

Future Freight Transportation

presented by

Edward McCormack - **University of Washington**

Mark Jensen – **Cambridge Systematics**



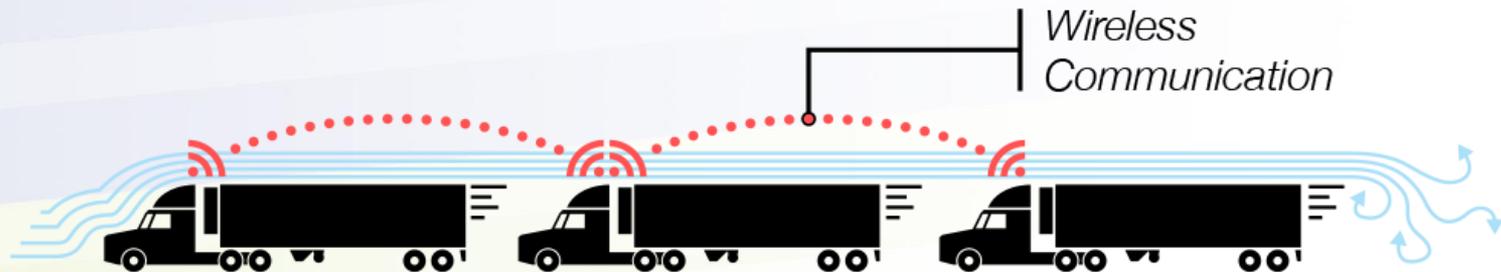
Think  Forward

Truck Platooning Concept



Without Platooning

Large gaps are needed to ensure the following driver has enough time to react.



With Platooning

Automatic control means shorter gaps are possible without compromising safety.

Truck Platooning: The Need

➤ Driver Shortage

- » Truck driver shortage that is forecasted to worsen over the next decade – the median age of the driver force is about 50 years

➤ Hours of Service (HOS) Regulations

- » Federal Motor Carrier Safety Administration (FMCSA) Hours of Service (HOS) regulations provide time limitations (hours/day hours/week, break rules)

➤ Safety

- » 3,852 people died in large truck crashes in 2015 – about 70% were occupants of cars and other passenger vehicles

➤ Infrastructure

- » Corridors with vehicles and trucks that are both connected and automated can have significantly closer vehicle spacing and can dramatically increased roadway capacity

Truck Platooning Benefits



Less Congestion

Capacity improvements result in less delays and better travel time reliability.



Cost Savings

Typical fuel savings average 5-10% for all trucks when platooning.



Improved Safety

Automated control of braking and accelerating reduces crash frequency and severity.



Enhanced Driver Comfort

Platooning technology takes much of the stress out of stop-and-go driving.

Capacity Outcomes

- Simulated lane capacity increase of up to 50% based on I-170 Simulation of Dedicated Truck Lanes

Environmental Outcomes

- 20%–25% reduction in emissions and fuel use from wind tunnel tests.
- 20% increase in fuel economy with CHAUFFEUR.
- 8%–15% fuel savings with five-vehicle platoons on high-speed test track.
- 8% improvement in fuel economy with three-truck platoons in Japan.
- 4%–18% improvement in fuel economy with three-truck platoons on Nevada highway.

