

FHWA Level 1 Truck Platooning Research Program

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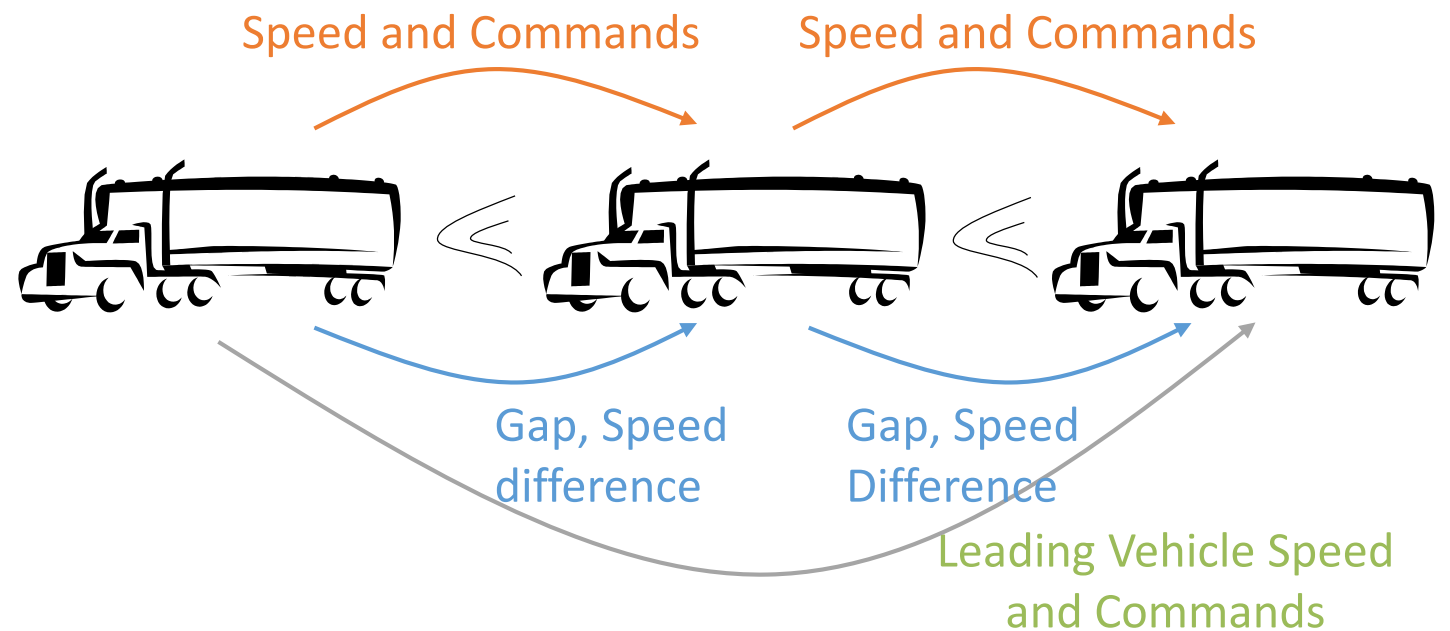
Outline

- What is Level 1 Truck Platooning?
- Previous FHWA Research
- Human Factors Truck Platooning Project
- Phase 1 Truck Platooning Early Deployment Assessments



