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Chapter 5

Automated Driving and the Future of Traffic Law

Nynke E. Vellinga

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Abstract Fully automated vehicles that can operate without human interference are getting closer to reality. Fully automated vehicles are expected to offer many benefits, from limiting the need for parking space to increased road traffic safety. Besides all the technical challenges, this development also gives rise to several legal questions. This is not surprising given that most national and international traffic laws are based on the notion that a human driver is behind the wheel. What is the legal consequence of letting the vehicle drive itself? This contribution will focus on the legal challenges automated driving poses for traffic law. Other legal questions will also be touched upon, for instance questions regarding liability and insurance, but the emphasis will lie on questions regarding traffic laws as the answers to those

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questions can influence the answers to the other legal questions. This contribution will discuss if an automated vehicle still has a driver within the meaning of the Geneva Convention on road traffic 1949 and the Vienna Convention on road traffic 1968, that form the base of many national traffic laws across the globe. It will be explored how, if necessary, these Conventions can be revised in order to accommodate automated driving. Inspiration will be drawn from national and international maritime traffic laws and from international aviation traffic law.

Keywords automated driving • traffic law • driver • liability • automated vehicle • law

5.1 Introduction

In March 2018, a woman was killed in a road accident in Tempe, Arizona, United States. She was hit by a vehicle when she crossed the street, walking her bike. In 2017, over 40,000 people were killed in motor vehicle accidents on the roads of the United States.¹ That is over 100 fatalities per day. The death of the woman in Tempe made the headlines. Why? The vehicle that killed her was an automated test vehicle from taxi service Uber. The accident made headlines across the globe as the first fatal accident with a self-driving car. The vehicle was equipped with cameras, radars, software, etc. A human (or ‘safety driver’)² behind the steering wheel should take over in case hard- or software were failing. However, apparently neither the driver nor the vehicle itself braked for the woman crossing the road in Tempe.³ This terrible event caused the discussion on the safety of automated vehicles to flare up. It brought various legal questions concerning automated driving to the attention of the general public. Not only the question who was liable in case of an accident caused by an automated vehicle⁴ got attention, but also the conditions under which automated vehicles are allowed on public roads⁵ and the technical requirements a

¹ National Safety Council (2017) Estimates Show Vehicle Fatalities Topped 40,000 for Second Straight Year. www.nsc.org/road-safety/safety-topics/fatality-estimates. Last accessed 14 August 2018.

² Hull et al. (2018) Hyperdrive. Uber Crash Highlights Odd Job: Autonomous Vehicle Safety Driver. www.bloomberg.com/news/articles/2018-03-23/uber-crash-highlights-odd-job-autonomous-vehicle-safety-driver. Last accessed 14 August 2018.

³ Hawkins AJ (2018) Uber’s self-driving car showed no signs of slowing before fatal crash, police say. www.theverge.com/2018/3/19/17140936/uber-self-driving-crash-death-homeless-arizona. Last accessed 14 August 2018.

⁴ The relatives of the victim in the accident in Tempe settled with UBER: Reuters (2018) Uber settles with family of woman killed by self-driving car. www.theguardian.com/technology/2018/mar/29/uber-settles-with-family-of-woman-killed-by-self-driving-car?CMP=Share_iOSApp_Other. Last accessed 14 August 2018.

⁵ The State of Arizona regulated barely anything at the time of the accident.

vehicle needs to meet got more attention. This contribution aims to give an analysis of some of these legal challenges on the road ahead. After discussing technical regulations and liability issues, the challenges around traffic laws will be explored more in-depth. In discussing a new approach to road traffic laws, inspiration will be drawn from international maritime and aviation traffic law.

5.2 Current Developments

Although technical developments are moving along fast, there is not yet a fully automated vehicle, that drives itself from A to B without human interference, on the public roads today. Most vehicles on public roads today will not be scored higher than the so-called Level 2. Level 2 means that the vehicle is under specific circumstances able to control the longitudinal and lateral motions of the vehicle, but it needs a human driver to supervise the vehicle and to act when necessary.⁶ This Level 2, and other levels of automation, are formulated by the SAE International.⁷ The Levels range from Level 0 (no automation) to Level 5 (full automation). This contribution will focus on Level 5 vehicles, which are vehicles able to operate without human supervision under all circumstances, and Level 4 vehicles during the period of the trip that they drive completely independent from humans.⁸ The moment where Level 4 vehicles need a human to drive, for instance in complex situations, will not be discussed given the brevity of the contribution. Terms like automated vehicle, autonomous vehicle, self-driving car are used by media to describe a vehicle that can drive itself without human interference for an entire trip. In this contribution, only the term ‘automated vehicle’ is used to describe Level 5 and Level 4 vehicles where the vehicle is operating on its own, without human interference.

