# Truck Platooning

Image based on photo courtesy Peloton Technology.
https://peloton-tech.com/multimedia/

## A Report from the MAASTO Working Group and Mid-America Freight Coalition

MAASTO
MID AMERICA ASSOCIATION OF STATE TRANSPORTATION OFFICIALS

MID-AMERICA FREIGHT COALITION

Illinois Department of Transportation

INDIANA DEPARTMENT OF TRANSPORTATION
INDOT

IOWA DOT

AD ASTRA PER ASPERA
Kansas Department of Transportation

KENTUCKY TRANSPORTATION CABINET

MDOT
Michigan Department of Transportation

DEPARTMENT OF TRANSPORTATION

MoDOT

OHIO DEPARTMENT OF TRANSPORTATION

WISCONSIN DEPARTMENT OF TRANSPORTATION

# About this Project

The purpose of this project is to understand the regulatory and operational issues that need to be addressed in order to operate truck platooning across multi-state freight corridors. The results will define regulatory and operational scenarios that support truck platooning, promote safety, and advance greater efficiency in the industry. Our goal is to have the 10 states of the Mid America Association of State Transportation Officials (MAASTO) region ready to support rapidly evolving trends in the trucking industry as exemplified by truck platooning.

# What is Truck Platooning?

Platooning is the practice of electronically “coupling” two or more trucks in order to allow significantly shorter gaps between them. Vehicle platooning uses radar and vehicle-to-vehicle communications to form and maintain a tight formation.

There is a driver behind the wheel of each truck. In general, there is some automation of functionality, such as electronically coupled braking and cloud-based communication between the trucks, but a driver is required to remain engaged with the driving task and monitor the environment at all times.

# Drafting

Truck platooning increases fuel efficiency by reducing aerodynamic drag. The benefits are especially relevant over long distances where most of a truck’s fuel is spent on pushing the truck through the surrounding air.

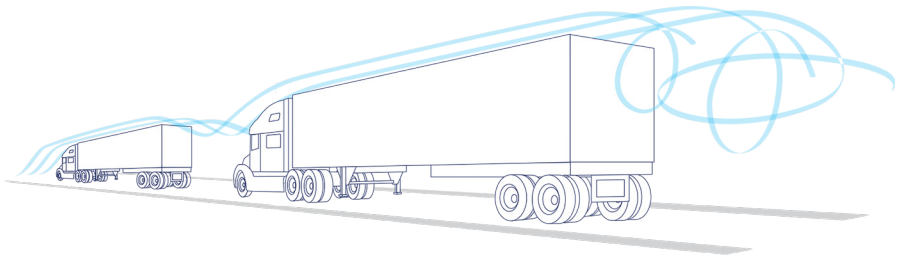


Image source: Peloton Technology
https://peloton-tech.com/how-it-works/

# State Truck Platooning Laws

As of December 2017, eleven states had amended their state laws to specifically permit truck platooning in some capacity. Key features from the laws that have been approved include:

## PROVIDING A DEFINITION

Nine of the 11 states included either a definition of the truck platooning concept (MI, NV, TN), a definition of the technology used in truck platooning (TX), or a combination of the two (AR, FL, GA, NC, SC). In some cases (AR, FL), the definition requires that some features of operating a vehicle such as steering controls and systems monitoring remain with a human operator. One state (TN), defines "operator" for the purposes of truck platoon to be the person in control of the lead vehicle.

## FOLLOWING TOO CLOSELY

An exemption from the state's following too closely law for truck platooning is a feature of the legislation enacted in all eleven states.

## REQUIREMENTS TO SUBMIT A PLAN FOR TRUCK PLATOONING

Three (AR, MI, TN) of the eight states that permit platooning require that platoon operators first submit a plan to appropriate state officials. Appropriate state officials include the state DOT (or transportation commission) in all three states and the state safety agency in two (MI, TN) of the three states. State officials have a prescribed period of time in which to reject the plan (30 or 45 days) or it is considered to be approved.

## STATE DOT APPROVAL

One state (NC) requires the DOT to approve a truck platoon by traffic ordinance. This appears to have the same effect as requiring a plan.

## STUDY OR PILOT PROGRAM

Platooning is permitted only as part of a study or pilot program in three states (CA, FL, UT).