California's Truck Platooning Test Program

I-710 Freight Corridor Fundamental Concept

Vehicle-to-roadside communications

Trucks use automated driving technologies, including truck platooning

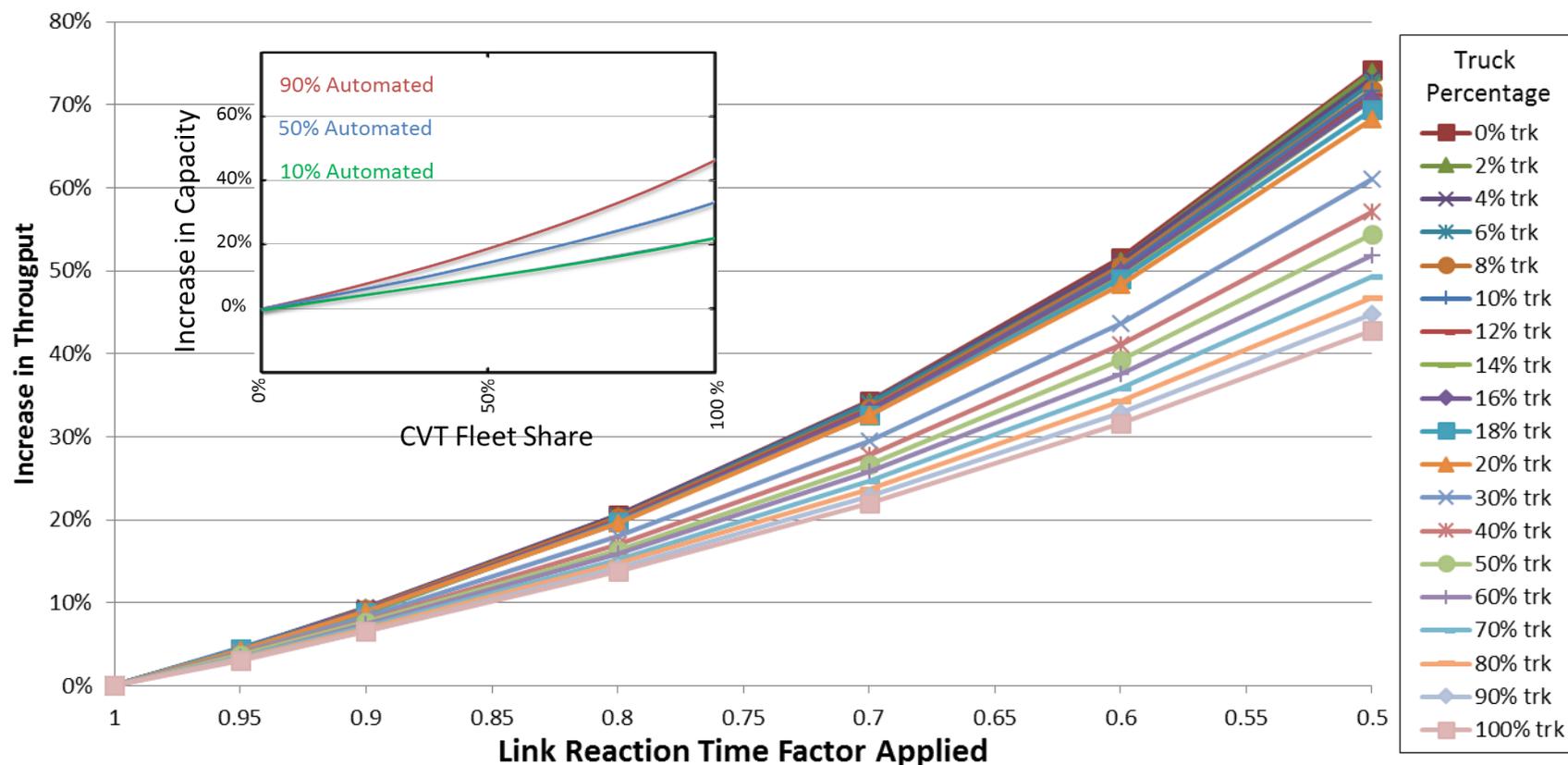
Dedicated four-lane roadway

Cars prohibited (they must use the existing freeway)



California's Truck Platooning Test Program

I-710 Dedicated Truck Lanes Impact



- Mesosimulation: CV effects simulated using adjustments to saturation flows (capacity).
- Different factors used depending on facility type and CV strategy being considered.

California's Truck Platooning Test Program

Legislative Changes for C/AV

- Many states have “Anti-Convoy” laws that preclude truck platooning
- California’s Anti-Caravanning Law requires a minimum spacing of 100 feet.
 - » Law was recently amended to allow for shorter headways for testing purposes only



Source: Oshkosh Northwestern

California's Truck Platooning Test Program

Trucking Co. Interview Highlights

- How likely do you think drivers will be to use truck platooning technology?
 - » A little over half of the respondents were either “very likely” or “likely” to use platooning technology
- When near other platoon-capable trucks, whom would you be willing to form platoons with?
 - » Willingness to platoon within pre-established or known fleets
 - » Less willingness to randomly platoon with independent owner-operated trucks
- What is the necessary payback or break-even time period you would need from this system?
 - » Large majority indicated a 1-year time frame was appropriate

Truck Platooning Industry Acceptance

- Large companies with relatively high densities of trucks along major corridors could deploy platooning with confidence
 - » Companies are beginning to view the technology as economically feasible, provided that payback periods are achievable within the first one to two years.
- Business models for enabling different operator-owned fleets to participate in a platoon were an issue of concern
 - » Also, issue of lead truck versus following truck differing mileage benefits can be addressed in several ways
- Security of the futuristic information technology-based infrastructure that could support platooning is a concern
 - » This is a broader issue that AV technology must address

Leveraging FRATIS Technologies to Extend Electric Truck Range

- Adapt the the following Applications for the Environment: Real-Time Information Synthesis (AERIS) applications for a truck in-vehicle driver feedback system:
 - » Eco-Routing tool that suggests the most fuel-efficient route from one stop to the next;
 - » Eco-Driving tool that provides timely information, recommendations, and warnings regarding fuel-efficient vehicle operation; and
 - » Eco-Score tool that provides a means for driving performance tracking, self-evaluation, and peer comparison.
 - This driving feedback system was successfully tested on a fleet of 45 public sector utility vehicles in Riverside, CA
- FRATIS and AERIS elements are integrated into one “**ecoFRATIS**” system

