inattention due to overreliance on vehicle automation, which resulted in his lack of reaction to the truck's presence. The report found that the car's operational design contributed to the driver's overreliance on the automation because it permitted his prolonged disengagement from the driving task and his use of the automation in ways inconsistent with guidance and warnings from the manufacturer.[6]

In March 2018, a self-driving Uber vehicle killed a woman on a public street in Arizona, in what was reported as the first fatal crash involving a self-driving vehicle and a pedestrian.[7] The vehicle sensed the woman's presence six seconds before the impact, but (as a federal investigation subsequently found), its emergency braking system was not enabled, ostensibly to avoid erratic

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[5] See https://www.toyota.ca/toyota/en/connect/2000/toyota-e-palette-concept-vehicle-ces-2018.

[6] See National Transportation Safety Board, 'Highway Accident Report: Collision Between a Car Operating With Automated Vehicle Control Systems and a Tractor-Semitrailer Truck Near Williston, Florida May 7, 2016,' NTSB/HAR-17/02 (12 September 2017) online: https://www.ntsb.gov/investigations/AccidentReports/Reports/HAR1702.pdf. Another Tesla driver was killed in an accident in Mountain View, California on 23 March 2018. National Transportation Safety Board, 'Preliminary Report: Highway HWY18FH011' (7 June 2018) online: https://www.ntsb.gov/investigations/AccidentReports/Reports/HWY18FH011-preliminary.pdf.

[7] 'Self-driving Uber kills Arizona woman in first fatal crash involving pedestrian', *The Guardian*, 19 March 2018, available at https://www.theguardian.com/technology/2018/mar/19/uber-self-driving-car-kills-woman-arizona-tempe.

vehicle behaviour. Uber stated that it relied upon operators to intervene and take action, though the system itself is not designed to alert them, and in this instance, the driver failed to brake until after the impact had occurred.[8] It was reported little than a week later that the dead woman's family had reached a settlement with Uber, pre-empting possible legal proceedings, on terms that have not been disclosed. Around the same time, it was revealed that Uber's testing program in Arizona was authorised by the state governor, without informing the public. Uber subsequently suspended its AV testing in Arizona and other locations in the US, as well as in Toronto.[9] The tragic story provides a foretaste of the further litigation surrounding AV collisions that is surely inevitable, even if the direct causes here were human choice and human inadvertence.

The Wider Context

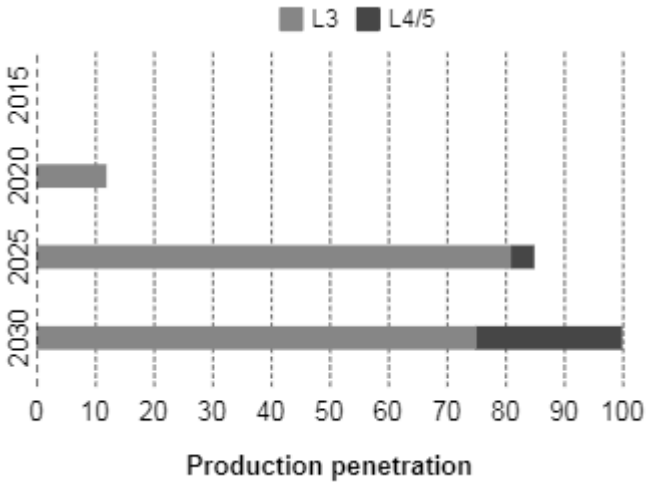
For now, AVs are hardly ever to be found on our roads – and not at all, so far as I am aware, on public roads in Europe, at least if we speak only of vehicles with 'high' or 'full' automated driving capacity (denoted Levels 4 and 5 on the now standard scale).[10] Even Level 3 vehicles – with 'conditional' automation, meaning that drivers can choose whether they drive or not - are rare, as can be seen from the graphical representation below of AV production penetration in the UK. However, aspects of lower level automation are now familiar features of new cars (cruise control, ABS, lane-keeping assistance, self-parking etc) and it is projected that all vehicles produced in the UK by 2027 will have at least L3 technologies embedded in them and that there will be a 25% penetration of fully autonomous vehicles by 2030.

