July 22, 2019

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

Re: Request for Comments Concerning Safe Integration of Automated Driving Systems-Equipped Commercial Motor Vehicles, Docket No. FMCSA-2018-0037-0136

Dear Administrator Martinez,

The Texas Innovation Alliance (Alliance) respectfully submits comments to the Federal Motor Carrier Safety Administration (FMCSA) as the agency seeks to understand how changes to its rules can account for significant differences between human operators and automated driving systems (ADS). As a state facing rapid growth, rising congestion, and over 3,500 traffic fatalities every year, Texas has a keen interest in advancing ADS technologies. The Alliance welcomes the opportunity to offer input and supports the agency's leadership to develop a regulatory environment that encourages the safe testing and deployment of technologies with significant potential to improve the safety, mobility, and economic vitality of the United States.

The Alliance is a partnership network of over 40 cities, transportation agencies, and research institutions who are committed to developing shared solutions to the most pressing mobility challenges in the state. Charged with preparing the transportation system to meet the future mobility needs of Texas residents and businesses, the Alliance seeks to safely integrate and take full advantage of the latest technology advancements. Drawing on practical experience and research expertise from the Texas Department of Transportation (TxDOT) and Southwest Research Institute (SwRI), the Alliance offers input in response to questions outlined in the request for comments as well as encourages FMCSA to:

> **Uphold Standards for All Safety and Operational Roles.** As commercial motor vehicles (CMVs) transition from human operation to ADS control, it will be important to adjust training, inspections, and endorsements to incorporate the new features in ADS-equipped CMVs to ensure proper operations. The autonomous systems in trucks will need to meet or exceed the same safety standards that human operators are subject to, where applicable. Where new standards are needed, FMCSA will need to develop the proper language and processes to ensure the safety of our roadways.

Develop a Lexicon for Automated Driving Systems to Provide Clarity. ADS-equipped CMVs will have differences from traditional CMVs that cannot be captured in the current language. FMCSA needs to develop unique terminology for automated trucks that will give the AV truck industry a sense of security that is not found in providing interpretations of current regulations. Without concrete language, there will continue to be confusion within the field regarding what is expected of ADS-equipped CMVs. When vehicle control devices are removed from the cab, it will become impossible for existing regulations to be applied. FMCSA should act proactively in considering the establishment of new terminology.

Build Awareness on Long Term Issues. Some of the concerns presented in this request for comment are not ready for immediate action. FMCSA should work to investigate solutions to the more complex issues before developing firm language. While it is important to establish regulations, it could be harmful to build regulations without full understanding of what Level 4 and Level 5 autonomous trucks will look like. Research partnerships would be a useful method for developing answers to the more specific questions posed in this request for comment.

As we usher in new mobility solutions, the Alliance believes incremental steps are needed to support safe testing while FMCSA continues working with public and private stakeholders to gather additional data and insights. We appreciate FMCSA's proactive approach to soliciting input from public, industry, and research perspectives. The Alliance shares a vision where automated vehicles are an opportunity to reimagine commercial mobility and looks forward to continued engagement with FMCSA to build a safer future for all.

Regards,

Darran Anderson
Executive Sponsor
Texas Innovation Alliance
Director, Strategy and Innovation
Texas Department of Transportation

Alliance Working Group
City of Arlington | City of Frisco | Houston METRO | North Central Texas Council of Governments | Southwest Research Institute | Texas Department of Transportation | Texas Southern University | University of Texas at Austin Center for Transportation Research

If you have any questions regarding this submission, please feel free to contact Kristie Chin, PhD, at kristie.chin@utexas.edu.

1. Do the FMCSRs require a human driver?

1.1. Should FMCSA establish a rule that would prohibit an ADS-equipped CMV from operating outside its designated ODD?

The Alliance has experience with autonomous vehicle (AV) pilots and has found companies lack an incentive to attempt operations outside of their ODD. ADS-equipped CMVs have ODDs because they are incapable of operating correctly outside of these conditions, so this rule would be an unnecessary form of oversight that could prove rather impractical to implement. The Alliance encourages FMCSA to refrain from establishing a rule regarding operations outside a designated ODD until a need can be demonstrated.