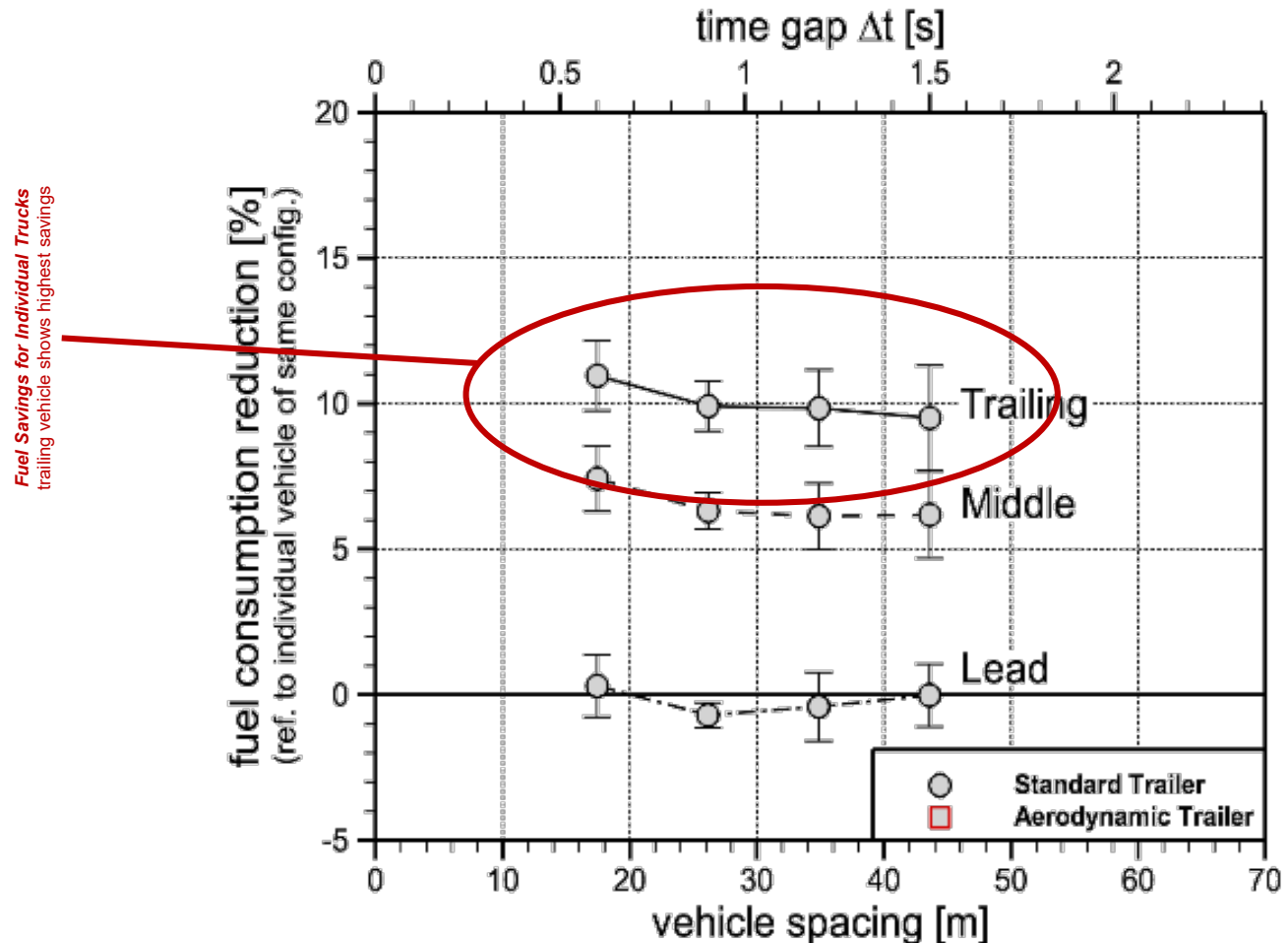
What is Level 1 Truck Platooning?

- Two or more trucks platoon with vehicle-to-vehicle (V2V) communication.
- Longitudinal control only (throttle and brakes), driver steers the truck.
- Vehicles already equipped with production adaptive cruise control (ACC).
- Speed of lead truck either manually or automatically (ACC) controlled.
- Gap is typically based on time headway – consistent with driver preference.



Potential Benefits

- Energy and emissions savings from aerodynamic drag reduction.
- Reduced highway congestion (shorter following distance).
- Possible safety improvements from faster reaction times and supporting systems (e.g., Automatic emergency braking (AEB), air-disc brakes, etc.).
- Reduced driver workload.