[8] National Transportation Safety Board, 'Preliminary Report: Highway HWY18MH010' (24 May 2018) online: https://www.ntsb.gov/investigations/accidentreports/reports/hwy18mh010-prelim.pdf.

[9] Mark Harris, 'Exclusive: Arizona governor and Uber kept self-driving program secret, emails reveal', *The Guardian*, 28 March 2018, available at https://www.theguardian.com/technology/2018/mar/28/uber-arizona-secret-self-driving-program-governor-doug-ducey.

[10] SAE International, 'Taxonomy and Definitions for Terms Related to On-Road Motor Vehicle Automated Driving Systems,' Recommended Practice 3016_201806 (June 2018)..

Table: forecast of UK production of autonomous vehicles.[11]



Though the market for AVs is so far undeveloped, the attraction of investing in further AV development – for both manufacturers and governments – are obvious. As summarised in a recent policy paper by the UK Department of Transport, *The Pathway to Driverless Cars*, the key advantages of AVs are to create more free time for persons generally (it being claimed that the average driver can save up to six working weeks of driving time each year), to improve health and safety, inasmuch as 94% of road injuries and deaths are currently attributed to human error, to reduce emissions and ease congestion, and to increase access to vehicles for everyone.[12] Necessary steps in this process are to promote the UK as a place to test, sell and use AVs by creating a regulatory landscape that is appropriately permissive, clarifying liability rules and giving victims easy access to compensation.[13] With these objectives in mind, the Government introduced a Bill in Parliament in 2017 to establish a new regulatory and liability regime[14] and revived it under a different name after the General Election of that year, passing in July the year after and becoming the *Automated and Electric Vehicles Act 2018*.

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[11] KPMG, 'Connected and Autonomous Vehicles – The UK Economic Opportunity ' (March 2015), p 9 (chart and table), available at https://www.smmt.co.uk/wp-content/uploads/sites/2/CRT036586F-Connected-and-Autonomous-Vehicles-%E2%80%93-The-UK-Economic-Opportu...1.pdf.

[12] Department of Transport, 'The Pathway to Driverless Cars: A detailed review of regulations for automated vehicle technologies' (February 2015), paras 1.2–1.8 and Figure 13.1, available at https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/401565/pathway-driverless-cars-main.pdf.

[13] Department of Transport, *The Pathway to Driverless Cars* (0000). The UK Government's policy response was developed by the Department in a series of research and policy papers with the recurring title 'The Pathway to Driverless Cars'.

[14] Bill 43, *Vehicle Technology and Aviation Bill*, UK Parl, Sess 2016-17, introduced 22 February 2017.

Policy Choices

Before we look at the details of the Act, what are the basic policy choices that the legislator must make as regards the liability issues that are the focus of this paper? Who should bear the risk of damage resulting from the use of an AV? In what circumstances should the victim be granted compensation?[15]

Conceivably, the loss could simply be left to lie with the victim: *casum sentit dominus* (let the loss lie where it falls). That is the basic starting point in all legal systems,[16] though it is also universally recognised that there may be good reason for shifting the loss through the imposition of a liability to compensate. The initial response is generally to do this in the case of fault – the negligence of the driver, as it most commonly is. But with an AV, there may be no driver, so it is necessary to ask whether other parties can be made to bear the risk and on what basis: the car-owner, its insurer, the car-maker, the software designer, an at-fault third party, or perhaps the State? Fault, of course, remains an option – but it is not the only possible basis of allocation.[17]

Further, even where in a first step the loss is *shifted* from the victim to another person, it may remain possible for the latter to pass the loss on through further litigation so as to achieve the goal of loss distribution. The first defendant then becomes simply the conduit through which the loss is 'channelled' to the ultimate risk-bearer or *group* of risk-bearers. The rationale for doing so may be that the latter are better able to bear the risk, or to distribute it further without additional litigation (eg through product pricing), or because they are in the best position to *control* the risk. The possible justifications, and their possible combinations, are various.[18]

We therefore have to ask the following questions. First, on what basis should the law shift the loss from the victim to another person? Second, *to whom* should the loss be shifted? And third, what further loss distribution should there be, and on what basis?