At the moment, tests with automated vehicles are taking place on public roads across the globe. The test vehicles of Waymo, a Google company, have driven over 8 million miles on US roads,⁹ whilst Volvo is engaging the public in a self-driving vehicle project on the streets of Gothenburg.¹⁰ In several U.S. States regulation concerning the testing of automated vehicles is already in place.¹¹ The German legislator clarified the

⁶ SAE 2018.

⁷ SAE 2018.

⁸ SAE 2018.

⁹ On the road. www.waymo.com/ontheroad/. Last accessed 14 August 2018.

¹⁰ Volvo Drive me. www.volvocars.com/intl/buy/explore/intellisafe/autonomous-driving/drive-me. Last accessed 14 August 2018.

¹¹ See for instance National Conference of State Legislatures: Autonomous Vehicles, Self-driving vehicles enacted legislation. www.ncsl.org/research/transportation/autonomous-vehicles-self-driving-vehicles-enacted-legislation.aspx (last accessed 14 August 2018) for an overview.

Straßenverkehrsgesetz,¹² and the Dutch parliament is currently reviewing a proposal to allow testing of automated vehicles on public roads without a driver inside of the vehicle.¹³ Many governments are stimulating the development of automated driving technologies, as it is expected that automated vehicles will contribute significantly to road safety by eliminating human error. Currently, human error is the cause of around 90% of motor vehicle accidents.¹⁴ Automated vehicles could help battle congestion, improve the mobility of people currently unable to drive, etc.¹⁵ Before automated vehicles will become available to the general public, several legal challenges will have to be overcome.

5.3 Technical Regulations

Automated vehicles will not just pop up on the public roads without any sort of safety checks. These vehicles will have to be approved by a vehicle authority, just like a conventional vehicle. Within the European Union, the approval given by the approval authority of one Member State, is recognized in the other Member States. This approval can be issued to a single vehicle, but a type of vehicle can also be approved.¹⁶ The approval authority has the task of approving vehicles before the vehicles are allowed on public roads. A vehicle is approved when it satisfies several technical regulations, amongst others regulations issued by the United Nations Economic Commission for Europe.¹⁷ These regulatory acts include rules on sound levels, emissions, seat strength, lamps, braking, steering equipment, and so on.¹⁸ See for example UNECE Regulation No. 79, 5.4.1.1.:

“Any fault which impairs the steering function and is not mechanical in nature must be signalled clearly to the driver of the vehicle.(...)”

¹² It is now under specific conditions allowed to use highly or fully automated driving functions (“hoch- und vollautomatisierte Fahrfunktion”), see § 1a, § 1b Straßenverkehrsgesetz. See also (2017) Straßenverkehrsgesetz für automatisiertes Fahren geändert. www.bundestag.de/dokumente/textarchiv/2017/kw13-de-automatisiertes-fahren/499928. Last accessed 14 August 2018.

¹³ *Kamerstukken II* 2017/18, 34838. See <http://www.zoek.officielebekendmakingen.nl/dossier/34838> (Accessed 14 August 2018) for the latest developments.

¹⁴ NHTSA, Traffic Safety Facts, February 2015. See also Smith 2013.

¹⁵ See for instance (2018) Self-driving cars offer huge benefits—but have a dark side. Policymakers must apply the lessons of the horseless carriage to the driverless car. www.economist.com/news/leaders/21737501-policy-makers-must-apply-lessons-horseless-carriage-driverless-car-self-driving. Last accessed 14 August 2018.

¹⁶ Article 6ff, Directive 2007/46/EC.

¹⁷ See Articles 4, 34–35 and Annex IV of Directive 2007/46/EC, The EU is a Contracting Party to the UNECE Revised 1958 Geneva Agreement by virtue of council decision 97/836/EC or subsequent council decisions.