Previous FHWA Research

- Naturalistic Truck Study
 - Mined existing datasets to quantify heavy-truck following behavior and expand the understanding of how heavy trucks follow light vehicles and other trucks.
- Exploratory Advanced Research (EAR) Projects
 - Caltrans/California PATH: Three-truck Level 1 Platooning System.
 - Auburn University: Two-truck Level 1 Platooning System.
- Antenna Placement Study
 - Modeled various configurations and terrains.



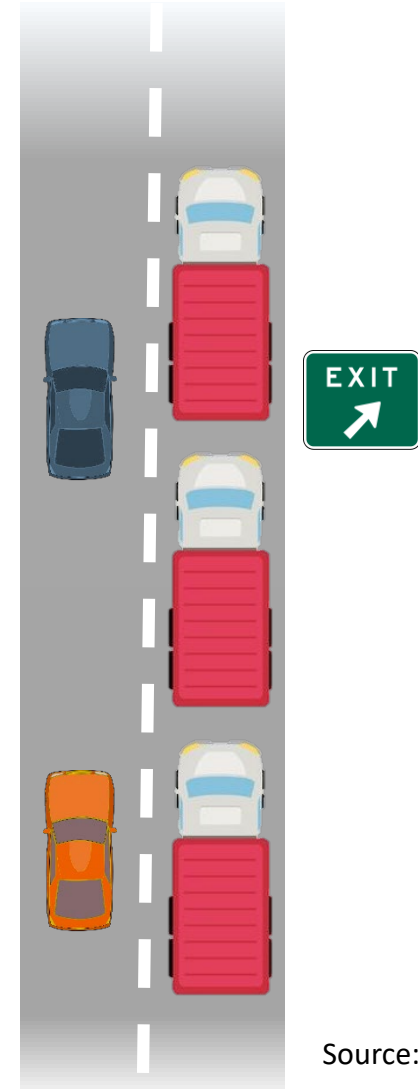
Human Factors Truck Platooning Project



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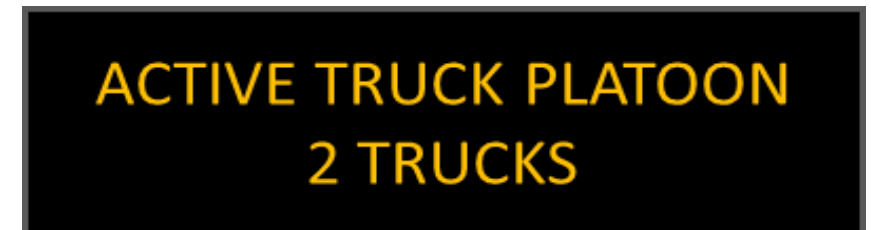
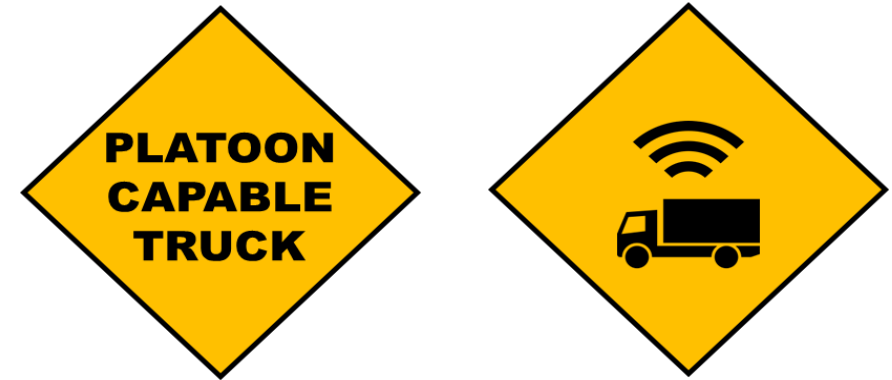
Human Factors Issues Related to Truck Platooning Operations

- Human Factors Truck Platooning
 - Goal: Investigate human factors issues associated with traveling near a truck platoon.
- Main issues researched:
 - Freeway entry/exit.
 - Visual indicator/other road user recognition of platooning.
 - Prior knowledge of other road users.
- Approach:
 - Sign Laboratory Study.
 - Driving Simulator Study.