1.3. Should FMCSA consider amending or augmenting the definition of "driver" and/or "operator" provided in 49 CFR 390.5 or define a term such as "ADS driver" to reduce the for misinterpretation of the requirements?

The Alliance believes FMCSA should take into consideration augmenting the definition because it is unclear what value this could provide. It is important that rules consistently apply the same terms, so that companies can interpret them easily. The Alliance would encourage FMCSA to seek diverse perspectives from industry experts and encourages synergy between any changes and the newly passed SB 2205. There are technical concerns that arise when vehicles lack a steering wheel and brakes, which would be important to consider. FMCSA should determine if these highly autonomous vehicles require a different term from low level autonomous vehicles.

2. Commercial Driver's License (CDL) Endorsements

2.1. Should a CDL endorsement be required of individuals operating an ADS-equipped CMV?

The Alliance believes it is important that operators who could be responsible for taking control of a vehicle in any circumstance (Level 0-3) be required to have a CDL endorsement. When it comes to higher levels of automation (Level 4-5), it is less clear what the appropriate solution is. The Alliance believes it would be worth taking into consideration creating a new endorsement for operators who are not expected to control the vehicle.

2.2. If so, what should be covered in the knowledge and/or skills test associated with an ADS endorsement?

It seems beneficial for operators to understand how the vehicle works and how the ADS is working, but the typical CDL endorsement may prove impractical. This is an area of concern that would benefit from a gradual shift away from current practice if changes are needed. FMCSA might consider working with companies developing ADS-equipped CMVs to determine what form of training or endorsement would work best. As high-level automation is still early in development, it is difficult to predict what the best solution will be.

2.5. In an operational model that has an individual remotely monitoring multiple CMVs, should the Agency impose limitations on the number of vehicles a remote driver monitors?

The Alliance believes there is value in considering a limitation on the number of vehicles to be monitored by a single human remote operator. There is a risk that comes in the form of company

incentive to maximize the vehicles monitored by each operator to maximize profits. More work is needed to determine what the appropriate number of vehicles would be, but FMCSA should take this issue under consideration. It will be important to distinguish between human operators and machine operators to accommodate the possibility that non-human remote operators will be developed.

5. Distracted Driving and Monitoring

5.1. How should the prohibition against distracted driving apply to onboard operators responsible for taking control of the CMV under certain situations, and to remote operators with similar responsibilities?

The Alliance sees no reason to remove the prohibition against distracted driving for onboard operators when they are responsible for taking over the CMV at any point or for remote operators performing the same tasks. These operators are responsible for large vehicles travelling at high speeds and distraction poses a significant risk to others sharing the roadway. FMCSA will need to consider how they can enforce this regulation for remote operators who work within an office environment.

6. Safe Driving

6.1 Should FMCSA consider revising its rules to ensure that (1) any human exercising control of an ADS-equipped vehicle must continue to comply with all the rules under Part 392, and (2) a CMV under the control of a Level 4 or Level 5 ADS must satisfy the operational rules?

(1) Yes, we concur that any human exercising control of an ADS-equipped vehicle shall comply with all rules under Part 392.
(2) Yes, the Alliance believes that any CMVs under the control of Level 4 or Level 5 ADS shall still satisfy the operational rules. If the surface transportation system is fully connected and cooperative, some operational rules may not be necessary. For example, C.F.R. §392.10 requires that every bus transporting passengers shall not cross a railroad track or tracks at grade unless the driver of the bus first stops the bus within 50 feet of, and not closer than 15 feet to, the tracks; thereafter listens and looks in each direction along the tracks for an approaching train; and ascertains that no train is approaching. When it is safe to do so, the driver may drive the bus across the tracks in a gear that permits the bus to complete the crossing without a change of gears. The driver must not shift gears while crossing the tracks. However, in a fully connected and cooperative transportation system, the ADS-equipped bus would be able to know if it is safe to cross without stopping via V2X communications (e.g., bus-to-train, bus-to-vehicle, bus-to-infrastructure).

6.2 For example, should FMCSA require that the ADS be capable of identifying highway-rail grade crossings and stopping the CMV prior to crossing railroad tracks to avoid collisions with trains, or going onto a highway-rail grade crossing without having sufficient space to travel completely through the crossing without stopping?