¹⁸ UNECE World Forum for Harmonization of Vehicle Regulations (WP.29) is responsible for developing and updating these regulations. www.unece.org/trans/main/wp29/introduction.html. Last accessed 14 August 2018.

As the example illustrates, in technical provisions reference can be made to the notion of ‘driver’. At the moment, the driver within the meaning of these regulations is the conventional driver, with his hands on the steering wheel and his feet on the pedals. However, an automated vehicle does not have a conventional driver. How can these technical provisions nevertheless accommodate automated driving? A novel interpretation of the notion of ‘driver’ in this context could provide a solution. This approach is taken by the United States National Highway Traffic Safety Administration (NHTSA) regarding some Federal Motor Vehicle Safety Standards (FMVSS).¹⁹ For instance, for the purpose of FMVSS no. 101 Section 5.1.1, the NHTSA interprets the self-driving system of the vehicle as the driver.²⁰ FMVSS no. 101 Section 5.1.1 states:

“The controls listed in Table 1 and in Table 2 must be located so they are operable by the driver under the conditions of S5.6.2”

Tables 1 and 2 list different controls and telltales, such as turn signals, brake system malfunction and the horn. NHTSA states that “If no human occupant of the vehicle can actually drive the vehicle, it is more reasonable to identify the “driver” as whatever (as opposed to whoever) is doing the driving.”²¹ This approach can also be used regarding the UN regulations and other technical provisions. However, some technical regulations might need to be rewritten as they might not be suitable for the described interpretation. Besides the need to rewrite provisions, the rise of automated vehicles will also give rise to new technical regulations; for instance, regarding the sensors and cameras an automated vehicle needs to be equipped with.

Technical regulations could also reflect the outcome of the debate on ethical issues concerning automated driving.²² The outcome of the highly debated ‘trolley problem’ (if a fatal accident is unavoidable, who should the vehicle protect/kill?) can be translated into technical requirements. For instance, it can be required that a vehicle is programmed in such a way that it, in an unavoidable accident, does not favor one road-user over the other, but tries to limit the number of victims and severity of the injuries.

5.4 Civil Liability

A question that is often raised by media is one concerning civil liability: if an automated vehicle causes an accident, who will pay the damages? This question needs, just like the questions regarding technical regulations discussed in the last section, answering before automated vehicles become available to the general

¹⁹ The United States do not use a system of type-approval. Instead, manufacturers have to self-certify the compliance of their vehicles with the FMVSS.

²⁰ Letter from NHTSA to Chris Urmson 2016.

²¹ Letter from NHTSA to Chris Urmson 2016.

²² See on ethical dilemma’s concerning automated driving: Ethik-Kommission automatisiertes und vernetztes Fahren 2017.

public. After all, the outcome of this liability question will be the deciding factor regarding who needs to be insured against damage caused by the automated vehicle. The liability question is in turn influenced by traffic laws, by whether or not a traffic rule has been violated, as will be discussed in the next section.

Automated vehicles come with new risks, such as the risk of hacking or the risk of a software failure. An in-depth study of the liability issues concerning automated driving goes beyond the scope of this contribution. In this chapter the position of some, not all, stakeholders that could face liability claims is discussed only briefly with the aim to provide a short insight into the questions surrounding liability for damage caused by automated vehicles. It is important to note that the answer to the question who is liable for damage caused by an automated vehicle very much depends on national law.

The user of the vehicle—the person dispatching the vehicle and determining its destination—will likely not be liable when the automated vehicle is involved in an accident. After all, the user has barely any influence on the behavior of the vehicle. Nevertheless, the user might still be held liable in case a risk-based liability regime applies or when the user was at fault because, for instance, he ignored certain warnings given by the vehicle.²³

There might also be circumstances under which the owner or keeper of the vehicle is liable for the damage caused by the automated vehicle.²⁴ Depending on national legislation, the owner can be liable for damage caused by the automated vehicle if he omitted to install an update that could have prevented the accident.

