



SAFETY TECHNOLOGIES IN THE
TRUCKING
INDUSTRY

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Introduction



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In the not so distant past, it was only on television, in the movies or in our imagination that vehicles were equipped with artificial intelligence and able to drive by themselves. These futuristic vehicles could suggest alternative routes and communicate with the driver before a potential problem occurred. These were ideas for science fiction, not the real world. Fast forward to 2012: while the vehicles of today may not appear as advanced as those in some popular television shows and movies, in reality they are not far off.

Nowhere is this more apparent than in the trucking industry. Innovative technologies have been vital to this industry for decades, from the development of the Interstate Highway System of the 1950s, to CB radios of the 1970s, to the mobile and satellite technologies of today. Motor carriers and the transportation industry as a whole are now incorporating features such as on-board safety systems, efficient routing software, virtual training simulators, state-of-the-art seating, driver cameras and predictive modeling, to name only a few. The benefits of these upgrades are apparent as they often more than pay for themselves by maintaining compliance with government regulators, increasing efficiency, and improving safety, thereby reducing expenses such as insurance costs, downtime and potential litigation costs.

The Economy and the Trucking Industry

While businesses and consumers rely on the trucking industry to deliver products, the health of the trucking industry is forever linked to the economy and the level of demand by those same consumers. A decrease in manufacturing and consumer spending as a result of poor economic conditions directly impacts the transportation sector, as was evident during the recent recession.

The FMCSA has emphasized the role that it expects technology to play in achieving both its goals and the industry's goals for safety, security and efficiency in transporting goods.

As the economy slowly recovers from the recession, the transportation sector, in unison with the overall economy, is also beginning to show signs of improvement. The slow but steady growth in consumer demand has increased manufacturing output and resulted in more trucks on the road traveling more miles.

According to the American Trucking Association, after falling 4.6 percent in January of this year, the advanced seasonally adjusted For-Hire Truck Tonnage Index rose 0.5 percent in February -- the sixth increase in seven months. The increase put the index at 5.5 percent higher than the same month a year ago.¹ While more tonnage means more miles being driven, which is a good sign for the trucking industry and the economy in general, it also increases safety issues, including accidents, injuries and fatalities.

Regulating the Trucking Industry

Large truck and bus safety has long been a priority of the U.S. Department of Transportation (DOT) -- so much so that on January 1, 2000, pursuant to the Motor Carrier Safety Improvement Act of 1999, the Federal Motor Carrier Safety Administration (FMCSA) was established as a separate part of the DOT. The primary mission of the FMCSA is to reduce crashes, injuries and fatalities involving large trucks and buses.² To accomplish this mission, the FMCSA:

- develops and enforces data-driven regulations that balance motor carrier (truck and bus companies) safety with efficiency;
- harnesses safety information systems to focus on higher risk carriers in enforcing safety regulations;
- targets educational messages to carriers, commercial drivers, and the public; and
- partners with stakeholders including federal, state and local enforcement agencies, the motor carrier industry, safety groups, and organized labor on efforts to reduce bus and truck-related crashes.³

The FMCSA has emphasized the role that it expects technology to play in achieving both its goals and the industry's goals for safety, security and efficiency in transporting goods. In an effort to promote safety technologies, the FMCSA has compiled information to assist motor carriers in their decisions regarding safety and security technologies. Examples include return on investment for the purchaser, initial cost and effectiveness to improve safety, security and efficiency, to name a few. The FMCSA also provides carriers with product guidelines to provide information on specific safety and security technologies.

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In addition to partnering with the trucking industry to reduce crashes, injuries and fatalities, the FMCSA also develops, implements and enforces specific safety initiatives and regulations. One such example, which began in December 2010, is the Compliance, Safety and Accountability (CSA) initiative developed for large truck and bus carriers to help reduce crashes, injuries, and fatalities. The CSA initiative was developed as a way for the FMCSA and its state agency partners to communicate with transportation carriers regarding safety issues before accidents occur. The CSA initiative is a new matrix for safety that incorporates three major components in an effort to make the roads safer for everyone:

- Measurement – CSA measures safety performance, using inspection and crash results to identify carriers whose behaviors could potentially lead to crashes.
- Evaluation – CSA helps the FMCSA and its state agency partners correct high-risk behavior by contacting more carriers and drivers – with interventions tailored to their specific safety problem, as well as a new Safety Determination methodology.
- Intervention – CSA covers the full spectrum of safety issues, from how data is collected, evaluated, and shared to how enforcement officials can intervene most effectively and efficiently to improve safety on our roads.⁴

Craig O’Connell, Vice President of Lexington Insurance Company, describes the CSA initiative as “the old regulations on steroids. CSA is more proactive than reactive, allowing motor carriers to track trends and see where they are getting better or worse so they can take corrective action in real time if necessary.”

