



Autonomous Truck Peer Meeting, June 2016

Held In Conjunction with I-95 Corridor Coalition Connected & Automated Vehicles
Conference “What States Need to Know”

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Working Paper No. 11

March 2018

The Institute for Trade and Transportation Studies provides research data and expert opinions to its members concerning the effects of commercial freight movements on domestic and international activities, regarding infrastructure and transportation needs, and safety implications.

The ITTS member states include:

- Arkansas Department of Transportation
- Florida Department of Transportation
- Georgia Department of Transportation
- Kentucky Transportation Cabinet
- Louisiana Department of Transportation and Development
- Mississippi Department of Transportation
- Missouri Department of Transportation
- Virginia Department of Transportation
- West Virginia Department of Transportation

Executive Summary

The question is how should state DOTs be planning for the new technologies that are emerging in the various automotive industries, including everything from changing manufacturing to fleet operations and connected vehicles/streets. While the technology is moving at a breakneck pace, there are still some concerns that will influence the rate of market penetration of connected/autonomous vehicles. There are differences of the technology, which can refer to vehicle to vehicle communication (safety, platooning), or vehicle to infrastructure (roadway conditions, signaling, etc.) The key items related to different responses by various parties.

- 1) Technology discussion and specifications will drive the willingness of trucking companies to integrate autonomous vehicles into their fleets.
- 2) The costs of deploying these new technologies must be profitable for private sector fleets to adopt.
- 3) Advantages of autonomous/connected trucks technology must be accessible to all users.
- 4) Safety comes before efficiency.

The rate of adoption will be determined by the ability of both Federal and State public sector regulatory functions to address the institutional/ operational constraints outlined by existing policies and programs, while addressing acceptability concerns by the general public.

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Meeting Overview/Agenda

The ITTS member states voted to have a pre-meeting on Autonomous trucks in conjunction with the I-95 Corridor Coalition's *Connected and Automated Vehicles Conference: What States Need to Know* on June 21-22, 2016.¹

Purpose of the meeting is to assess how State DOTs within the ITTS Region are considering connected/autonomous trucks in their current planning/operational programs.

Agenda	2:00-2:15	Introductions: Bruce Lambert
	2:15-3:00	Industry Presentations Lee Wagner, Western Express: Topic: how one firm looks at changing technologies and fleet adoption Ross Froat – (Technology and Maintenance Council) and American Trucking Association)
	3:00-3:30	State Response
	3:30-3:45	Break
	4:00-5:00	Open discussion on how states are viewing emerging technologies (Moderated by Bruce Lambert)

¹ <http://i95coalition.org/projects/connected-and-automated-vehicles/>

Summarized Areas of Interest

As the meeting's structure was to serve as a "pre-meeting" in conjunction to the I-95 Corridor Collation Meeting, the focus consisted more outlining areas of research about the technologies themselves, the rate of adoption of these technologies by the trucking industry, and the implications on statewide planning activities.²

This list is presented here only as a starting point for more research on autonomous and connected trucks. In no way should be considered an exhaustive list of items related to the adoption of connected and autonomous trucks or be assumed to represent the opinion of any single presenter or group.

- 1) To assist in identifying the different levels of automation, the U.S. Department of Transportation outlines a vehicle autonomy in the following manner:
 - a) **Level 0:** There is no automation and the truck is full operating by human, similar to our available cars now days.
 - b) **Level 1:** The acceleration and decelerations are partially autonomous depending on the driving environment. Very little aid in steering and cruise control.
 - c) **Level 2:** Partial automation in driving mode, more driving assistance will be active as steering and braking (Acceleration and deceleration). The pedals are fully automated.
 - d) **Level 3:** Conditional automation, driving is performed by automated driving system, which is fed by data from human driving tests and humans expectations. Therefore, all the drivers' role is to keep their brains on for safety; however the driver can ignore the road for two minutes, while the driving system is working efficiently.
 - e) **Level 4:** High automation, the truck has all the advantages of level (3); however, it does not even need the drivers' brains, hand or legs to be on.
 - f) **Level 5:** Full automation, no need for the driver at all, the car is driverless.

- 2) Truck platooning, defined for now as two tractor/trailer combinations running one behind the other with twelve to thirty meters of separation.³ Initially, both vehicles will have human drivers but the following truck will be aided by adaptive cruise control, automatic braking assist, lane assist, and possibly other modern collision-avoidance and self-driving technology, leaving the driver to simply engage and disengage from platooning; afterward, until the platooning function is disengaged, the following driver would not exercise active vehicle control. Discussion brought up the following:
 - a) Peleton Technologies, Inc. is developing the equipment needed for platooning;

² The comments made at the time of the conference and have not been attributed to any single attendee.