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[15] See further David C. Vladeck, 'Machines Without Principals: Liability Rules and Artificial Intelligence,' (2014) 89 Wash. L. Rev. 117 at 125–129.

[16] See further Helmut Koziol, *Basic Questions of Tort Law from a Germanic Perspective* (Vienna: Jan Sramek Verlag 2012) at para 1/1; Ken Oliphant, 'Basic Questions of Tort Law from the Perspective of England and the Commonwealth,' in Helmut Koziol, ed., *Basic Questions of Tort Law from a Comparative Perspective* (Vienna: Jan Sramek Verlag 2015) at paras 5/8–5/10.

[17] As to liability in the absence of either fault or defect, see Vladeck, *supra* note 15 at 146–47.

[18] As to distributive justice through tort law, see generally Tsachi Keren-Paz, *Torts, Egalitarianism and Distributive Justice* (Ashgate, 2007).

The *Automated and Electric Vehicles Act 2018*[19]

Accidents caused by self-driving cars may be dealt with under the established negligence-based regime of tortious liability and/or by other applicable liability regimes. If the 'operator' of a self-driving car did not pay due attention in advance of the accident, and could have avoided its occurrence, then he or she would potentially be liable in negligence to anyone who suffered damage as a result in the usual way. But if there is no actual driver, the focus in many road accident cases will necessarily shift to some alternative defendant. One possible target is the producer of the vehicle, with a concomitant shift of focus from the general fault liability regime governed by the law of negligence to the strict liability for damage caused by defective products under the *Consumer Protection Act 1987*. However, proving a defect in the vehicle may not be a simple matter.[20]

The *Automated and Electric Vehicles Act 2018* introduces a new direct claim against the insurers of an automated vehicle (defined us one to be listed as such by the Secretary of State: s. 1). The proposal follows an official consultation in the second half of 2016[21] and agreement on the main contours of the reform from the UK insurance industry, a key stakeholder.[22] After the first attempt to introduce legislation was foiled by the calling of a General Election in 2017 (as noted above), a revised Bill was introduced to the new Parliament and successfully negotiated the legislative process. The ensuing *Automated and Electric Vehicles Act* was given Royal Assent on 19 July 2018.

Basic liability provisions

The key provision is section 2(1), which imposes strict liability on the vehicle insurer for damage the vehicle causes in a self-driving accident:

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[19] Automated and Electric Vehicles Act 2018 (UK), 2018, c 18.

[20] As to the difficulties, see Kenneth S. Abraham and Robert L. Rabin, 'Automated Vehicles and Manufacturer Responsibility for Accidents: A New Legal Regime for a New Era' (2019) 105 Va. L. Rev. 127, 143 f.

[21] Department for Transport/Centre for Connected and Automatous Vehicles, 'Pathway to Driverless Cars: Proposals to support advanced driver assistance systems and automated vehicle technologies '(July 2016), available at https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/536365/driverless-cars-proposals-for-adas-and_avts.pdf; eidem, 'Pathway to driverless cars: Consultation on proposals to support Advanced Driver Assistance Systems and Automated Vehicles. Government Response' (January 2017), available at https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/581577/pathway-to-driverless-cars-consultation-response.pdf.

[22] Association of British Insurers/Thatcham Research, 'Pathway to Driverless Cars: Proposals to support advanced driver assistance systems and automated vehicle technologies. Response of the Association of British Insurers and Thatcham Research' (undated, late 2016).

> Where (a) an accident is caused by an automated vehicle when driving itself..., (b) the vehicle is insured at the time of the accident, and (c) an insured person or any other person suffers damage as a result of the accident, the insurer is liable for that damage.

This may be termed the *primary liability* provided for in the Act. The insurer bears liability for damage suffered by any person, including the insured person, as a result of the accident, provided the vehicle is insured at the time. The vehicle must be 'driving itself' in the sense that 'it is operating in a mode in which it is not being controlled, and does not need to be monitored, by an individual' (s. 8(1)(a)). This requirement makes clear that the liability is intended to apply to vehicles on Levels 4 and 5 of the widely recognised scale, but not those at Level 3. The strictness of the liability is apparent inasmuch as it may arise where neither the owner of the vehicle was at fault nor the vehicle defective, for example, where it is hacked by a third party.[23]

This primary liability is complemented by an *alternative liability* on the vehicle owner. if the vehicle is not insured. Section 2(2) provides:

> Where (a) an accident is caused by an automated vehicle when driving itself..., (b) the vehicle is not insured at the time of the accident […], and (d) a person suffers damage as a result of the accident, the owner of the vehicle is liable for that damage.