However, it is likely that there will be a shift away from traffic liability to product liability once automated vehicles are a normal sighting on the public roads.²⁵ It is likely that most accidents with automated vehicles are not caused by human error but by the hardware and software of the vehicle, for instance a malfunctioning sensor or a fault in the software. The liability of the manufacturer for a defective product is, within the European Union, governed by the Product Liability Directive of 1985 (Directive 85/374/EEC).²⁶ The manufacturer of the automated vehicle, or parts of the vehicle (see Article 5 Product Liability Directive) can be liable for the damage caused by the automated vehicle if the automated vehicle is considered to be a defective product (Article 6 Product Liability Directive). If the damage was caused by the software, the question rises if software is a ‘product’ within the meaning of the Directive. In literature, there seems to be a tendency to answer this question with ‘yes’.²⁷ The manufacturer can avert liability if he successfully invokes one of the defenses of Article 7 Product Liability Directive. In the context of developing such a novel product as automated vehicles, the most important defense is likely to be the so-called development risk defense: the manufacturer is not liable if “the state of scientific and technical knowledge at the

²³ Marchant and Lindor 2012.

²⁴ Schrader 2016; Engelhard 2017; Schellekens 2015.

²⁵ Engelhard and De Bruin 2017; Marchant and Lindor 2012.

²⁶ Van Dam 2013; Tjong Tjin Tai and Boesten 2016.

²⁷ Reese 1994; De Schrijver and Maes 2010; Engelhard 2017.

time when he put the product into circulation was not such as to enable the existence of the defect to be discovered” (Article 7(c) Product Liability Directive). Under specific circumstances, other stakeholders might be liable (for instance the road authority for a fault in the road infrastructure).²⁸ Besides the discussion on liability, there is also discussion on the role insurance plays in an automated future.²⁹

5.5 Traffic Laws

A topic that perhaps does not get as much attention in the media as the liability questions but is nevertheless a very important topic is traffic laws and automated vehicles. At first glance this might seem a matter of national law as road traffic regulation is often national law. However, a large number of national traffic laws are based on two international conventions: the Geneva Convention on road traffic of 1949 (hereinafter: Geneva Convention) and the Vienna Convention on road traffic of 1968 (hereinafter: Vienna Convention).³⁰ The aim of the Conventions is to facilitate international traffic and to increase road safety.³¹ As automated vehicles are expected to have a positive effect on road safety, the new technology fits within the aim of the Conventions to increase road safety. The Conventions are of great importance worldwide: the Geneva Convention has 96 parties, the Vienna Convention has 74 Contracting Parties (some of which are also party to the Geneva Convention). These countries range from Australia (party to the Geneva Convention), Chile (party to both Conventions), Germany (Vienna Convention), India (Geneva Convention), Kazakhstan (Vienna Convention), the Netherlands (Geneva Convention and Vienna Convention), Ukraine (Vienna Convention), United States (Geneva Convention), to Zimbabwe (Geneva Convention and Vienna Convention). All these Contracting Parties need to bring their national laws in conformity with the Convention to which they are party to (Article 1 Geneva Convention, Article 3 Vienna Convention). The Global Forum for Road Safety of the UNECE, or Working Party 1 (hereinafter WP.1), is responsible for, among others, keeping both the Geneva Convention and the Vienna Convention up to date. Currently, WP.1 is debating on how to revise the Conventions in order to accommodate automated driving.³² This contribution aims to provide insights in the

²⁸ Van Dam 2013.

²⁹ Vellinga 2017; Schellekens 2015; Van Wees 2016; Verbond van Verzekeraars Toekomstvisie Automotive. Onderweg naar morgen www.verzekeraars.nl/media/4684/onderweg-naar-morgen.pdf. Accessed 14 August 2018.

³⁰ The Vienna Convention was the answer to a growing demand for greater uniformity of national regulations than under the Geneva Convention (Attachment email Robert Nowak, United Nations, to author, 1 June 2017).

³¹ Preamble Geneva Convention, preamble Vienna Convention.

³² The testing of automated vehicles on public roads is allowed under the Geneva Convention and the Vienna Convention.

bottlenecks regarding the Conventions and automated driving and will offer a novel solution by taking inspiration from maritime and aviation traffic laws.

5.5.1 Rules of the Road

Both Conventions have a chapter on rules of the road (Chapter II of both Conventions). These traffic rules cover, among others, overtaking (Article 11 Geneva Convention, Article 11 Vienna Convention), giving way (Article 12 Geneva Convention, Article 18 Vienna Convention), and distracted driving (Article 8 para 6 Vienna Convention). The notion of ‘driver’ plays an important part in these rules of the road, as the traffic rules are often directed at the ‘driver’. The notion of ‘driver’ is such a central concept in the Conventions, the Conventions even state that that every (moving) vehicle should have a driver (Article 8 para 1 Geneva Convention, Article 8 para 1 Vienna Convention). An automated vehicle is a vehicle within the meaning of the Conventions (Article 4 para 1 Geneva Convention, Article 1(p) Vienna Convention), so an automated vehicle also needs to have a driver to comply with the Conventions. But does it actually have a driver within the meaning of the Conventions?