³ The notes on Truck Platooning were made by Richard Warner, West Virginia Department of Transportation

- b) Fuel economy is driving the platooning concept. Research shows that the lead truck will experience an approximate 5% improvement in fuel mileage, and the following truck 10%;
 - c) Liability is a concern; one large trucking company has already equipped its vehicles with wide-angle video cameras that continuously record the driver and the full view through the windshield on a 30-second loop. Hard-braking events and accidents are recorded and stored permanently;
 - d) Differing state regulations (examples: anti-convoy, anti-tailgating) ideally need to defer to a uniform national standard;
 - e) WIM and Pre-Pass issues need to be resolved;
 - f) An increased level of communication regarding bridge conditions, work zones, and weather will be necessary;
 - g) Platooning trucks may be restricted to the right lane unless weaving issues dictate otherwise;
 - h) Regarding driverless trucks, the American Trucking Association is preparing a policy for the industry. The increasing problem of driver and technician shortages is a serious concern and is expected to expedite adoption of this technology by the trucking industry;
 - i) NHTSA is requiring vehicle-to-vehicle communication technology on all 2018 light-duty vehicles. This is expected to be extended to heavy vehicles sometime afterward and will be a significant step toward the advent of driverless trucks, which have already undergone testing in the western US and in Europe;
 - j) FHWA's Turner-Fairbank research facility is testing platoons of two, three, and soon, four trucks;
 - k) Platooning is expected to be a continuing discussion issue until known problems are settled and nationwide regulation is in place.
- 3) Bridges (but can also be applied to hard assets): State Departments of Transportation are responsible for the building and maintenance of highways and related infrastructure, so it is important to understand what levels of information are necessary to the autonomous truck, either before or while it is travelling, related to roadway conditions.
- a) Weight limits
 - b) Operational space
 - c) Bridge management and data on bridge conditions
 - d) Pavement design
 - e) Do we need a new infrastructure in place to account for this activity?
 - f) Highway Performance Monitoring System (HPMS) submission
 - g) White lines, markings and other physical elements
 - h) Passive data collection (relation to wireless technologies)
 - i) Roadways will need to be fully marked/instrumented, but will fight for different communication bandwidth
- 4) Congestion mitigation: Does the location and flow of the traffic influence the benefits of automation?
- a) Smaller area flow signalization or Traffic jam assistance
 - b) Larger area drayage flows or managing Corridor applications vs. system

- 5) Horizon- adoption rate
 - a) Autonomous vs. connected vehicles have different rates in truck fleets as well as when applied to infrastructure related infrastructure needs
 - b) Cars will be adopted/accepted before trucks by general public
 - c) There will be changes in the concept of highway capacity as trucks can operate at higher speeds in closer proximity to each other.
 - d) Various entities will have different adoption rates as they will adopt various technologies to meet their needs.
 - e) There are already many autonomous functions on existing vehicles.
 - f) Discussion on truck platooning
 - g) How will inspection and fleet maintenance change
 - h) Will this be included on traditional 2 ½ year adoption by the mega carriers and trickle down to rest of truck operators?
 - i) Will managing fuel costs and approving of platooning lead to faster adoption by truck operators?

- 6) Reliability: System reliability will be important, as the autonomous truck could respond to more information regarding, speed, time, etc., but it will still be operating on the existing traffic areas.
 - a) Performance measures- can they be developed from these new technologies, and if so, what would they be when compared to existing Performance Measures
 - b) Managing work zones
 - c) Managing weather related delays

- 7) Long Ranging Planning: There are always challenges in balancing infrastructure: such as balancing current assets, with projected population growth and demand against the service availability (options) of passenger and goods movement. Does the technology change that historic relationship of landuse and transportation planning activities?
 - a) There will always be questions concerning how states can manage information along a corridor, or even develop frameworks for operational sharing
 - b) There are also questions regarding common operational frameworks that cross state boundaries
 - c) There are other questions concerning how an automated truck will respond to truck parking questions related to delivery times, as well as the role of what facilities will be needed to handle/offload these vehicles.
 - d) Will these vehicles be able to offset some of the associated congestion tied to urban or last mile movements?

- 8) Modal issues: Trucks operate in a competitive situation via other modes, so understanding the relationship of truck drayage or length of haul could have some relationship to mode share.
 - a) Does this compete with shortline railroads?
 - b) Traffic density must support this technology.