## ELECTRONIC DISPLAYS INSIDE VEHICLES

One state (FL) expressly permits the use of electronic displays visible to vehicle operators inside trucks equipped with platooning technology.

## FOLLOW ALL APPLICABLE LAWS

One state (NV) requires that trucks using platooning technology must be capable of being operated in compliance with vehicle and traffic law unless granted an exemption from the state.

## FLEXIBILITY FOR CARRYING VEHICLE REGISTRATION

One state (TN) allows the vehicle registrations for all platooned trucks to reside in the lead vehicle rather than requiring it to reside in each vehicle in the platoon.

## REQUIREMENT FOR A LICENSED DRIVER

While some level of vehicle automation is required to maintain a platoon of vehicles, it appears that most state laws envision (but may not specifically require) a driver to be in control of some of the vehicle operations. Three states (CA, MI, TN) specifically require that a properly licensed driver be present behind the wheel of each vehicle in a platoon. As noted in the definition paragraph above, in two states (AR, FL) the definition of truck platooning requires that some features of operating a vehicle such as steering controls and systems monitoring remain with a human operator.

In addition to the features noted above, seven of the states with platooning laws also enacted laws that deal more broadly with autonomous vehicles (AV) or technology. It is possible that language in AV laws could serve to expand the authorizations for platooning. These AV laws were not closely inspected as part of this analysis of state truck platooning laws.

# Why Truck Platooning?

- Overall freight volumes are expected to increase by 20% by 2024 with the trucking industry taking on a higher percentage of the overall freight tonnage.
- Technology is available today that makes truck platooning an attractive option for fuel savings, improved safety, and pollution reduction.

## Fuel Savings

- Truck Platooning saves fuel by reducing wind resistance between trucks when the distance between trucks is reduced.
- While trucks make up just 4% of the vehicles on the road, they consume 20% of transportation fuel.

## Reduced Congestion

- Congestion may be reduced through fewer accidents and improved notification for drivers of congestion so they can choose an alternative route.
- Capacity is improved due to reduced following distances and more consistent traffic flow.

**29%**

Transportation's portion of 2016 petroleum-based energy consumption in the U.S. in 2016.

**10%**

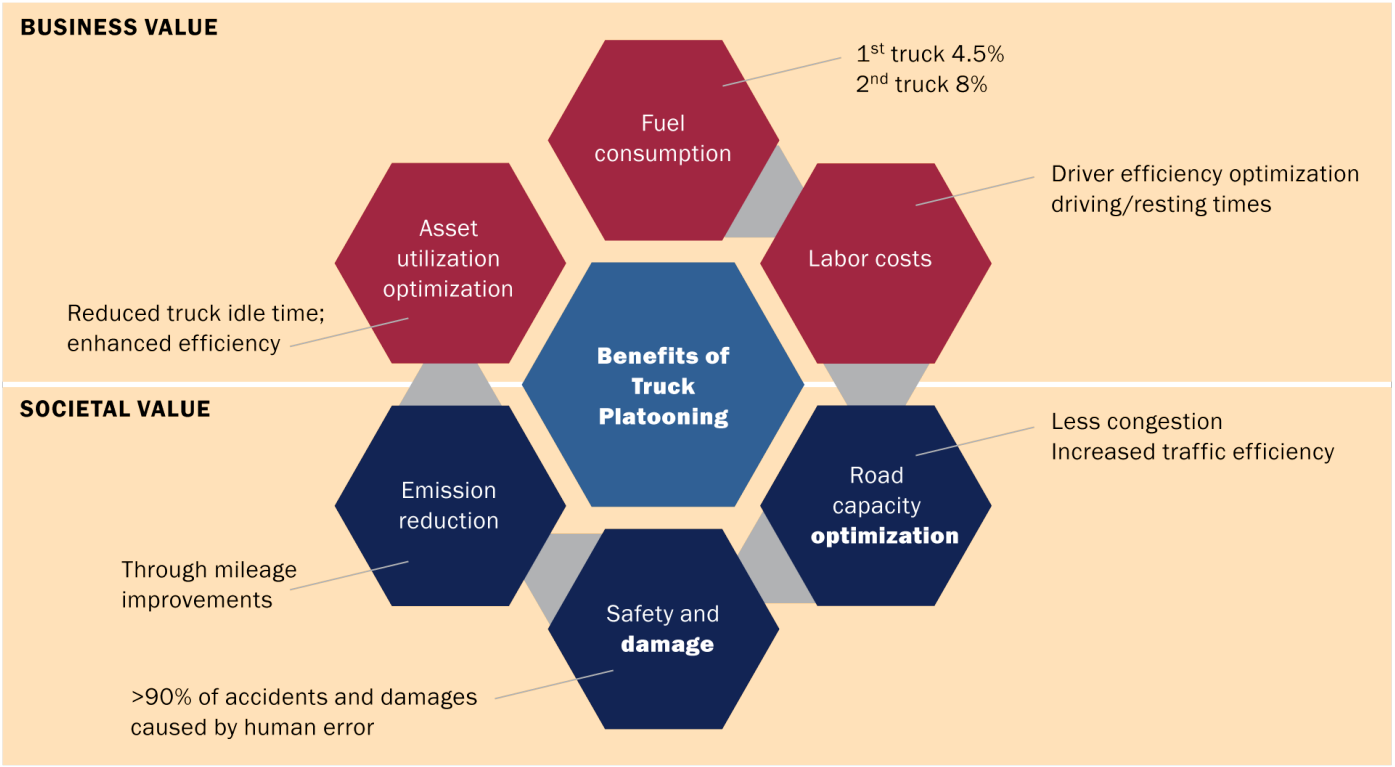
Portion of U.S. oil consumed in long-haul trucking annually.