5.5.2 The Notion of ‘Driver’

The Geneva Convention and the Vienna Convention provide similar definitions of the notion of ‘driver’:

“Article 4 para 1 Geneva Convention: ““Driver” means any person who drives a vehicle, including cycles, or guides draught, pack or saddle animals or herds or flocks on a road, or who is in actual physical control of the same,(...).””

“Article 1(v) Vienna Convention: ““Driver” means any person who drives a motor vehicle or other vehicle (including a cycle), or who guides cattle, singly or in herds, or flocks, or draught, pack or saddle animals on a road;(...).””

So, a driver is a person who drives a vehicle. In this context, and given the current stand of the discussion, this ‘person’ is a human, not a legal person.³³ This is no surprise given that the Conventions were drafted in a time when vehicles without a human behind the wheel seemed almost impossible. It would have been self-evident a vehicle has a human driver.

³³ United Nations Conference on Road and Motor Transport, Committee III on Road Traffic, Summary Record of the Seventeenth Meeting, held at the Palais des Nations, Geneva, on Tuesday, 6 September 1949 at 3 p.m., E/CONF.8/C.III/SR.17/Rev.1, 21 November 1949, p. 2; Vellinga et al. 2016; Lutz 2014; Smith 2014.

The Geneva Convention and the Vienna Convention do not provide more insights into what it entails to ‘drive’. In the case law of the Contracting Parties, however, the meaning of ‘driving’ is discussed. The case law of the Contracting Parties can therefore shine some light on what it entails to be ‘driving’ a vehicle.

In this contribution, the case law of Germany (party to the Vienna Convention) and the Netherlands (party to both Conventions) will be discussed.³⁴ In the case law of both countries, what it entails to ‘drive’ has been explained. The interpretation of ‘driving’ is often discussed in relation with the interpretation of ‘driver’ (German: *Fahrzeugführer*, Dutch: *bestuurder*).

Given German case law, the driver of a vehicle is the person “wer das Fahrzeug in Bewegung zu setzen beginnt, es in Bewegung hält oder allgemein mit dem Betrieb des Fahrzeugs oder mit der Bewältigung von Verkehrsvorgängen beschäftigt ist. Bringt ein Kraftfahrer sein Fahrzeug nicht verkehrsbedingt zum Stehen, bleibt er solange Führer des Kraftfahrzeugs, wie er sich noch im Fahrzeug aufhält und mit dessen Betrieb oder mit der Bewältigung von Verkehrsvorgängen beschäftigt ist. Dies ist regelmäßig erst dann nicht mehr der Fall, wenn er sein Fahrzeug zum Halten gebracht und den Motor ausgestellt hat”.³⁵ This means that the person who sits behind the wheel while a car is being pushed, unconditionally following the orders given by the person who pushes the car, is not a driver within the meaning of German law.³⁶

A different interpretation of the notion of ‘driver’ has developed in the Netherlands. According to Dutch case law, a person is regarded the driver if he influences the direction and/or speed of the vehicle by operating the controls.³⁷ The person pulling the hand brake whilst sitting in the passenger seat,³⁸ the person walking next to the car while using the steering wheel,³⁹ the person steering the vehicle while it is being towed⁴⁰; they are all driver of the vehicle.

³⁴ See also N.E. Vellinga (forthcoming) Self-driving vehicles: preparing road traffic law for a driverless future, Conference Proceedings ITS World Congress Copenhagen, 17–21 September 2018.

³⁵ Freely translated: (...) who starts to set the vehicle in motion, who keeps the vehicle moving or who is generally occupied with the operation of the vehicle or with the handling of traffic operations. If a driver does not bring his vehicle to a halt due to traffic conditions, he remains the driver of the motor vehicle so long as he is still in the vehicle and occupied with the operation of the vehicle or with the handling of traffic operations. This is usually no longer the case if he has stopped the vehicle and turned off the engine. Bundesgerichtshof (BGH)4 StR 592/16, 27 April 2017, ECLI:DE:BGH:2017:270417U4STR592.16.0.