- c) Does this Autonomous Trucks into other modal operational issues, such as rail, to improve system efficiencies?
- 9) Legislative responses: Institutional frameworks influence how companies can deploy these trucks, so the question of what laws serve to both encourage or prohibit the adoption of autonomous vehicles will likely follow any technological gains.
- a) May differ at a state level (such as convoy regulations), a national level (HOS, other interstate commerce provisions) or even a local level (truck routes)
 - b) Metropolitan Planning Organizations (MPOs) may examine innovation to address non-attainment areas, which means can Congestion Mitigation Air Quality (CMAQ) or other funds be eligible for ITS, connected/autonomous studies?
- 10) Funding limits exist for State DOT's to respond to these new technologies, even if the regulatory framework encourages investment to support these trucks.
- a) Some is imposed by FHWA, federal regulations
 - b) Others are imposed by State budgets and legislators
 - c) Some new funding options should be explored to mitigate additional costs to State DOT's if traditional budgets do not allow for the funding to adopt to these new vehicles.
 - d) Move away from relying only upon taxes/user fees
 - e) Mileage based user fees may not be adequate as well
 - f) Limitation may not be with the ability of legislative options to encourage adoptability
 - g) Who wants to give up free access?
 - h) Platooning-if trucking spends \$100 billion on fuel, and can get a 6% reduction on fuel costs if deployed, that may mean less taxed fuels
- 11) Messaging: How will the public and private sector work on adopting these new technologies, but also how will the institutional frameworks regarding regulatory oversight, inspection and data share exist?
- a) Funding, including questions concerning aligning funding with emerging program needs
 - b) Questions of data sharing and partnerships
 - c) Who owns what information?
 - d) How do you manage the risks of adoption?
 - e) Need to better show the effects of economic benefits of adoption
 - f) That smarter vehicles will continue to be sold, can we adjust our institutional constrains in a more timely manner to support their adoption and to capture the public sector benefits afforded by these technologies?
 - g) Can the public sector get is "fair" share?
 - h) Trucks will adopt these technologies as they generate cost efficiencies/safety or to satisfy regulatory requirements

Resources Shared In Conjunction With Meeting

A Look at the Legal Environment for Driverless Vehicles

TRB's National Cooperative Highway Research Program (NCHRP) Legal Research Digest 69: A Look at the Legal Environment for Driverless Vehicles explores legal policy issues that may be associated with driverless vehicles. It provides an introduction to how civil and criminal liability may adhere to driverless vehicles, the implications of these vehicles for privacy and security, how these vehicles are likely to become subject to and potentially alter prevailing automobile insurance regimes, and other related topics. Project: [Project Information](#)
Project Number: 20-06/Topic 21-01

Peloton's presentation from the ITTS Conference in Tampa, 2014 <http://ittsresearch.org/2014conf/Peloton-ITTS%20freight%20in%20the%20southeast%20-%202014.pdf>

Review of Federal Motor Vehicle Safety Standards (FMVSS) for Automated Vehicles. Prepared by USDOT – John A. Volpe National Transportation Systems Center, Technology Innovation and Policy Division – DOT-VNTSC-OSTR-16-03

American Trucking Associations, Technology and Maintenance Council " **Recommendations Regarding Automated Driving and Platooning Systems**", Future Truck Program Position Paper: 2015-3, December 2015

American Trucking Associations, Technology and Maintenance Council " **Automated Driving and Platooning: Issues and Opportunities**", TMC IR 2-15-2.

American Trucking Associations, National Highway Traffic Safety Administration, U.S. Department of Transportation, **Docket #2016-0036.**

Attendees

In person:

Richard Bishop, Bishop Consulting

Thomas Blair- Missouri Department of Transportation

Brandon Brown, Louisiana Department of Transportation

Erik-Johnson, Virginia Department of Transportation

Bruce Lambert, Institute for Trade and Transportation Studies

Tom McQueen, Georgia Department of Transportation

Shane McKenzie, Kentucky Transportation Cabinet

Mike Roeth, North American Council for Freight Efficiency

MaryGrace Parker, I-95 Corridor Coalition

Shane Sawyer, Virginia Department of Transportation

Richard Warner, West Virginia Department of Transportation

Andrew Warren, Arkansas Highway and Transportation Department

On phone:

Ross Froat, American Trucking Associations

Michael Henry, Arkansas Highway and Transportation Department

Phil Jones, Louisiana Department of Transportation and Development

Libby Ogard, Prime Focus LLC

Virginia Porta, Arkansas Highway and Transportation Department

Lee Wagner, Western Express