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June 18, 2018

The Honorable Raymond P. Martinez
Administrator
Federal Motor Carrier Safety Administration
1200 New Jersey Avenue SE
Washington, DC 20590

Re: Request for Comments Concerning Federal Motor Carrier Safety Regulations (FMCSRs) Which May Be a Barrier to the Safe Testing and Deployment of Automated Driving Systems-Equipped Commercial Motor Vehicles on Public Roads, Docket No. FMCSA-2018-0037

Dear Administrator Martinez,

Waymo respectfully submits the comments below in response to the Request for Comments (RFC) referenced above. We welcome the opportunity to offer feedback on actions the Federal Motor Carrier Safety Administration (FMCSA) can take to clarify how the existing Federal Motor Carrier Safety Regulations (FMCSRs) provide a framework for fully autonomous (i.e., SAE Level 4 or higher)[1] commercial motor vehicles (CMVs) to be safely and responsibly tested and commercially deployed in the United States.

Today, the United States urgently needs to take steps to improve road safety for large trucks. The U.S. Department of Transportation (DOT) has reported that in 2016, there were 722 large truck occupant fatalities in the U.S., a nine percent increase over the prior year. The number of injury crashes involving large trucks or buses has also risen sharply, from a low of 60,000 in 2009, to an estimated 119,000 injury crashes in 2016. That amounts to a more than 98 percent increase of injury crashes for large trucks and buses.[2] Distracted driving and driver fatigue are major factors contributing to more than 475,000 large truck crashes every year, according to the U.S. Department of Transportation. Waymo believes fully autonomous vehicles, including CMVs, offer significant potential to improve road safety and play a role in reversing some of these worrying trends.

Waymo knows that fully autonomous vehicles will change the transportation industry, creating new jobs while reducing the need for others. But we also believe that self-driving technology can help strengthen the trucking sector, which is one of the most important engines of our

[1] As described by SAE International Recommended Practice J3016 ("SAE J3016"), and which National Highway Traffic Safety Administration has incorporated by reference in *Automated Driving Systems 2.0: A Vision for Safety*.
[2] FMCSA, *Large Truck and Bus Crash Facts 2016*, https://www.fmcsa.dot.gov/safety/data-and-statistics/large-truck-and-bus-crash-facts-2016.

economy. For instance, fully autonomous CMVs can make the transport of goods more efficient and more affordable, stimulating demand for more trucking. There is also a shortfall of 50,000 drivers in the U.S. trucking industry today, a gap that is projected to reach 174,000 by 2026. Self-driving technology could help narrow that gap.

To usher in these benefits, Waymo believes the existing FMCSRs can be interpreted by FMCSA to accommodate the safe and timely integration of fully autonomous CMVs onto U.S. roadways. We encourage FMCSA to use interpretive guidance to remove any regulatory barriers to the safe testing and commercial deployment of these vehicles on public roads.

If interpretive guidance cannot resolve all such barriers, the Agency's waiver, exemption, and pilot program authority is well-suited to address safety issues for fully autonomous CMVs. Such tools provide FMCSA with ample flexibility to ensure safety while it gathers real-world information about how fully autonomous CMVs operate safely and are expected to be used in the marketplace. These learnings could be used by the Agency to inform possible rulemaking activities in the future.

I. Introduction to Waymo and Background on Fully Autonomous CMVs

Improving road safety is at the heart of Waymo's mission and culture, and it informs every decision our company makes. Indeed, building technology that could help reduce traffic fatalities is what motivated the start of our development in 2009, when we were founded as the Google Self-Driving Car Project. Since then, we have spent nearly a decade on R&D to build technology that can live up to the promise of saving lives. Today, our vehicles are put through an extensive safety and testing program, including learning to safely navigate the most common types of pre-crash scenarios. In addition, we have self-driven over seven million miles across more than 25 U.S. cities, and simulated more than 5 billion miles of self-driving in our virtual world.

While Waymo's focus has mostly been on making it safe and easy for *people* to move around, we have increasingly turned our attention to moving *things* as well. Last year, Waymo began testing our Level 4 self-driving system in Class 8 trucks in Arizona and California, always with a fully trained driver behind the wheel. We extended that testing to Atlanta earlier this year for a pilot program with Google, moving goods for their data centers. The Level 4 self-driving system we are developing for Waymo's Class 8 trucks is built from the same technology that is in our driverless light-duty vehicles.

Geographic limitations are one essential part of the operational design domain (ODD) for any Level 4 vehicle. The geofenced territory of a particular system's ODD may span highways, surface streets, or both within a single city, throughout a state, or between many states. In order for a CMV equipped with a Level 4 automated driving system (ADS) to continue its trip beyond the geofenced ODD, a human driver would have to disengage the ADS and take over the driving, subject to all of FMCSA's existing requirements for drivers. We have described how a vehicle equipped with our Level 4 ADS operates within its ODD in the Waymo Safety Report,[3] which we submitted to the National Highway Traffic Safety Administration (NHTSA) to describe how our vehicles conform to the federal AV guidance.