³⁶ BGH 22.03.1977, VI ZR 80/75.

³⁷ Hoge Raad (HR) 13 August 2005, ECLI:NL:HR:2005:AT7292, NJ 2005/542.

³⁸ HR 13 August 2005, ECLI:NL:HR:2005:AT7292, NJ 2005/542.

³⁹ HR 12 June 1990, ECLI:NL:HR:1990:ZC8550, NJ 1991/29, VR 1990/158; HR 23 February 1999, ECLI:NL:HR:1999:ZD348, VR 2000/81.

⁴⁰ HR 2 February 1965, ECLI:NL:HR:1965:AB3467, NJ 1965/281; HR 26 January 1971, ECLI:NL:HR:AB5997, NJ 1971/208; HR 1 December 1987, ECLI:NL:HR:1987:AB7814, NJ 1988/689; HR 2 October 1990, ECLI:NL:HR:1990:ZC8593, NJ 1991/380.

Even though the definitions of ‘driver’ and ‘driving’ given in the case law of the discussed Contracting Parties differ, they do have some elements in common. It can be said that the driver decides on the direction and speed (lateral and longitudinal movements) of the vehicle by operating at least some controls. The decisions of the driver have an immediate effect: if he decides to brake and pushes the brake pedal down, the vehicle will immediately slow down.

Summarizing, the driver, within the meaning of the Conventions, is a human who decides on the speed and direction of the vehicle by operating at least some of the vehicle’s controls. What does this mean for automated driving? Does an automated vehicle (Level 5 or Level 4 during the period where the vehicle operates without human interference) have a driver within the meaning of the Geneva Convention and the Vienna Convention?

5.5.3 *The Driver of an Automated Vehicle*

If one thinks of automated vehicles, a couple of potential ‘drivers’ can spring to mind: the user—the human who provides the destination and who dispatches the vehicle—the manufacturer, the self-driving system of the vehicle. After all, the self-driving system⁴¹—the combination of hard- and software—makes decisions regarding longitudinal and lateral movements. The manufacturer has great influence on this via the hardware and software it equips the vehicle with. Given the interpretation of the notion of ‘driver’, both the manufacturer and the self-driving system are nevertheless not the driver of the automated vehicle as they are both not human. The user of the vehicle, however, is human. Is s/he perhaps the ‘driver’ of the vehicle, within the meaning of the Conventions? On the one hand, the user does have some influence on the driving behaviour by setting its destination, dispatching the vehicle, and perhaps by adjusting certain settings (for example, there might be a setting for how much distance the automated vehicle should keep from the vehicle driving in front of it). On the other hand, the user does not decide on swerving, overtaking, accelerating, braking, etc., and he does not operate the controls during the trip. Therefore, the actions of the user do not amount to ‘driving’.⁴² So neither the user, the manufacturer or the self-driving system is the ‘driver’ of an automated vehicle within the meaning of the Geneva Convention and the Vienna Convention. From a legal perspective, an automated vehicle is truly driverless. Given the importance of the notion of ‘driver’ in the Geneva Convention and the Vienna

⁴¹ See also UNECE Global Forum for Road Traffic Safety 2017. See on the discussion on legal personhood for robots: European Parliament resolution of 16 February 2017 with recommendations to the Commission on Civil Law Rules on Robotics (2015/2103(INL)); (2018) Open letter to the European Commission, Artificial intelligence and robotics <https://g8fip1kplyr33r3krz5b97d1-wpengine.netdna-ssl.com/wp-content/uploads/2018/04/RoboticsOpenLetter.pdf>. Last accessed 14 August 2018; Hartlief 2018.

⁴² See also Von Bodungen and Hoffmann 2016.

Convention, this means that automated driving is incompatible with the Conventions. This gives rise to the question how the Conventions can be revised in order to accommodate automated driving.

5.5.4 *Automation and Traffic Laws*

In order to accommodate automated driving, the Geneva Convention and the Vienna Convention need revision. Road traffic is not the only mode of transport facing automation. Maritime traffic and aviation have been familiar with automation longer: both modes are familiar with the use of an autopilot. Although these autopilots are perhaps not as advanced as Level 4 and Level 5 vehicles,⁴³ the laws on maritime and air traffic could nevertheless provide insights into how to accommodate new levels of automation in traffic law.

