U.S. Department of Transportation
ITS Joint Program Office

U.S. DOT Research in Truck Platooning

TRB Session 1468

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ITS JPO | U.S. DOT

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Outline

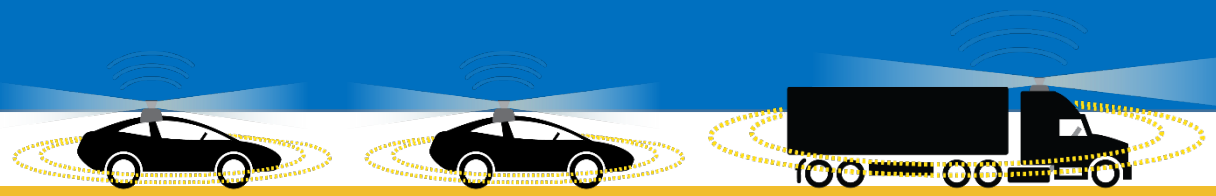
- Cooperative automation research at USDOT
- Truck platooning research results
- On-going and planned platooning research

Preparing for the Future of Transportation: *Automated Vehicles 3.0*

https://www.transportation.gov/av/3

U.S. Department of Transportation

COOPERATIVE AUTOMATION
Research Program



Safely improve the operational efficiency and maximize capacity of our Nation's urban and rural roadways

RESEARCH FOCUSED ON ARTERIAL AND FREEWAYS

Source: FHWA.

Reduce fuel consumption at intersections by 20 percent.

Source: FHWA.

Fuel savings of 10 percent.

Source: FHWA.

Double capacity of existing lanes.

U.S. Department of Transportation
Federal Highway Administration

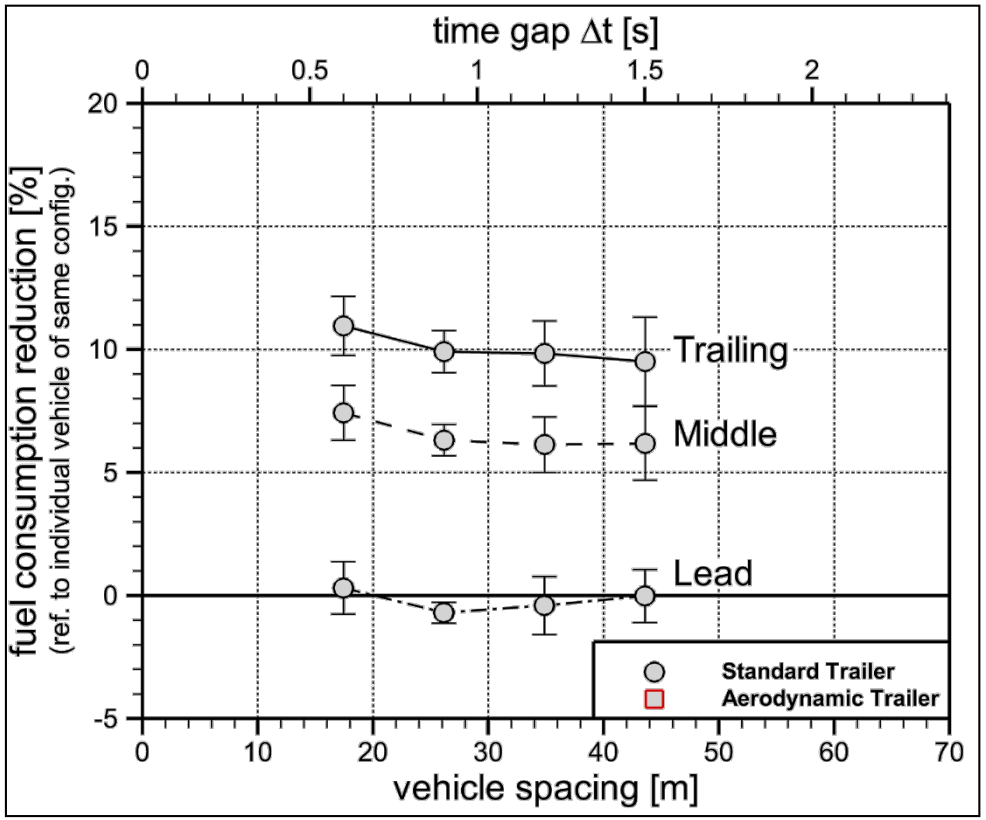
Research Results

FHWA EAR Driver Assistive Truck Platooning (Level 1)

