CONOPS

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

CONOPS Study Overview

BACKGROUND

Although automated driving systems (ADS) for trucks promise increased safety, productivity, and efficiency, it is not clear how they should be integrated into fleet operations with conventional vehicles. The Virginia Tech Transportation Institute (VTTI) has assembled a team of experts in the fields of ADS, data collection, safety data analysis, data repositories, naturalistic driving, roadway infrastructure, statistical methods, and truck fleet operations to develop and demonstrate a pragmatic Fleet Concept of Operations, or CONOPS. This CONOPS will provide the trucking industry with clear guidelines on how to safely implement—and benefit—from ADS-equipped trucks. Additionally, data from CONOPS real-world demonstrations will provide the U.S. Department of Transportation (USDOT) with critical information to inform rulemaking regarding ADS-equipped trucks.

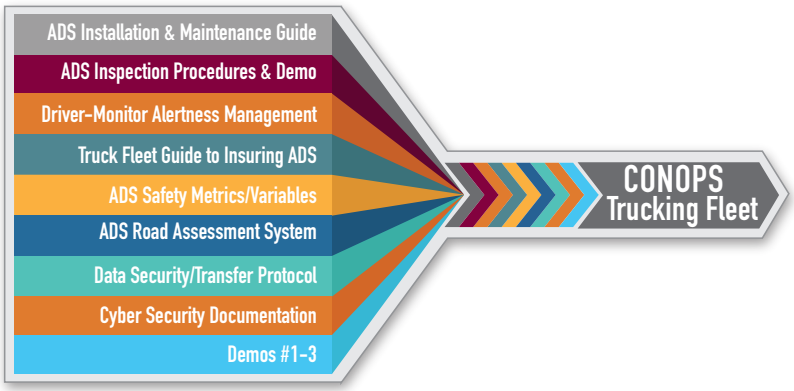

Figure 1. CONOPS Summary: Informing the Development and Planning of the Live Demonstrations.

OBJECTIVES

The goals of the CONOPS project are to:

1. Safety: Collect information and practices on how to safely integrate ADS-equipped truck into the U.S. on-road transportation system
2. Data: Provide the USDOT with data for safety analysis to support rulemaking to help modernize regulations
3. Deployment: Demonstrate how to integrate and deploy ADS-equipped trucks in a productive, cooperative way into existing road freight ecosystems
4. Collaborate: Include a broad and diverse group that includes government entities, university and research institutes, trucking associations, and private partners

METHODS

If the benefits of ADS are to be realized, the U.S. trucking industry needs a rigorous, data-driven CONOPS. The CONOPS is a comprehensive document that describes ADS characteristics from the viewpoint of the truck fleets. As shown in Figure 1, the CONOPS includes eight key sections: ADS Installation and Maintenance Guide for Fleets, ADS Inspection Procedures, Driver-Monitor Alertness Management, Motor Carrier Guide to Insuring ADS-Equipped Trucks, Identification of ADS Safety Metrics/Variables, ADS RoadAssessment System, Data Security/Transfer Protocol, and Cybersecurity Best Practices.

To develop the CONOPS, VTTI assembled a comprehensive, 17-organization team to provide the necessary expertise and perspectives: six State Departments of Transportation (Nebraska, Pennsylvania, Tennessee, Virginia, West Virginia, and Wyoming) and the I-95 Corridor Coalition (an alliance of transportation agencies from the State of Maine to the State of Florida); the ADS technology developer, Pronto; two trucking fleets (Schneider National and Hub Group); the National Private Truck Council, which represents hundreds of private truck fleets; and supporting organizations (Travelers Insurance, the Texas Transportation Institute, and the Commercial Vehicle Safety Alliance). Since the project started, there has been an additional partnership with the Florida Department of Transportation (FDOT).

For this study effort, VTTI has partnered with Pronto, an ADS technology developer that is led by a pioneering team that has been at the forefront of important advances in the autonomous vehicle industry. Pronto was founded in 2018, and in that same year became the first, and is still the only, company to successfully drive coast-to-coast in the United States without a single driver input.