EcoFRATIS Application Benefits

- FRATIS Optimization of port truck trips results in reductions of VMT of 10 percent or more
- AERIS eco-driving applications will result in MPG improvements of 10 percent or more



- The integration of the above applications – to create the “eco-FRATIS” application will result in 20% or greater improvements in energy usage and corresponding emissions reductions
 - » Range of electric vehicles will be extended by 20%

I-35 FRATIS

- Provide trucking companies with traveler information to deal with massive construction projects on I-35 in central Texas
- Customized feed (Freight Solver) was offered to trucking companies
- Being tested on a national and regional carrier with a before and after evaluation
- Developing guidance to support other transportation agencies' efforts to effectively share construction information with freight community

Freight Solver for Freight Community

I-35 Trip Data

Custom Feeds

Freight 7-Day Closure Forecast

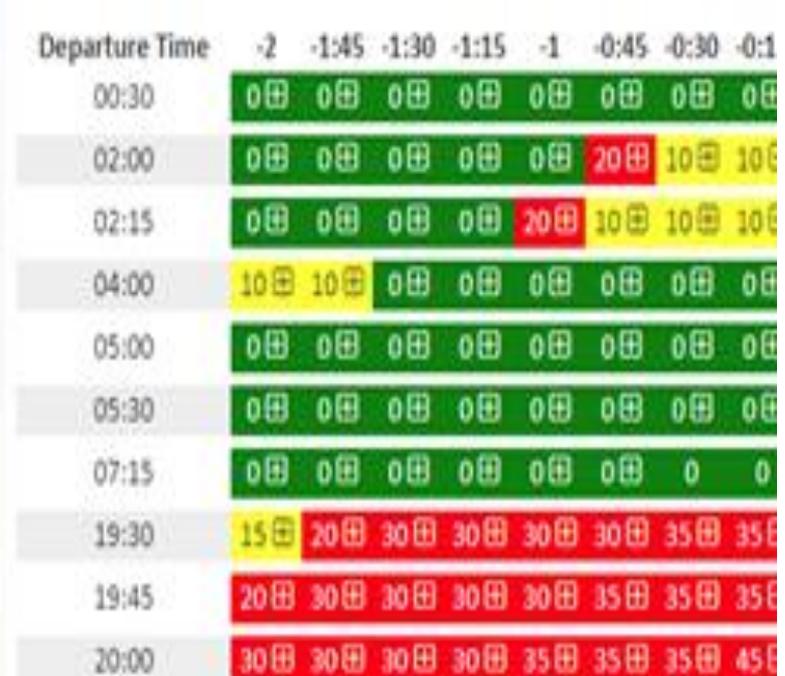
LISTING COVERS 7AM WEDNESDAY, OCTOBER 18 THROUGH 7AM WEDNESDAY, OCTOBER 25

This listing is subject to change due to inclement weather or other unforeseen events that may occur.

▲ NB NORTHBOUND
 ▼ SB SOUTHBOUND
 ↔ CR CROSS ROAD
 ■ HIGH IMPACT CLOSURE

HILLSBORO THRU WAXAHACHIE (I-35E)

	DATES/TIMES	LOCATION	ROADWAY	CLOSED	MAP
↔	10/18 - 10/18, 9AM - 3PM	WB US 287 Business at I-35 E, Waxahachie	US 287 Business	Right lane	LINK
▼	10/18 - 10/19, 6PM - 7AM	FM 308 to FM 566, Milford	I-35 E Mainlanes (MM 382.0)	Left lane	LINK
DELAY	7PM 8PM 9PM 10PM 11PM 12AM 1AM 2AM 3AM 4AM 5AM 6AM				
10/18					
▲	10/18 - 10/19, 6PM - 7AM	Pecan to Pecan Tree Rd, Forresteron	I-35 E Mainlanes (MM 392.7)	Right lane	LINK
DELAY	7PM 8PM 9PM 10PM 11PM 12AM 1AM 2AM 3AM 4AM 5AM 6AM				
10/18					
▼	10/18 - 10/19, 8PM - 6AM	Sterrett Rd to US-287, Waxahachie	I-35 E Mainlanes (MM 407.5)	Left lane	LINK
DELAY	7PM 8PM 9PM 10PM 11PM 12AM 1AM 2AM 3AM 4AM 5AM 6AM				
10/18	5 5				
▲	10/18 - 10/19, 8PM - 6AM	Brookside Rd to FM 66, Waxahachie	I-35 E Mainlanes (MM 400.0)	Left lane	LINK



Concluding Thoughts

- All these freight technologies have environmental benefits (and reduce costs)
 - » Platooning of trucks reduces congestion
 - » EcoFRATIS increases the range of electric trucks which makes them much more feasible
 - » I-35 FRATIS results in fewer delays during a trip
- All are a win – win for public and private sector