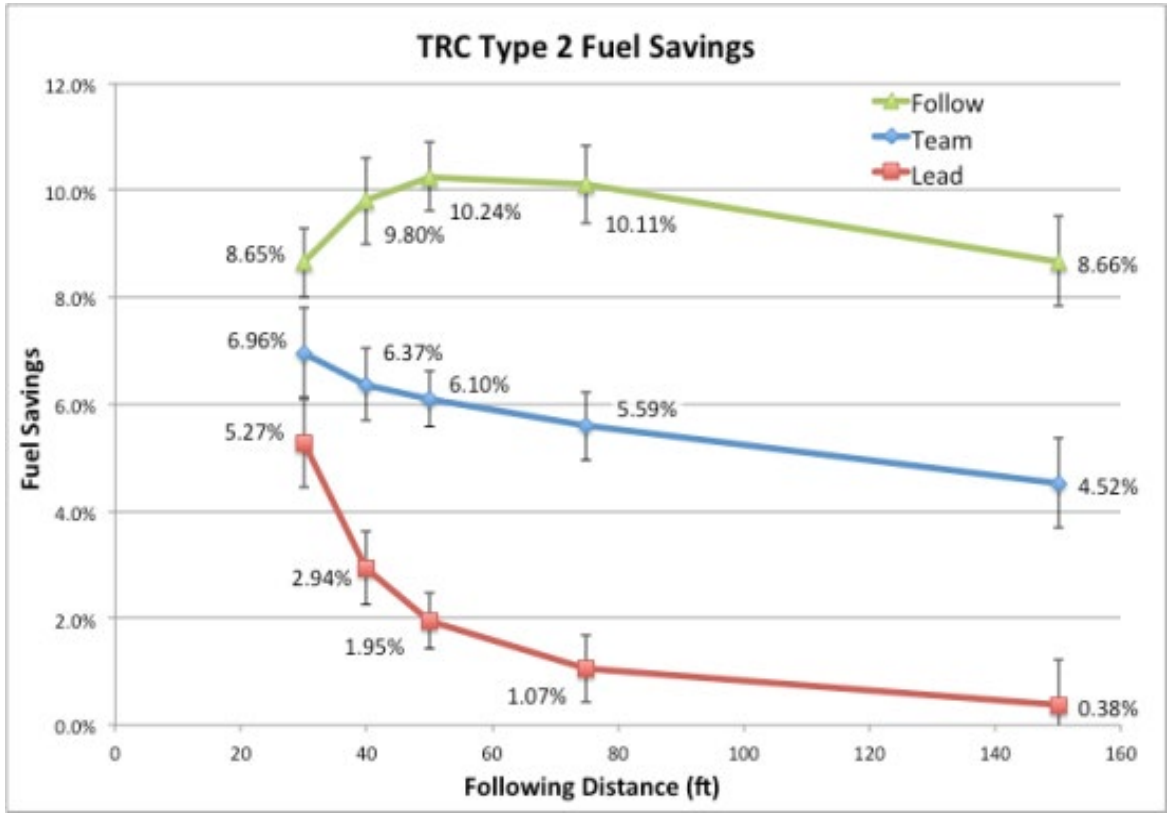
- Caltrans/Volvo
  - Three-truck platoon
  - Vehicles already equipped with production ACC
  - Lead truck either manually or automatically (ACC) driven
  - Gap is based on time headway – consistent with driver preference
- Auburn U./Peterbilt
  - Two-truck platoon
  - Business case analysis
  - Vehicle and aerodynamics simulation/analysis
  - Platoon formation modeling
  - Traffic modeling

Fuel Economy Testing Results

Caltrans/Volvo – 3-Truck Platoon



Auburn/Peterbilt – 2-Truck Platoon



Naturalistic Driving Study

- Used previous naturalistic, heavy truck data sets to quantify heavy-truck following behavior and expand understanding of how heavy trucks follow light vehicles and other trucks:
  - Safety Pilot Model Deployment heavy truck database.
  - Integrated Vehicle-Based Safety System (IVBSS) database.
- Important Findings:
  - 75% of heavy vehicle drivers follow other vehicles with a time gap of 2.5 second or less.
  - 70% of cut-ins occur at time headways of 2.5 second or less.