This liability is also a strict liability; there is no requirement that either the owner was at fault or that the vehicle or its automated systems were in any way defective. The provision ensures that the victim of an AV accident will still have someone to sue even if the owner has failed to comply with the mandatory insurance requirement.

The scheme thus created means this: if the automated vehicle is insured at the time, the insurer is liable for the damage (s. 2(1)); there is no requirement of fault or even defect. If the automated vehicle is not insured at the time, the owner is liable for the damage (s. 2(2)).

These liabilities are additional to liabilities arising under existing tort law. Section 2(7) preserves the *liability of other persons*:

> The imposition by this section of liability on the insurer or vehicle owner does not affect any other person's liability in respect of the accident.

This would include persons who are 'at fault' (eg the negligent driver of another vehicle or a negligent cyclist or pedestrian) and the manufacturer (for product defects). Other liable persons

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[23] Oliver Jeffcott and Rose Inglis, 'Driverless cars: ethical and legal dilemmas' [2017] Journal or Personal Injury Law 19 at 24.

may be sued either directly by the victim or by the insurer/the owner seeking indemnity in respect of damages they have paid to the injured party. The latter is addressed in section 5(1) of the Act, which preserves the insurer/the owner's right to seek an indemnity from other responsible persons:

> Where (a) s 2 imposes on an insurer, or the owner of a vehicle, liability to a person who has suffered damage as a result of an accident ('the injured party'), and (b) the amount of the insurer's or vehicle owner's liability to the injured party in respect of the accident ... is settled, any other person liable to the injured party in respect of the accident is under the same liability to the insurer or vehicle owner.

The insurer/owner must pay the injured party any excess in the amount recovered from another liable person over the damages paid (s. 5(3)).

Taken in the round, these provisions manifest an intention to protect the injured person from the financial consequences of the damage suffered, while channelling the loss to any person bearing responsibility for it under existing principles of tortious liability.

Putting the risk back on the victim

There are a number of mechanisms in the Act that limit or exclude the liabilities for which it provides, thereby putting the risk of an AV accident back on the person who suffers damage in it.

First, a defence of contributory negligence applies (s. 3(1)), which provides that 'the amount of the liability is subject to whatever reduction under the Law Reform (Contributory Negligence) Act 1945 would apply to a claim in respect of the accident brought by the injured party against a person other than the insurer or vehicle owner.' We are asked to imagine then the application of a reduction in the damages by the same reduction as would have been appropriate if it had been possible to bring the claim against an at-fault driver or an on-defect producer. This presents a difficult logic problem, as the appropriate reduction would depend on (amongst other things) *the degree* of the at-fault driver's negligence – and possibly the degree of the product defectiveness – which cannot be specified if we are talking in the same abstract terms as the statute. This will no doubt prove an interpretative difficulty in the application of the Act.

More stringently, there is a 100% exemption from liability under the Act where the claim is brought by the person in charge of the vehicle at the relevant time and 'the accident… was wholly due to the person's negligence in allowing the vehicle to begin driving itself when it was not appropriate to do so' (s. 3(2)). It is not immediately clear why there should be a total defence

in such circumstances, rather than the proportional reduction in damages appropriate in cases of contributory negligence generally. It must be said that the statutory provision seems rather harsh.

Additionally, it may be noted that the insurer may exclude or limit liability to an insured for prohibited software alterations or the failure to install critical updates (s. 4(1)):

> An insurance policy in respect of an automated vehicle may exclude or limit the insurer's liability under s 2(1) for damage suffered by an insured person arising from an accident occurring as a direct result of (a) software alterations ... that are prohibited under the policy, or (b) a failure to install safety-critical software updates...

