Texas Department of Transportation

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July 29, 2019

Ms. Heidi Renate King
Deputy Administrator
National Highway Traffic Safety Administration
1200 New Jersey Avenue S.E.
Washington, DC 20590

RE: Docket Number NHTSA- 2019-0036

Dear Deputy Administrator King:

The Texas Department of Transportation (TxDOT) welcomes the opportunity to provide comments on two of the questions posed by the National Highway Traffic Safety Administration's Advance Notice of Proposed Rulemaking (ANPRM) on the Removing Regulatory Barriers for Vehicles with Automated Driving Systems.

Below you will find TxDOT's responses to questions one and two as posted in Docket Number NHTSA-2019-0036.

1. *What are the possible advantages and disadvantages of each approach (as listed in the ANPRM)?*

(1) Normal ADS-DV operation:

Advantage: Can test the ADS-DV operation as is.

Disadvantage: Normal ADS-DV operation testing may not cover all edge cases.

(2) Test Mode with Pre-Programmed Execution (TMPE):

Advantage: Compatibility of the commands within the compliance library and vehicle being evaluated can be ensured.
TMPE can pre-program the testing information that would precisely execute the Federal Motor Vehicle Safety Standard's (FMVSS) test procedures.

Disadvantage: Pre-programmed execution may not be possible for test procedures requiring driving maneuvers that are outside of an ADS's ODD.
The TMPE's test mode may present a cybersecurity threat.

(3) Test Mode with External Control (TMEC):

Advantage: Allow test engineers to directly select the desired tests and input parameters.

Disadvantage: The TMEC's external control may present a cybersecurity threat.

(4) Simulation:

Advantage: Can provide consistent, constant, and immediate feedback. Can test more use cases at lower cost. Can test high risk events where live testing may not be acceptable.

Disadvantage: May not ideally represent real world situations.

(5) Technical Documentation for System Design and/ or Performance Approach:

Advantage: Technical documentation can demonstrate FMVSS compliance in the appropriate standards.
Can help identify components and functions for which no discrete performance requirement needs to be measured through testing.

Disadvantage: Can be burdensome for both NHTSA and Original Equipment Manufacturers.

(6) Use of Surrogate Vehicle with Human Controls:

Advantage: Can demonstrate compliance verification using manual control vehicles.

Disadvantage: Surrogate vehicles may not represent the ADS-DV very well. Use of surrogate vehicles and human controls introduce variables inconsistent with real ADS-DVs and their operations, which create unacceptable variances in test results from real systems.

2. ***Discuss whether each approach fits the requirements and criteria of the Safety Act and enables effective enforcement of the FMVSSs. Explain the basis for your answers.***
Different test approaches have different ideal working situations and should be used based on specific requirements and criteria of the Safety Act.

Additional approach specific questions

Approach A: Normal ADS-DV Operation

13. *Are there specific challenges that will be encountered with this kind of approach for vehicle compliance verification? Please be specific and explain each challenge.*

For NHTSA to test all safety features and operational scenarios, it will be necessary for these vehicles to have significant testing capabilities. AV manufacturers will need to provide a form of override control and/or external control device to allow proper testing of the vehicles. Much of the technology, software, and hardware are deemed proprietary, making it is unclear how NHTSA testers would be able to access sufficient external control to complete the testing.

15. *How would NHTSA ensure that the performance of the ADS-DV during testing is consistent with how the vehicle would perform during actual normal use?*

NHTSA should establish clear requirements for testing protocols to be put in place by the vehicle manufacturers. All vehicles should be required to have a testing ODD that contains situations capable of testing all FMVSSs. The testing ODD should also contain all situations in which the vehicles are expected to operate in real-world ODDs. Within the test ODD, NHTSA staff should be able to program a variety of routes and destinations to allow a sufficiently wide range of testing.

Approach B: Test Mode with Pre-Programmed Execution (TMPE)

16. *How could engineers responsible for performing FMVSS compliance assessments of an ADS-DV without manual controls be expected to access and interface with the compliance test library menu?*

Manufacturers will need to play a significant role in providing access for safety testing through a standardized approach to providing this access for a range of functions.

Access will be needed by fleet managers for daily operations and their own safety protocols. It is important to note that the ability of a fleet operator to perform certain daily tests for checkout of a given vehicle's systems and sensor calibration would be a very important aspect of operating a large fleet of vehicles.

Approach C: Test Mode with External Control (TMEC)

25. *Is it reasonable to assume a common (universal) interface, translator, and/or communication protocol between an external controller and any ADS-DV will be developed?*

Yes.

26. *What is the most viable method for securely interfacing an external controller with the ADSDV (e.g., wireless or physical access)?*

A physical control should be required by NHTSA for increased security with a physical interface with these vehicles. This will provide a higher level of security and protection from external hacking.

28. *Is it reasonable to assume any geofence-based operating restrictions could be suspended while an external controller intended to assess FMVSS compliance is connected to the ADSDV?*

Yes.

29. *Are there other considerations NHTSA should be aware of when contemplating the viability of using an external controller-based vehicle certification?*

There should be a rigorous testing protocol and security clearance process whereby vehicle manufacturers can grant NHTSA authority to conduct tests.

Approach D: Simulation

30. *How can simulations be used to assess FMVSS compliance?*

Simulation is an appropriate tool for assessing FMVSS compliance for structured scenarios, and can be used to test extreme events where risks of live tests are too great. High risk scenarios need to be scripted, repeatable and standardized, just like normal operations scenarios, to ensure common testing.

31. *Are there objective, practicable ways for the agency to validate simulation models to ensure their accuracy and repeatability?*

NHTSA should consider the need for core safety modules related to ADS-DV's, where the agency can verify those modules are safe for public use.

Approach E: Technical Documentation for System Design and/or Performance Approach

34. *How can the documentation-focused approach ensure compliance with FMVSS, considering it neither verifies that the vehicles on the road match the documentation nor confirms that the vehicles on the road comply with the FMVSSs?*

This method presents some challenges when the human operator is removed.

Given the intellectual property concerns pertaining to the source code developed for ADS systems, manufacturers will be likely very reluctant (if at all) to provide code in any detail enough to verify compliance. Since every code will be different, evaluation will be incredibly resource-intensive for both manufacturers and testing facility. The cost and complexity of reviewing test code is much more expensive than existing test methods.

Approach F: Use of Surrogate Vehicle with Human Controls

39. *If results from FMVSS compliance tests of a conventional vehicle performed by its manufacturer differ from the results of NHTSA tests of an equivalent ADS-DV (particularly if the conventional vehicle complies with the agency's standards, but the ADS-DV does not), can the conflicting results be reconciled? If so, how?*

The ability to operate a surrogate vehicle that is identical in its ADS functionality and performance could have a strong benefit to fleet operations of ADS-DVs for purposes of either failure management and/or hosting of empty vehicles through the system.

The provision of continued failure-mode operations using a surrogate vehicle to which the trailing ADS-DVs could be "virtually coupled" would be an important

feature. Creating a platoon of vehicles that could progress through the system under manual operation of a leading surrogate vehicle would be of great value when a high ridership demand condition must continue to be served while system failure recovery is underway.

If you have any questions regarding this submission, please feel free to contact me at (512) 305-9508 or Darran.Anderson@txdot.gov.

Sincerely,

Darran Anderson
Director, Strategy and Innovation

cc: James M. Bass, Executive Director
Marc D. Williams, P.E., Deputy Executive Director
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