Yes, the Alliance concurs that the ADS shall be capable of identifying highway-rail grade crossings and stopping the CMV prior to crossing railroad tracks. However, in a fully connected and cooperative transportation system, the ADS-equipped bus would be able to know if it is safe to

cross without stopping V2X communications (e.g., vehicle-to-vehicle, vehicle-to-train, and vehicle-to-infrastructure).

6.3 For scenarios in which the control of the ADS-equipped CMV alternates, or may alternate, between a human and the technology, should FMCSA require that both the human operator and ADS comply with the applicable operational rules?

Yes, both the human operator and ADS shall comply with the applicable rules.

7. Inspection, Repair and Maintenance

7.1. If so, what qualifications should be required of the individual performing the inspection?

ADS Levels 4 and 5 should provide some level of log data/report that is consistent across manufacturers and provides information sufficiently-detailed to indicate proper functioning of the system and all modules/components. Guidance documentation and training should be provided to allow an inspector to properly evaluate the data/report and determine if the system is functioning properly. Inspectors receiving such training could be identified as ADS-certified.

7.2. What kind of routine or scheduled inspections should be performed and what types of ADS-related maintenance records should be required?

Within the intent of Level VIII wireless roadside inspections, these should be performed whenever an ADS-equipped vehicle is within range of an inspection facility/vehicle appropriately-equipped to conduct these inspections. Carriers lacking Level VIII inspections within some defined period of time (similar to current minimum inspection requirements) should be required to submit to an inspection – either Level VIII or otherwise. Hardware maintenance record standards should mirror existing standards. Software for Levels 4 and 5 ADS systems should be self-reporting and provide some level of log data upon request and as part of Level VIII inspections.

7.3. Should the inspection period be more frequent than annual for an ADS-equipped CMV?

Hardware maintenance record standards should mirror existing standards. Software for Levels 4 and 5 ADS systems should be self-reporting and provide some level of log data upon request and as part of Level VIII inspections.

7.4. Should inspections be mileage-based or time-based (e.g., 1,000 miles, 3 months or 1,000 hours of operation)?

As existing metrics for ADS typically measure in units of hours (i.e., California tracks hours without crashes), it follows that inspections could use a similar time-based metric. Actual hours should be determined based on analysis of historical operational up-times between points of failure for a variety of devices.

7.5. Should FMCSA impose general requirements for motor carrier personnel responsible for ADS-related inspection, repair, and maintenance tasks similar to the Agency's brake inspector qualification requirements?

Yes, it is unclear why this item is restricted to brake inspector requirements. See 7.1 for suggestions.

7.6. How could FMCSA ensure that motor carriers apply available after-market software updates?

Firmware and software versions for all ADS components must be included within the Level VIII wireless inspection and must match the latest versions available.

8. Roadside Inspections

8.1. Should motor carriers be required to notify FMCSA that they are operating Level 4 or 5 ADS-equipped CMVs?

Yes, self-certification or other external certification to verify that ADS-equipped vehicles have met the requirement(s) implied by either the Level 4 or Level 5 designation should be required. For Level 4 this should include the ODD. In order to follow the growth of autonomous vehicles, it is important to maintain awareness of the volume of ADS-equipped CMVs on roadways. As the volume rises, FMCSA may see value in building out autonomous specific regulations.

8.2. If so, how should the carrier notify FMCSA?

In addition to the certification mentioned above, the carrier should be required to include this data as part of the MCS150 Carrier Registration (when they get their USDOT number), IRP carrier/vehicle registration, insurance policy, and the initial vehicle inspection.

8.3. Should FMCSA require markings identifying the ADS Level of a vehicle?

Recent incidents have shown a tendency for drivers to act aggressively towards vehicles that have been identified as having ADS, typically due to the presence of external sensors. In light of this it may be counterproductive to safety to require a visible marking. However, it would be beneficial to provide this identification electronically through Vehicle to Vehicle (V2V) communication, such as a CVSA Level VIII Electronic Inspection via a Probe Data Message variant containing encrypted uniquely identifiable information.