Naturalistic Study of Truck Following Behavior; 2016 Final Report: https://rosap.ntl.bts.gov/view/dot/12251

Research Underway

Truck Platooning Human Factors Study

- Question: How will other road users respond to and navigate around a “wall of trucks” on the freeway?
- Approach: Driving Simulator study with test subjects.
- Focus areas, impacts on:
  - Merging in between, ahead of, or behind platoon trucks.
  - Visibility of road signs.
- Variables:
  - Number of trucks and spacing between trucks.
  - Displays on trucks or roadside indicating truck platoon operation status.

Truck Platooning Impacts on Bridges Phase I – Structural Safety

- Objective:
  - Recommend load models for bridge evaluation
  - Propose design specification modifications
- Interim reports
  - Parametric Analysis (Spring 2019)
  - Sample Bridge Analysis (Fall 2019)
  - Proposed Load Rating Methodology (Spring 2020)
  - Potential Impacts of Platooning on Design (Spring 2020)

Truck Platooning Early Deployment Assessments (Phase 1)

- Goal – To measure the safety and operational impacts of truck platooning on truck drivers, surrounding traffic and infrastructure on select public roadways.
- Strategy – Partner with industry, shippers, and state agencies and leverage planned early deployments of truck platooning.
- Approach – Issue a two-phase Broad Agency Announcement (BAA).
  - Phase 1 – Develop plans and proposal for evaluation of in-service truck platoons.
    - Up to 3 awards, 9-month period of performance.
  - Phase 2 – Conduct evaluation.
    - Number of awards TBD, only Phase 1 awardees eligible.
  - Independent Evaluator for Phases 1 and 2.

VOLPE ITS-JPO FMCSA FHWA

CARMA 3

USDOT Multi-Modal Partnership

U.S. Department of Transportation

Federal Highway Administration
Office of Operations
Office of Operations R&D
Office of Safety R&D

Federal Motor Carrier Safety Administration (FMCSA)
Technology Division
Research Division

Intelligent Transportation Systems Joint Program Office (ITSJPO)
Vehicle Safety and Automation
Data Program

Volpe National Transportation Systems Center
Advanced Vehicle Technology Division

Source: FHWA.

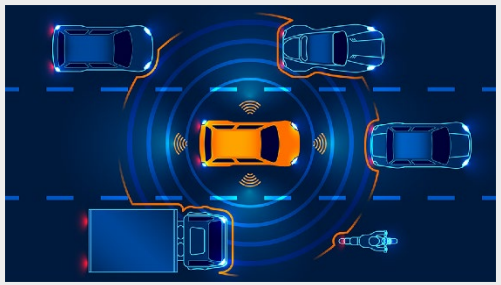
CARMA 3 APPROACH

Advancing CADS research with FHWA and FMCSA fleet and partnerships

CARMA PLATFORM

Source: FHWA.

- Expand cooperative automation capabilities.
- Develop proof of concepts to support TSMO use cases.
- Collaborate with Infrastructure Owner-Operator (IOO)/Original Equipment Manufacturers (OEM) community.



- Leverage Autoware OSS development.
- Enable automated driving systems (ADS) Level 2–3 capabilities.
- Engage ADS community.

Autoware PLATFORM

COOPERATIVE AUTOMATION

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CARMA site –https://highways.dot.gov/research/research-programs/operations/CARMA

GitHub Site – https://github.com/usdot-fhwa-stol

Confluence Site – https://usdot-carma.atlassian.net/wiki

Automated Driving System Demonstration Grants

- Goals of the ADS Demonstration grants:
  - Safety: Test the safe integration of ADS into the nation's on-road transportation system.
  - Data for Safety Analysis and Rulemaking: Ensure significant data gathering and sharing of project data with USDOT and the public throughout the project in near real time.
  - Collaboration: Work with innovative State and local governments and private partners to create collaborative environments that harness the collective expertise, ingenuity, and knowledge of multiple stakeholders
- https://www.transportation.gov/av/grants
- Webinar on January 24, 2019

For More Information

transportation.gov/av

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