Both maritime traffic and air traffic are, to some extent, regulated at an international level. Take for instance the United Nations International Regulations for Preventing Collisions at Sea of 1972 (COLREGS 1972)—a time in which some form of automation of the steering task was not unfamiliar in sailing—and Annex 2 of the Convention on International Civil Aviation (Chicago Convention), that entail traffic rules for traffic at sea (COLREGS 1972) and in the air (Annex 2 Chicago Convention).

The COLREGS 1972 and Annex 2 Chicago Convention both provide rules on how to deal with a head-on situation:

“Rule 14 COLREGS 1972: “(...) When two power-driven vessels are meeting on reciprocal or nearly reciprocal courses so as to involve risk of collision, each shall alter her course to starboard so that each shall pass on the port side of the other.(...)”

“3.2.2.2 Annex 2 Chicago Convention: “(...) When two aircraft are approaching head-on or approximately so and there is danger of collision, each shall alter its heading to the right.”

These traffic rules are directed at the vehicle, not at a human who might have access to the controls. Who or what alters the course of the vessel or aircraft—the master of the ship, the helmsman, the pilot-in-command, the autopilot—is irrelevant.⁴⁴ As long as the ship or aircraft alters its course in the right direction, it is obeying the law.

The COLREGS 1972 put the responsibility for the operation of the vessel with, among others, the master of the ship and the crew:

“Rule 2 a COLREGS 1972: “Nothing in these Rules shall exonerate any vessel, or the owner, master or crew thereof, from the consequences of any neglect to comply with these

⁴³ For instance, the autopilot on board of a ship needs to be regularly checked by a crew member, see the International Convention on Standards of Training, Certification and Watchkeeping for Seafarers.

⁴⁴ Cockcroft and Lameijer 2012.

Rules or of the neglect of any precaution which may be required by the ordinary practice of seamen, or by the special circumstances of the case.””

The responsibility for the operation of an aircraft lies with the pilot-in-command:

“2.3.1 Annex 2 Chicago Convention: “The pilot-in-command of an aircraft shall, whether manipulating the controls or not, be responsible for the operation of the aircraft in accordance with the rules of the air, except that the pilot-in-command may depart from these rules in circumstances that render such departure absolutely necessary in the interests of safety.””

So, the owner of the ship, the master of the ship and the crew or the pilot-in-command can be held responsible if a vessel or an aircraft does not alter its course in a head-on situation. As is clearly stated in 2.3.1 Annex 2 Chicago Convention, it is not relevant if this person was operating the controls.

This approach—directing behavioural rules at the vehicle and assign responsibility to a person—establishes a distinction between who or what operates the vehicle and who is responsible for that operation. The approach can be used as a blueprint for revising the Geneva Convention and the Vienna Convention. It would open up the possibility of automated driving, where the self-driving system ‘drives’ the vehicle while a human remains responsible for the operation of the vehicle.

5.5.5 *Adopting a New Approach*

As discussed above, the Geneva Convention and the Vienna Convention will need revision in order to accommodate automated driving. The approach from maritime and aviation traffic law can serve as a blueprint for this revision. In order to achieve the same system and distinction between who or what operates the vehicle and who is responsible for the operation, three steps will need to be taken.

First, the provisions stating that every vehicle should have a driver (Article 8 para 1 Geneva Convention, Article 8 para 1 Vienna Convention) need to be deleted from the Conventions. This is needed in order to accommodate vehicles with a high degree of automation, the vehicles that do not have a driver within the meaning of the Conventions.

The next step is to take the notion of ‘driver’ out of the rules of the road. Currently, the notion of ‘driver’ is omnipresent in the Conventions. This needs to change to accommodate automated driving. If traffic rules are no longer directed at the driver but at the vehicle, following the example from the COLREGS 1972 and Annex 2 Chicago Convention, it becomes irrelevant whether a vehicle is driven by a system, a human, or something else. Even though the notion of ‘driver’ is, as pointed out above, omnipresent in the Conventions, this approach does not come out of the blue: the Vienna Convention already knows a traffic rule directed at the vehicle instead of the driver. Article 11 para 9 Vienna Convention states:

“A vehicle shall not overtake another vehicle which is approaching a pedestrian crossing marked on the carriageway or sign-posted as such, or which is stopped immediately before

the crossing, otherwise than at a speed low enough to enable it to stop immediately if a pedestrian is on the crossing. (...)”

