Source: United States Department of Transportation/Getty.

U.S. Department of Transportation
Federal Highway Administration

WORK ZONE MANAGEMENT PROGRAM

FACT SHEET

PROVIDING IN-CAB, TRAFFIC-RELATED WARNING MESSAGES TO COMMERCIAL MOTOR VEHICLE DRIVERS

The Issue

Commercial motor vehicles (CMVs) are highly overrepresented in fatal work zone crashes nationwide. Between 2018 and 2020, 30 percent of all fatal work zone crashes involved CMVs, and over 55 percent of fatal work zone crashes occurred on rural interstates.[1] Many fatal work zone crashes involve rear-end collisions with traffic slowed or stopped in a queue. Warning CMV drivers of traffic slowdowns and congestion upstream of those queues is one way to help reduce the likelihood of such crashes occurring. Roadside changeable message signs are the traditional method of providing warnings to both CMV and passenger vehicle drivers. However, signs are not always located where they are needed to provide warnings. In addition, drivers may not always detect such external roadside warnings depending on what other driving actions they are performing or if they are cognitively or visually distracted in some fashion. Therefore, providing in-vehicle warnings that can be received anywhere they are needed is highly desirable.

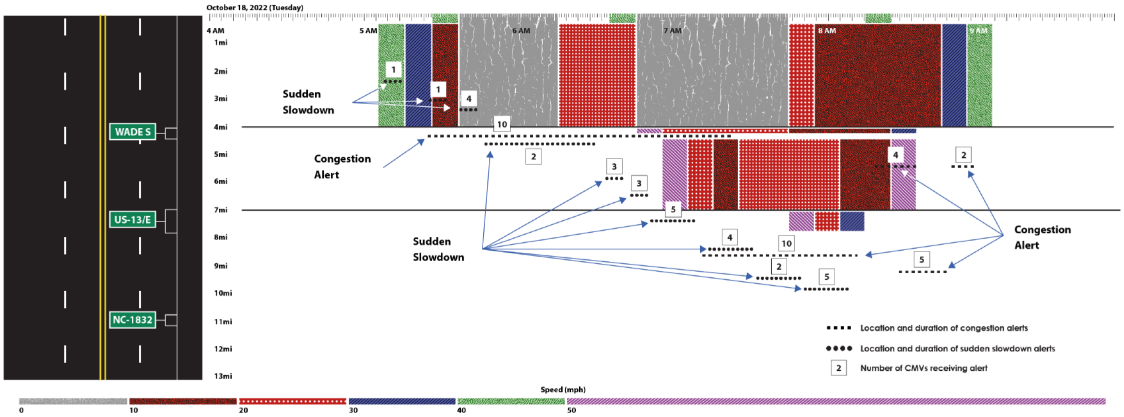
A Solution

Many CMVs have electronic logging devices (ELDs) in their cabs that record CMV drivers' hours of service. These devices also allow entities to communicate with the driver using add-on applications to support weigh station bypassing, electronic inspections, and fleet operations. Recently, at least one data provider expanded its ELD application by providing real-time warnings of roadway congestion and slowdowns. The provider continuously monitors probe-based traffic data on selected routes. When the difference in speed between a CMV and downstream traffic speed is 35 miles per hour (mph) or greater, the application automatically creates a 2-mile geo-fenced region upstream of the slowdown location and sends a warning message to the ELD in CMVs that are subscribers of the warning application and are entering the geo-fenced region (**figure 1**). If there is more than a 3-minute increase in travel time detected along a route, the application creates a 3-mile geo-fenced region where a traffic congestion warning message is issued to the application-enabled ELDs entering the region (**figure 2**). The concept has been successfully demonstrated on Interstate 95 in North Carolina. **Figure 3** is a speed heatmap of a segment on Interstate 95, where an incident resulted in the loss of roadway capacity in a work zone. Overlaid on the speed heatmap are the locations, durations, and number of ELDs with the warning application enabled that received the alerts. Alerts align well with the development, growth, and dissipation of the region of slower speeds.

[1] Work Zone Traffic Crash Trends and Statistics. National Work Zone Safety Information Clearinghouse. Accessible at **https://workzonesafety.org/work-zone-data/work-zone-traffic-crash-trends-and-statistics/**.

Source: North Carolina Department of Transportation (NCDOT).
Figure 1. Screen shot. Sudden slowdown warning.

Source: North Carolina Department of Transportation (NCDOT).
Figure 2. Screen shot. Congestion warning.



Source: North Carolina Department of Transportation (NCDOT).
Figure 3. Illustration. Correlation of speed heatmap and commercial motor vehicle electronic logging devices' sudden slowdown and congestion ahead warning messages.

Alert Type	Total Number of CMVs Alerted	Alert per Hour
Congestion	31	8.2
Sudden Slowdown	30	12.3
Total	61	9.8

Source: North Carolina Department of Transportation (NCDOT).
Figure 4. Table. The number of CMVs alerted during different types of slowdowns and how many alerts were sent each hour in conjunction with the heatmap in figure 3.

Because of the fairly low sample size obtained to date, the effects of such alerts upon driver behavior have been difficult to assess. For example, only 61 CMVs received an alert on their ELDs during the event portrayed in **figure 4**. However, travel information engineers and transportation specialists expect that such alerts will have a positive effect on safety as market penetration of this type of technology increases across different ELD platforms and CMV fleets. The potential exists to expand the type of alerts that can be delivered through ELDs. For example, in-cab warnings of downstream lane closures, lane shifts, or other geometric constraints in work zones could help CMV drivers be better prepared to navigate those conditions.

https://highways.dot.gov

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