**38%**

Portion of fleet operating expenses devoted to fuel.

**6.7%**

Average reduction in fuel use for platoons.




Graphic based on diagram by TNO in "Truck Platooning - Driving the Future of Transportation."
http://orfe.princeton.edu/~alaink/SmartDrivingCars/PDFs/TruckPlatooning-TNO.pdf

## Improved Safety

- Commercially available radar-based Forward Collision Avoidance and Mitigation (FCAM) Systems can reduce the frequency and severity of front and rear-end collisions, the most frequent types of truck-related crashes and crash-related fatalities.
- A study by Con-way Freight (now XPO Logistics) using its fleet of about 12,600 trucks over 30 months found a 71% reduction in rear-end collisions with the use of FCAM systems.
- Vehicle-to-vehicle communication allows the following trucks to react to problems encountered by the lead truck much faster than a driver would be able to react.
- A study by the US DOT and Volvo with 100 trucks over three years revealed that 80% of drivers preferred to drive with collision-avoidance systems in place. There was a 37% reduction in "conflicts" such as hard-braking situations that could result in collision.

## Reduced Pollution

With 22.4 lbs. of $CO_2$ produced per gallon of diesel fuel, a reduction of nearly 7% in the number of gallons used has a direct impact on air quality. Consider an example of two trucks operating independently and traveling 300 miles each. They might typically use a combined total of 100 gallons of diesel that produces 2,238 lbs of $CO_2$. With truck platooning, fuel consumption can be reduced by 4.5% for the lead truck and 10% for the following truck. As a result, the combined fuel consumption of both trucks would drop to 93.30 gallons and results in 2,088.05 lbs. of $CO_2$, a reduction of 149.95 lbs. of $CO_2$.

| ENVIRONMENTAL BENEFITS FROM TRUCK PLATOONING | | | | |
|---|---|---|---|---|
| | **Green House Gases** | **Volatile Organic Compounds** | **Nitrogen Oxides** | **Particulate Matter** |
| Beginning gallons of diesel | 100 | 100 | 100 | 100 |
| VOCs at 600 miles at 6 mpg | 600 | 600 | 600 | 600 |
| Amount with 100 gallons | 2,238.00 lbs. | 268.20 grams | 5,167.81 grams | 121.20 grams |
| Gallons diesel with 6.7% reduction | 93.30 | 93.30 | 93.30 | 93.30 |
| Amount after 6.7% reduction | 2088.05 lbs. | 250.23 grams | 4821.56 grams | 113.08 grams |
| **Savings** | **149.95 lbs.** | **17.97 grams** | **346 grams** | **8.12 grams** |

# Businesses are Interested in Truck Platooning

Testing of truck platooning is taking place in several states including California. Venture capital is flowing toward these efforts. A slew of major trucking manufacturers have invested in platooning technology. Companies with near-commercial and/or prototype systems include:

DAIMLER

Continental

DAF

VOLVO

NAVISTAR™

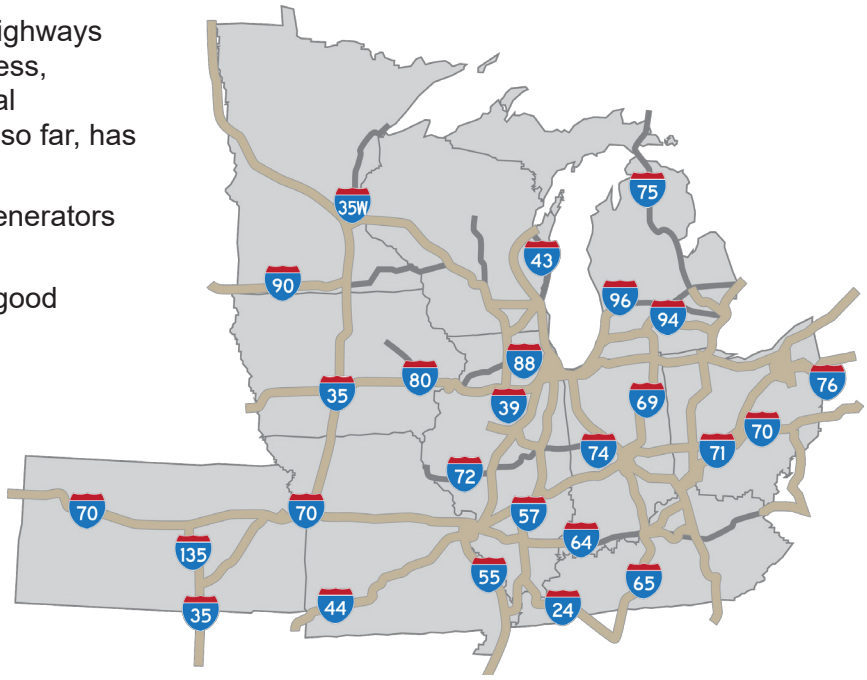
Peloton

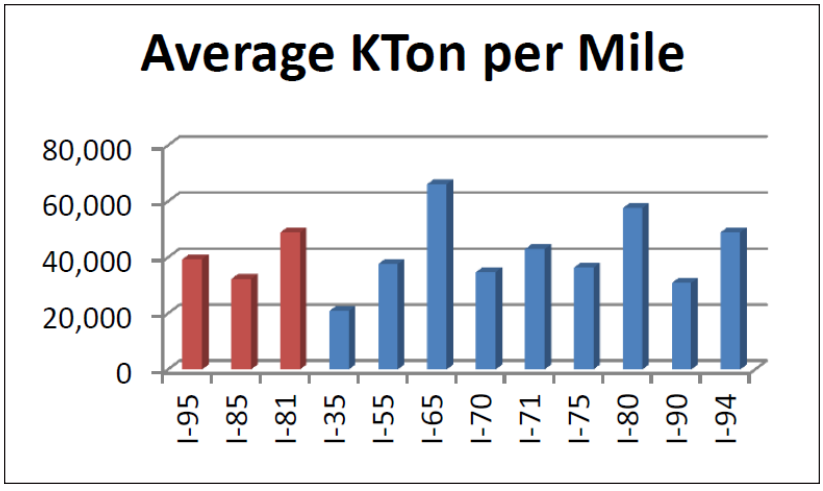
Cummins

# Potential Corridors for Truck Platooning in the Midwest

## Corridor Considerations

- Interstates and four-lane, divided highways are preferred due to controlled access, uniformity, and regional and national connectivity. 70% of all platooning, so far, has been on these types of roadways.
- Corridors between known freight generators have high potential.
- Current levels of truck traffic are a good indicator of need.
- The number of ramps, access points, and the difficulty of terrain must be considered.
- As platooning technology and acceptance matures, other state or local routes may also be appropriate, but these will require a safety and operations review to ensure feasibility.




## Midwest Interstates

An analysis for MAP-21 on total tonnage moved shows that the interstate highways in the MAFC region are major freight corridors. This is especially evident when the routes are viewed on the basis of kilotons moved per mile.

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