In addition to the CONOPS itself, the project includes a series of demonstrations that will touch a large segment of the continental U.S. Three hands-on ADS Roadshows will be held to demonstrate practical applications of ADS-trucking to end users, stakeholders, and the public,

PRONTO

VTTI CONOPS

METHODS *continued*

allowing them to experience ADS technology on closed test tracks. The roadshows will engage the public with driving automation systems to share information about their functionality, benefits, and limitations. The roadshow events demonstrate real-world, practical integration of increasingly sophisticated ADS into road freight operations. For example, the second Roadshow, hosted at the 2022 Technology and Maintenance Council (TMC) Annual Meeting, showcased a live ride-and-drive for attendees to experience the capabilities of an ADS truck. Along the closed course route, the ADS truck navigated a work zone scenario, designed and executed with the support of the Florida Department of Transportation (FDOT).

Three different deployments will also be made of the real-world, practical integration of increasingly sophisticated ADS into road freight operations with live traffic:

- Truck queuing in ports (Demo #1);
- Multiple SAE Level 4 cross-country trips (Demo #2); and
- Fleet integration scenarios (Demo #3)

The demonstrations will show how truck fleets can integrate more ADS functionality into their current fleets and business models to build toward a network of fully deployed ADS trucks in their commercial operations. Figure 2 demonstrates the circular process of the CONOPS and how lessons learned, demonstrations, deployment, and distribution activities provide feedback to

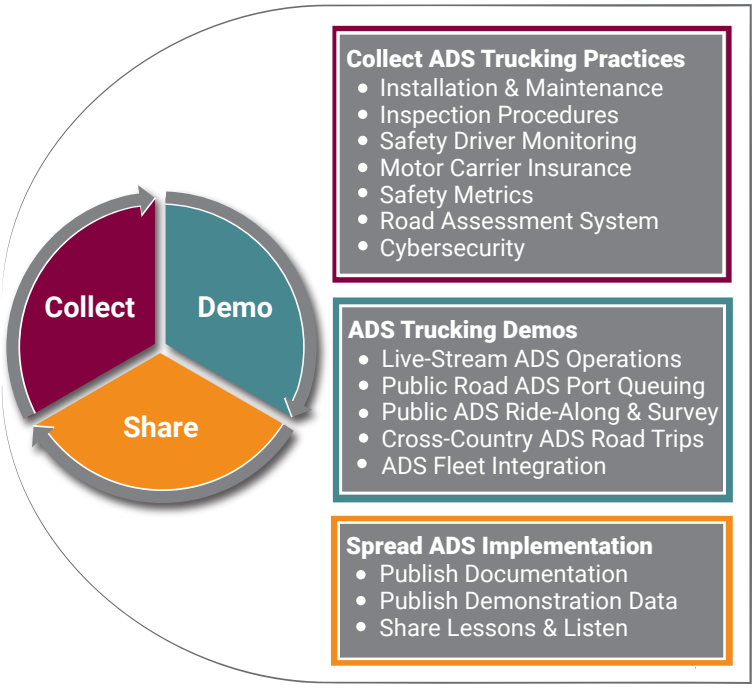

Figure 2. ADS trucking CONOPS process

Figure 3. A driver testing Pronto's ADS equipped truck

the project. The data collected in these demonstrations and deployments will be uploaded to a VTTI-supported data repository, the FMCSA CONOPS Dataverse, for storage and public access.

To date, the focus of nearly all ADS demonstrations has been on technical feasibility. As impressive as these demonstrations have been, feasibility alone is not sufficient to promote widespread adoption of ADS-equipped trucks or inform policymaking. Rather, the CONOPS envisions a "realistic autonomous" deployment that relies on a mixed-fleet model, where commercial fleets simultaneously own and operate trucks with different levels of ADS. The development and demonstration of this CONOPS for ADS-equipped trucks will help with the deployment of ADS-equipped trucks into real-world settings that are of practical importance to the trucking industry, regulators, and the public at large. Not only will the CONOPS demonstrations be technically feasible, they will also show how ADS can be implemented in trucking fleets in a manner that is:

1. Safe,
2. Repeatable, and
3. Commercially viable.

The data gathered in the demonstrations and provided to USDOT will reflect real-world trucking operations and will be invaluable for real-world safety analysis and rulemaking.

For more information, contact the project's principal investigator, Andrew Krum, at akrum@vtti.vt.edu. Senior Research Associate Erin Mabry is leading the ADS Truck Roadshows; for more information, please contact Erin at emabry@vtti.vt.edu.

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