CONOPS

Trucking Fleet Concept of Operations (CONOPS) for Managing Mixed Fleets

ADS-EQUIPPED TRUCKS' INSPECTION PROCEDURES

BACKGROUND

The inspection requirements for an Automated Driving System (ADS)-equipped commercial motor vehicle (CMV) are similar to that of a conventional CMV. ADS-equipped CMVs have additional sensors, wiring, and computing components to provide automated detection, decision making, and operation; however, those components depend on the function and good state of repair of the same body, chassis, and powertrain components present on all CMVs. Current CMV inspection practices include a pre-trip inspection performed by the driver and occasional roadside inspections during the trip by law enforcement officials, with the assistance of the driver, which cover mechanical and external parts of the vehicle. ADS-equipped CMVs present unique operational challenges in terms of law enforcement roadside interactions. Therefore, new paradigms and procedures should be considered so that all interactions with the CMV will be safe, effective, and efficient as possible while raising the safety standards in the industry.

The ADS Trucking Fleet CONOPS for Managing Mixed Fleets project is funded through the 2020 ADS Demonstration Grant Program sponsored by the U.S. Department of Transportation and administered by the Federal Motor Carrier Safety Administration (FMCSA). As part of this project, the Virginia Tech Transportation Institute (VTTI) with support from partners, including the Commercial Vehicle Safety Alliance (CVSA), collected information and is supporting outreach on the Enhanced CMV Inspection Program, the framework which was approved by the CVSA board in 2022 Enhanced CMV Inspection Program.

Figure 1. Kodiak ADS-equipped CMV undergoing an electronic enhanced inspection at a Texas weigh station using Drivewyze

Figure 2. CVSA certified ADS inspector measuring brakes on a Kodiak ADS-equipped CMV

The Enhanced Inspection approach was developed into the program, led by the CVSA Enforcement and Industry Modernization Committee and supported by other industry partners, including those organized by the Technology Maintenance Council of the American Trucking Associations. This inspection was designed to apply to SAE Level 4 and 5 ADS, with the expectation that it will remain applicable and relevant in the future as ADS continues to develop. A pilot training session for inspectors was performed in Grapevine, Texas, in May 2022, with the first certified inspectors being trained in February 2023.

Figure 3. CVSA certified ADS inspector checking sensors on a Kodiak ADS-equipped CMV

Drivewyze

COMMERCIAL VEHICLE SAFETY ALLIANCE CVSA

kodiak

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ENHANCED INSPECTIONS

The CVSA Enhanced CMV Inspection Program requires that both tractor and trailer be "defect free" prior to departure from its point of origin. In addition, only vehicles with minor non-safety critical defects during "in-transit" inspections should continue to their destination. The CVSA Enhanced CMV Inspection Program includes training qualified inspectors within the industry to perform a physical inspection of the vehicle both before dispatch and at in-transit freight or refueling/recharging locations along the trip.

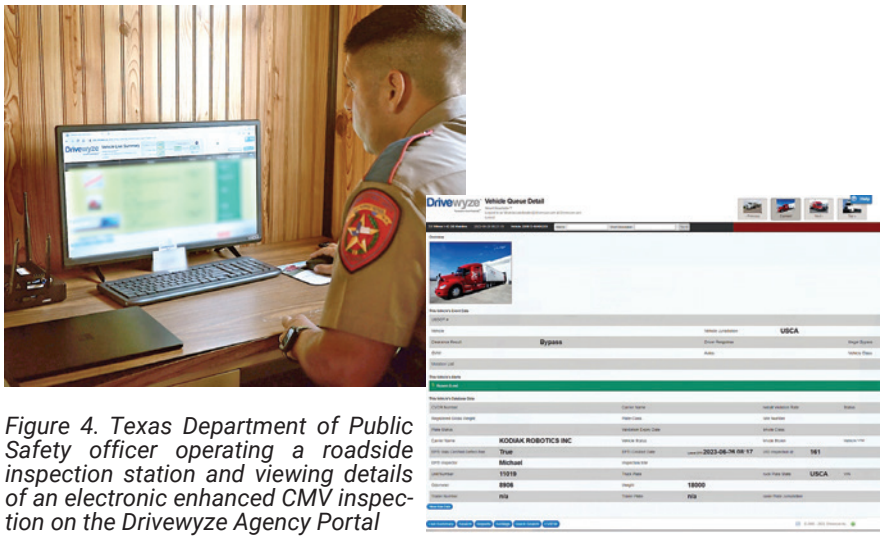

Figure 4. Texas Department of Public Safety officer operating a roadside inspection station and viewing details of an electronic enhanced CMV inspection on the Drivewyze Agency Portal

ELECTRONIC INSPECTION COMMUNICATIONS

The ADS electronic inspection verification message includes the status of the ADS-equipped vehicle from the Enhanced Inspection and a pass/fail for ADS, as well as, a statement about the operational design domain (ODD) to ensure the vehicle is operating within its domain safely. The electronic message broadcasts from the vehicle to the fleet operator and to enforcement. Electronic verification attached to the CVSA Enhanced CMV Inspection Program stands apart from other proposed and existing vehicle bypass and driver-focused messages such as a unique electronic identification (UEI) for CMVs and CVSA's Level VIII Electronic Inspection. UEI does not include information such as status of ADS equipment or ODD. UEI could serve a different function more akin to a vehicle registration for CMVs, whether operated by ADS or human drivers. The CVSA Enhanced CMV Inspection is also not the same as CVSA's Level VIII Inspection, which, as currently defined, focuses on the status of human drivers and does not include hands-on vehicle inspection data.

FUTURE

It is important to note that the CVSA Enhanced CMV Inspection Program is not yet a requirement for ADS-equipped CMVs operated with or without onboard staff. However, ADS-equipped CMV developers are already testing the program on a voluntary basis and are making it an important part of their safety policy.

One of the goals in the creation and application of the CVSA Enhanced CMV Inspection Program is uniformity. As this approach grows in practice, the hope is that they will become an industry standard sufficient for all types of ADS-equipped CMV use. Some significant questions remain: How does law enforcement interact with an ADS-equipped vehicle, especially if driverless? What do the internal policies of inspecting ADS software and hardware look like, and how does this relate to intellectual property protections for ADS manufacturers? Public and private stakeholders are hard at work to discover and develop solutions to these questions to ensure broad deployment continues to be safe and effective.

This and other topics affecting the ADS-equipped CMV ecosystem are being shared through research performed by the Virginia Tech Transportation Institute under the project entitled "Trucking Fleet Concept of Operations (CONOPS) for Managing Mixed Fleets," which is funded through the 2020 ADS Demonstration Grant Program and organized by the Federal Motor Carrier Safety Administration.

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