This provision shows that the new approach discussed in this contribution is not entirely unfamiliar to the Vienna Convention.

A significant number of provisions from the Geneva Convention and the Vienna Convention will need revision, but some provisions—like Article 11 para 9 Vienna Convention—can stay as they are. Most of the provisions that do need to change are provisions specifically written with a human in mind. Take for example Article 8 para 3 Vienna Convention:

“Every driver shall possess the necessary physical and mental ability and be in a fit physical and mental condition to drive.”

This provision is clearly written for a human. It serves no purpose to change this provision. Another example of a provision that does not need revision is Article 7 para 5 Vienna Convention on the wearing of safety belts. Apart from the actual feasibility, it does not serve any purpose to require a vehicle to wear a safety belt. It is, however, important to remain required for conventional drivers and passengers to wear safety belts as it increases their safety.⁴⁵ This provision can therefore be left unchanged.

The final step in adjusting the Conventions according to the new approach is to assign responsibility for the operation of the vehicle to a (legal) person. This establishes the distinction between who or what operates the vehicle and who is responsible for the operation. If the vehicle is driven by a human—which is the case with conventional vehicles and automated vehicles with the self-driving system switched off—the person operating the vehicle and the person responsible for the operation are one and the same person: the human driver. When there is no (human) driver, as is the case with an automated vehicle, the vehicle might be operated by the self-driving system. The system decides on making a turn, overtaking another vehicle, stopping for the red traffic light, etc. The responsibility for the operation, however, has to rest with a person. A reason for assigning responsibility to a person could be the influence he can exercise over the operation of the vehicle, just like the pilot-in-command and the master of a ship have a high degree of influence over the operation of their aircraft or vessel. Another option is to assign responsibility to multiple persons, following the example of rule 2 a COLREGS 1972 which assigns responsibility to the owner, master or crew of the vessel. The assigning of responsibility can have consequences beyond traffic law. Depending on national law, violation of traffic laws can expose the person responsible for the vehicle’s operation to criminal liability. This person might also face a claim for damages if the vehicle violated a traffic rule and, as a consequence, caused damage to another party. These consequences should not be disregarded. With whom this responsibility lies—the user of the vehicle, the manufacturer, the software programmer, the owner, etc.—is ultimately a policy matter.

⁴⁵ World Health Organization 2004.

5.6 Final Remarks

To turn the discussed approach into reality, a substantial overhaul of the Geneva Convention and the Vienna Convention is necessary. As discussed, the traffic rules should be directed at the vehicle instead of the driver. This requires Article 8 para 1 Geneva Convention and Article 8 para 1 Vienna Convention to be deleted and it requires amendments to a significant number of traffic rules. It will also be necessary to adopt a new provision on the responsibility for the operation of the vehicle. Amending the Conventions, especially the Geneva Convention, can be a time-consuming and challenging process (Article 31 Geneva Convention, Article 49 Vienna Convention). If amending the Conventions is deemed too complex or politically not feasible, a new convention can be drafted using the discussed approach.

Either way, the discussed approach would accommodate traffic of all levels of automation. Whether your vehicle is a conventional vehicle, a vehicle with several advanced driver assistance systems, an old-timer, or a fully automated vehicle, all vehicles must obey the same traffic rules from national laws based on the revised Conventions. This avoids discrepancies and provides legal certainty: an automated vehicle does not need a software update with new traffic rules before crossing the border to another country whilst the same person remains responsible for the operation of the vehicle. The approach offers a novel solution for the absence of a 'driver' in an automated vehicle whilst still accommodating conventional driving in conventional vehicles.

Although automated vehicles are already being tested on public roads across the globe, it will take a number of years, if not decades, before automated vehicles will become available for consumers. Until then, multiple legal questions need to be answered. This contribution has provided a novel solution for one of the main legal issues that needs to be solved. By taking a new approach inspired on maritime and aviation traffic laws, the Geneva Convention on road traffic and the Vienna Convention on road traffic can be revised in such a way that both Conventions accommodate traffic of all levels of automation. This is a first step in removing legal barriers for automated driving. More discussion on the legal issues concerning automated driving is paramount to provide solid solutions for the driverless future.

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