[3] *Waymo Safety Report* (2017), https://waymo.com/safetyreport/.

II. The FMCSRs Do Not Require a Human Driver

In the RFC, FMCSA asked "whether the FMCSRs, under certain conditions, could be read to require, or not require, the presence of a trained commercial driver in the driver's seat." The Agency notes that DOT's September 2017 guidance, *Automated Driving Systems 2.0: A Vision for Safety,* stated that FMCSA believes its regulations require that "a trained commercial driver must be behind the wheel at all times, regardless of any automated driving technologies available on the CMV, unless a petition for a waiver or exemption has been granted." However, the RFC shows the Agency's readiness to read the FMCSRs differently:

> *[T]he Agency is reconsidering its views on this matter. The absence of specific regulatory text requiring a driver be behind the wheel may afford the Agency the flexibility to allow, under existing regulations, ADS to perform the driver's functions in the operational design domain in which the system would be relied upon, without the presence of a trained commercial driver in the driver's seat.*

The Volpe report analyzing the FMCSRs speaks to this issue, stating (at p. 7) that "the FMCSRs do not appear to contain an explicit requirement that CMVs be operated by a human driver, but instead present requirements that apply to human drivers." Based on our own reading of the FMCSRs, we agree with Volpe that there is no explicit requirement that a driver must be present in a CMV. And, like Volpe, we think that several FMCSRs (e.g., 49 CFR § 392.9 requiring cargo inspection) assume – but do not require – the presence of a driver.

Accordingly, we recommend that FMCSA issue interpretive guidance to clarify that the FMCSRs do not require that a driver be present in a CMV or that any other natural person be behind the wheel of a CMV, particularly in the case of a CMV equipped with a Level 4 ADS that is operating within its ODD or a Level 5 system.[4] This clarification is important to correct the impression left by DOT's September 2017 guidance[5] that the FMCSRs require a driver behind the wheel of a CMV at all times. Including this clarifying interpretation as part of DOT's upcoming 3.0 guidance would help foster the development of fully autonomous CMVs, and we recommend FMCSA and DOT consider including it.

III. The Definition of "Driver" Requires Careful Application in the Context of Fully Autonomous CMVs

The FMCSRs contain a simple definition of driver: "*Driver* means any person who operates any commercial motor vehicle."[6] Although that same section defines "person" to include both individuals and organizations[7], "driver" as used in the FMCSRs clearly refers to an individual. For example, Part 395 concerns "Hours of Service of Drivers" and clearly refers to human operators. Importantly, that regulation defines "driving time" as "all time spent at the driving controls of a commercial motor vehicle in operation."[8]

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[4] Per SAE J3016, a Level 5 system has an unlimited ODD (i.e., it has the ability to operate on any roadways or under any conditions that a conventional human driver can).
[5] DOT, *Automated Driving Systems: 2.0: A Vision for Safety* (2018).
[6] 49 CFR §390.5.
[7] Id., "*Person* means any individual, partnership, association, corporation, business trust, or any other organized group of individuals".
[8] 49 CFR §395.2.

Applying these definitions in the context of fully autonomous CMVs yields these conclusions:

(1) An individual who is operating a CMV (i.e., performing the dynamic driving task) is generally considered a driver, even if the CMV is equipped with an ADS.[9]
(2) An individual who does not operate a CMV (i.e., does not perform the dynamic driving task) is not a driver, even if that person is onboard the CMV for some or all of a trip.

Onboard Personnel That Do Not Drive

Today, CMV drivers are responsible for many non-driving tasks – they inspect, maintain, and fuel the CMV; they secure the cargo; they handle weigh station inspections; etc. In a fully autonomous CMV, we expect many non-driving functions to continue to be performed by personnel in the vehicle for some period of time, even if such personnel is not responsible for driving the CMV.

A person onboard a fully autonomous CMV who performs only non-driving tasks (e.g., cargo inspection) certainly does not become a driver simply by riding in the CMV. To avoid any ambiguity or misunderstanding, however, FMCSA should issue interpretive guidance clarifying that a person is not a "driver" for the purposes of FMCSA's rules if that person does not operate a CMV during a given trip, even if such person is onboard a CMV equipped with and operated by a Level 4 or 5 ADS.

Onboard Personnel That May Drive In Limited Circumstances

Transporting goods with fully autonomous CMVs may involve human roles that will require FMCSA to reconsider how to interpret and apply current rules. In one scenario, a person might be responsible for operating the vehicle only in very limited, planned situations involving low speed movements on non-public roads that are ancillary to the main driving task (e.g., moving the vehicle only for refueling or through a weigh station). The Agency could, for example, consider such a person a non-driver. Or, even if the person is considered a "driver," the Agency may find that these incidental tasks do not constitute driving time for Hours of Service purposes because, when those tasks are performed, the CMV is not "in operation" as the term is commonly understood.