This is subject to conditions in the case of an insured person who is not the policy holder. In such case, the exclusion or limitation of liability in relation to software alterations is effective only to alterations which, at the time of the accident, the person knows are prohibited under the policy (s. 4(2)). The Act makes no provision for any policy exclusion or limitation of liability to other persons, who can thus enforce the liability against the insurer even if the accident is caused by prohibited software or the failure to install critical updates. The liability cannot otherwise be limited or excluded by a term of the insurance policy or in any other way (s. 2(6)).

Lastly, there are limits on the damages recoverable under the Act. The Act includes restrictions on the property damage that is included within its definition of 'damage' (s. 1(3)), excluding damage to (a) the AV itself, (b) goods carried for hire or reward in or on the vehicle or a trailer drawn by it, and (c) property in the custody, or under the control, of the insured person (where the insurer is liable) or the person in charge of the automated vehicle (where the owner is liable). The quantum of damages payable in respect of property damage in any one is also limited to the limit of compulsory insurance for property damage (as specified in s. 145(4)(b) of the *Road Traffic Act* 1988).

An obvious concern is that these various limitations on the liabilities created by the Act could result in unfairness in individual cases. Their application will have to be carefully monitored and, if experience proves it necessary, modifications will have to be introduced to avoid disproportionate consequences for victims.

Closing observations

At the conclusion of the Asimov short story referenced at the start of this piece, 'Sally' and the other cars combine to see off the nefarious Mr Gellhorn, who was trying to steal their motors and had already used violence against their keeper, Jake. Gellhorn's body is discovered shortly afterwards, a distance away and covered with tire tracks. Jake begins to wonder whether the cars

can be trusted not to turn against him, notwithstanding his good intentions towards them. He finds he is even beginning to avoid Sally.

The concerns that actually surround the introduction of AVs to our roads are somewhat less sinister. The benefits of AVs are widely trumpeted, especially in reducing accident rates, improving mobility and increasing leisure time. But the story of their development has not been one of unalloyed success and tragic accidents have occurred. To ensure the public is receptive to their presence, it is important that they have reassurance that they will be compensated in the event they suffer damage in an AV accident. Existing liabilities will not suffice as there maybe no 'driver' to sue for negligence, while proving a 'defect' in the vehicle may be too onerous.

The 2018 Act thus creates a regime of strict liability for damage caused by self-driving AVs. To that extent it shifts the loss from the victim and places it on the insurer or (in the absence of insurance) the owner. The liable party has the ability to seek recourse from at-fault persons or an on-defect producer, which preserves the deterrent effect of tort law – such as it is.[24]

Perhaps the most notable thing about liability under the Act is that it is a *strict* liability. This might not seem that remarkable to observers in Continental Europe, where strict liability for road accidents in quite widely recognised,[25] but it is certainly noteworthy in the UK, where strict liability is treated as anomalous. It comes just a few years after the abolition in 2013 of strict liability for workplace injuries,[26] and without any attempt to identify a principled distinction between the two contexts. Further, though the notion of a 'risk community' of road-users, all of whom pose risks to each other, while at the same time benefitting individually from their ability to do so, may provide a justification for a *general* regime of strict liability for road traffic accidents,[27] it is hard to see a principled reason why a strict liability should be introduced that applies only to self-driving – and not to conventionally driven – motor vehicles. As AVs begin to be seen on our roads, it may be questioned whether the public will be satisfied with the lack of a similar strict liability – and thus comparable rights to compensation – for road traffic accidents caused by conventionally driven vehicles. The result may well be political demands for a uniform regime of strict liability applicable to *all* road traffic accidents.

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[24] As to the deterrent effect of tort law, see Don Dewees, David Duff and Michael Trebilcock, *Exploring the Domain of Accident Law: Taking the Facts Seriously* (OUP, 1996).
[25] See Wolfgang Ernst (ed), *The Development of Traffic Liability* (Cambridge University Press, 2010; Ernst Karner, 'A Comparative Analysis of Traffic Accident Systems' (2018) 53 Wake Forest L. Rev. 365.
[26] Enterprise and Regulatory Reform Act 2013, s. 69.
[27] See Koziol, *Basic Questions of Tort Law from a Germanic Perspective*, *supra* note 16 at paras 6/179–6/181.