8.4. Should the Agency require motor carriers to utilize ADS-equipped CMVs that have a malfunction indicator?

Yes, ADS-equipped CMVs should be required to provide status information on demand. In addition to current status, it would be helpful to have access to some level of log data of system status over time. This information should be readily available for any law enforcement officer who elects to complete a roadside inspection or is driving in the vicinity of an ADS-equipped CMV. While malfunctions will continue to be normal for low levels of automation, it will be important to know if a malfunction incited an accident.

8.5. Should the Agency require that motor carriers deploying ADS-equipped CMVs ensure the vehicle can pull over in response to Federal and State officials or move out of the way of first-responders?

Yes, Safe Harbor should be a required standard maneuver for all Level 4 and Level 5 ADS vehicles.

8.6. How might that be achieved, and at what cost?

The Alliance cannot provide a specific answer to this question but believes it is worth investigating. Likely, the CMV and police car or emergency vehicle will need to be capable of V2V

communications, so the message to engage Safe Harbor can be transmitted and received. After the stop is complete, a new message would be sent informing the vehicle that it is safe to proceed. It is unclear how these messages would be transmitted and how much it would cost to instrument the publicly owned vehicles.

8.7. How would roadside enforcement personnel know that a vehicle can no longer operate safely?

If the vehicle is honestly Level 4 or Level 5, it should be continuously monitoring status and self-policing. It should not be operating unless it can operate safely, thus if it can no longer operate safely the vehicle will self-initiate a Safe Harbor maneuver and either stop where it is or move to a safer environment. A CVSA Level VIII Electronic Inspection could be used to confirm/validate that the vehicle is currently operating within acceptable/expected parameters. The Alliance is unsure if there is a way for enforcement to determine if a vehicle can or cannot operate safely without self-policing of ADS.

9. Cybersecurity

9.1. What types of safety and cargo security risks may be introduced with the integration of ADS-equipped CMVs?

Cybersecurity threats against ADS can take different forms such as network spoofing and denial of service attacks, tampering, impersonation, and system modification. When the network is clogged with spurious requests, ADS-equipped CMVs may have potential safety issues due to lack of timely information about real-time road conditions (e.g., construction lane closures, incidents). Higher value cargo may attract more aggressive cybersecurity threats, so it will be important to ensure ADS-equipped CMVs have appropriate safety measures.

9.2. What types of rules should FMCSA consider to ensure that motor carriers safety management practices adequately address cybersecurity?

Malicious use of ADS-equipped CMVs should be monitored and prevented. Besides strong cybersecurity rules and best practices, geo-fencing may be used to prevent ADS-equipped CMVs carrying hazardous materials from entering areas with high population density. Motor carriers should be capable of remotely monitoring and detecting illegal driving behaviors (e.g. speeding, running red lights) of ADS-equipped CMVs, and mitigating safety risks immediately.

10. Confidentiality of Shared Information

10.1. As the development of ADS technology continues, the Agency believes there is a need to learn about the performance limitations of these systems. FMCSA draws a distinction between information about performance limitations (e.g., how well does the ADS keep the vehicle in its lane and under what environmental conditions, etc.) and details about the system design (e.g., the specific types of sensors, or the arrays of sensors and cameras used for input to the central processing unit for the ADS). To what extent do ADS developers believe performance data should be considered proprietary and withheld from the public?

Currently states have widely different requirements concerning the reporting of ADS performance metrics. California requires a license to test ADS which includes mandated reporting of both accidents and takeovers over time, so that developers can be tracked and ranked by hours without

crashes and/or takeovers. Note that crashes are no worse than takeovers for vehicles designed/operating under Level 4, as these systems are not intended to have a safety driver. Arizona, Pittsburg, and Texas have seen significant growth in ADS testing over the past years, possibly in part to the lack of strict licensing requirements and having less stringent reporting standards than California. It seems reasonable to believe that ADS developers view such data as proprietary, particularly concerning metrics for which they do not compare favorably. Conversely, it is likely ADS developers would be happy to share data for which they lead in performance metrics. FMCSA may have better luck accessing key data under the agreement that it would not be shared out to the public, but this would likely be resisted by the public and lacks transparency. The Alliance recognizes it will be difficult to strike a balance between attaining the necessary performance data and maintaining transparency in operations.