Another scenario might involve a person with no regularly assigned driving responsibilities but who has the capability to operate the vehicle in an emergency situation (e.g., failure of the ADS requiring manual movement of the CMV to a safe place). This person, who may be onboard the CMV on a regular basis, should reasonably be considered a driver only in such emergency situations. FMCSA could interpret current rules, for example, to require such a contingent driver be subject to all driver requirements (including physical qualifications and alcohol and drug testing) but only be subject to the Hours of Service rules on the rare occasion when the contingency requiring the person to drive should arise.

We encourage FMCSA to use its current regulations and authorities to accommodate these novel, ADS-enabled approaches to CMV operation. This approach protects public safety while also enabling the deployment of new, safety-enhancing technologies.

[9] We recommend that FMCSA distinguish clearly between teleoperation and automated driving. We further recommend that the Agency also make clear that actual manipulation of vehicle controls by a remote driver makes that person a driver for purposes of the FMCSRs. See further discussion below.

IV. ADSs Should Not Be Considered "Drivers" for the Purposes of the FMCSRs and Should be Capable of Compliance with Rules of the Road

An ADS is, by definition, the collection of hardware and software that is capable of performing the entire "dynamic driving task" on a sustained basis.[10] Although the ADS operates the vehicle, it is not a "person" within the meaning of the FMCSRs; it is not an "individual, partnership, association, corporation, business trust, or any other organized group of individuals."[11] Accordingly, the ADS cannot be considered a "driver" as the term is used in the FMCSR because it is not a "person who operates any commercial motor vehicle."[12] Additionally, FMCSRs intended to manage the fatigue and frailties of human drivers, like the drug and alcohol testing requirements and the Hours of Service regulations, logically cannot and should not be applied to an ADS.

Even though the ADS is not a "driver," a Level 4 or 5 ADS should still be capable of complying with all the rules of the road applicable to the ODD in which the fully autonomous CMV will operate. Such a capability is an important part of the dynamic driving task and is one of the elements of ADS safety emphasized by DOT and NHTSA in *Automated Driving Systems 2.0: A Vision for Safety*.

V. The Agency Should Distinguish Between Remote Fleet Monitors and Individuals Who Can Remotely Drive a CMV

As DOT indicated in *Automated Driving Systems 2.0* (pg. 10):

> *In vehicles where an ADS may be intended to operate without a human driver or even any human occupant, the remote dispatcher or central control authority, if such an entity exists, should be able to know the status of the ADS at all times. Examples of these may include unoccupied SAE Automation Level 4 or 5 vehicles, automated delivery vehicles, last-mile special purpose ground drones, and automated maintenance vehicles.*

Waymo has this capability for central monitoring today. In addition to monitoring the status of the Level 4 automated vehicle, our Fleet Response Specialists can provide driving guidance suggestions to the vehicle, such as information on a road closure up ahead, or recommending that a vehicle experiencing a mechanical failure find a safe place to pull over so that a repair team can be dispatched to the location. Importantly, such specialists cannot drive the vehicle and have no controls for doing so.

Fleet monitoring of ADS-equipped vehicles, however, is clearly distinct from "remote driving" or "teleoperation," which involves individuals who can actually drive a vehicle from a remote location through a wireless connection to the vehicle. For safety and security reasons, Waymo has chosen to avoid including such technology in our self-driving vehicles. We feel that relying on such features would conflict with our objective of reducing the number of fatalities and

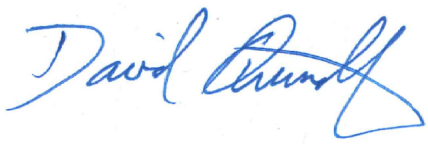
[10] SAE J3016.
[11] 49 CFR §390.5.
[12] Id.

injuries caused by crashes on U.S. roads – an overwhelming percentage of which are caused by human error.

While we do not have a recommendation as to the regulatory classification under which the Agency should treat this technology, any human drivers, whether in a vehicle or a remote location, should be held to the same standards as for drivers of non-automated CMVs.

The commercial availability of fully self-driving technology in CMVs can significantly contribute to the safety of American roads. Waymo believes that in order to facilitate this important technology and avoid unnecessary or unintended regulatory barriers, the Agency should focus on actions it can swiftly undertake (e.g., interpretive guidance) and on the aspects of autonomous CMV operation that are most likely to affect the marketplace over the next few years. We hope that our comments will aid in this endeavor, and we look forward to continuing to work closely with you and the Agency over the coming months and years.

Sincerely,



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