Sign Laboratory Study

- Test comprehension for various visual indicators.
- Show clips of simulated trucks near highway entrance and exit and ask participants to report their understanding and likely actions.



Driving Simulator Study

- Subjects experience driving a passenger car in the presence of truck platoons:
 - Two-truck and three-truck platoons will be simulated.
 - Focus is on freeway entry and exit.
- Twinning with EC ENSEMBLE project:
 - ENSEMBLE is focused on the development and testing of multibrand truck platoon operations.
 - The “Twinning” component is on the driving simulator study, which has similar goals and objectives to the FHWA driving simulator study.



Truck Platooning Early Deployment Assessments



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Truck Platooning Early Deployment Assessments – Goals

- To understand how truck platoons will operate in a realistic, operational environment.
 - Previous research involved limited testing and demonstration in a real-world environment.
- To inform State and local stakeholders that are making decisions related to truck platooning regulations.



Source: FHWA



Approach

- Assess various aspects of in-service truck platoons on their common delivery routes over an extended time period.
- Collect a variety of data, both technical and operational, related to the vehicles, environment, and drivers to assess safety, efficiency, and mobility impacts.
- Partner with and leverage current industry and State agency plans for truck platooning operations.
- Use a two-phase approach.



Two Phase Approach – Phase 1

Phase 1 – Concept Development

- *Key deliverables:*
 - Deployment Operational Concept.
 - Partnership Plan.
 - Test and Performance Evaluation Plan.
 - Phase 2 Readiness Assessment.
 - Phase 2 Proposal.
- Three Phase 1 Contracts were awarded in early March 2019.
- Each contract is worth approximately \$500K with a nine-month Period of Performance.



Two Phase Approach – Phase 2

Phase 2 – Test / Deploy / Evaluate

- *Key activities:*
 - Establish partnerships.
 - Recruit and train truck drivers.
 - Test the system.
 - Execute deployment.
 - Evaluate and publish results.
- One or more Phase 2 awards.
- Only Phase 1 contractors are eligible to compete for Phase 2.



Source: FHWA



Phase 1 – Initial Team Composition

Lead	Platooning Tech	State/ Local	Academic	Fleet	Other
Battelle	Volvo Group		Penn State, University of Michigan Transportation Research Institute (UMTRI)	Saia LTL Freight	Battelle, CAR, SAE International
California PATH	Volvo Group, California PATH	Caltrans, California Highway Patrol, I-10 Corridor Coalition	California PATH		Cambridge Systematics, Westat
CDM Smith	Robert Bosch	Columbus Region Logistics Council, Ohio DOT/Drive Ohio, Ohio Turnpike Commission	Ohio State University	Anheuser-Busch	CDM Smith, BGM Consulting, Sutra Research and Analytics

Phase 1 – Status

- Three teams are working with Noblis, the Phase 1 Independent Evaluator, to ensure a common understanding of performance measurement goals and expectations for evaluation plans.
- Noblis and USDOT team recently established a set of evaluation performance measure requirements.
- Competition Sensitivity
 - All three teams are vying for a Phase 2 award(s).
 - This limits the information that can be shared on the Phase 1 project.
 - Each team's approach and plans are not shared with others.



Phase 1 – Performance Measure Requirements

Performance Measure Category	No. of Requirements
OP – Platoon Operational Characteristics	4
S – Safety	12
M – Mobility	3
EE – Energy and Emissions	2
FLT – Fleet Operator and Driver Impacts	7
II – Infrastructure Impacts	3
SL – State and Local Government Impacts	2
VED – Vehicle Equipment Design Implications	3

USDOT has identified a priority level for each requirement within this project to recognize resource constraints and provide teams with flexibility in measurement strategies:

- Most Important.
- Important.
- Desirable.



Questions?



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