Having only been implemented for slightly over one year, the CSA initiative has already produced notable results. According to the FMCSA, safety measures have been compiled on over 200,000 carriers. Early interventions such as early warning letters have been issued to approximately 50,000 carriers with deficiencies in one or more safety measurement categories. Early indications are that the warning letters have prompted carriers to review their safety measures and make improvements.⁵

Safety Technologies

For more than 30 years, efforts by the federal government and the transportation industry to reduce large truck crashes have had positive results. For example, the large truck fatal crash rate was a record low 1.04 fatal crashes per 100 million vehicles miles traveled in 2009, the most recent year for which statistics are available. This is a significant decrease when compared to the 1.21 fatal crashes per 100 million vehicles miles traveled in 2008. Both

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years were improvements from the early part of that decade where in 2000, there were 2.2 fatalities per 100 million vehicle miles traveled.⁶

Looking back even further, the improvements are even more apparent. In 1975, when the DOT first began keeping records, there were 4.58 fatalities per 100 million vehicle miles traveled.⁷ Additionally, according the American Trucking Association, from 1989 to 2009, the number of large trucks involved in fatal crashes declined by 36 percent, and the vehicle involvement rate for large trucks in fatal crashes declined by more than 68 percent.⁸

While the statistics are promising and continue to trend in a positive direction, both the government and the trucking industry recognize that more can and must be done to help reduce the number of large truck incidents. As a result, the emphasis has turned to technology. Last year the U.S. Senate introduced the *Commercial Vehicle Safety Technology Act of 2011*, a bill identical to its House companion, the *Commercial Motor Vehicle Advanced Safety Technology Act*. The proposed bills, which ultimately did not pass, would have provided a tax credit for commercial vehicle owners who installed stability control systems, collision warning and other safety technologies.⁹

In December of last year, another bill, the *Commercial Motor Vehicle Safety Enhancement Act of 2011*, was introduced in the Senate. This bill proposes to reauthorize the FMCSA and make important improvements to federal truck and bus safety standards, including requiring that electronic on-board recorders be used on all trucks and buses involved in interstate commerce.¹⁰

These, in addition to other proposals and regulations being advanced by the FMCSA, are helping reinforce regulators' goal to achieve safety compliance through the use of technology. With this in mind, trucking companies also are beginning to see firsthand the benefits that they themselves can realize. For example, carriers can gain valuable information from their fleets that provide insight into driving decisions, safety and performance. This insight not only provides a safer work environment and safer roads, but it also offers the potential for increased profitability and lower expenses, including property damage and auto liability insurance costs, workers' compensation insurance costs, indirect costs due to employee injury (e.g., training new employees), labor costs, operational costs, environmental costs, retained losses and potential litigation costs, among others.¹¹

Additionally, as the economy continues to improve, actions taken during the recession to operate a safer and more efficient fleet are now starting to pay big returns. As Trevor Gallagher, Executive Vice President of Chartis' Transportation Group explains, "During the recession,

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the number of truck drivers shrank by approximately 15 percent. As a result, motor carriers kept their best drivers and were able to pay them better, resulting in an overall safer fleet.”

Consequently, we now see fleets with the most competent drivers utilizing the most effective safety technologies. O’Connell explains, “In order to survive, the trucking industry had to become more efficient. The use of safety technologies helped aid in efficiency; healthier and safer drivers in safer trucks allowed for more hours on the road and more hauling. We now see safer and more efficient fleets that are able to do more with less, which bodes well for the industry. “

The variety and availability of safety technologies in the trucking industry are vast and choices are made based on the needs of a specific motor carrier. Safety is at the heart of each of these new technologies, but the systems must also prove to be cost-effective investments for the users. Some examples of commonly used safety technologies include on-board safety systems, speed-limiting technologies, geofencing, electronic on-board recorders, predictive modeling, seating improvements and training simulators.

On-Board Safety Systems

Injuries resulting from large truck crashes are at the lowest level in over a decade, but many of the incidents that still occur could possibly be prevented through the use of on-board safety systems. Some examples of on-board safety systems include the following: ¹²

Forward Collision Warning Systems (FCWS) are designed to improve driver behavior by providing feedback about safe following distances. These devices provide audible and/or visual warnings of objects that come within a predefined distance in front of the vehicle. A FCWS also can be integrated with an adaptive cruise control (ACC) system, which automatically maintains a specific following distance between the equipped vehicle and the vehicle in front of it. According to FMCSA estimates, for every dollar spent on FCWS devices, carriers could potentially get more than a dollar back in benefits, with estimates that range from \$1.33 to \$7.22.¹³

Lane Departure Warning Systems (LDWS) are designed to inform the driver that his or her vehicle has departed the lane when the vehicle is traveling a pre-defined speed and the vehicle’s turn signal was not used to make the intended lane change. An LDWS device is a warning system for the driver and does not take any automatic action to avoid the lane departure or control the vehicle. According to the FMCSA, for every dollar spent on LDWS devices, carriers could potentially get back more than a dollar back in benefits, with estimates that range from \$1.37 to \$6.55.¹⁴

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Roll Stability Control (RSC) Systems are sensors that monitor vehicle dynamics by providing an estimate of a large truck's stability based on its mass and velocity. If a rollover risk is detected by the sensors, the RSC system will automatically address the situation by slowing the vehicle. According to the FMCSA, for every dollar spent on an RSC system, carriers could potentially get more than a dollar back in benefits, with estimates that range from \$1.66 to \$9.36.¹⁵

Speed-Limiting Technology

According to statistics reported by the National Highway Traffic Safety Administration, driving in excess of the posted speed limit or driving too quickly for particular weather conditions contributed to 8 percent of all accidents involving large trucks in 2009.¹⁶ That 8 percent statistic pales in comparison to the Large Truck Crash Causation study statistic, conducted by the FMCSA, which concluded that 22.9 percent of all large truck crashes and 10.4 percent of large truck/passenger car crashes were attributable to "traveling too fast for conditions."¹⁷ Either way, speeding is a primary concern for transportation carriers, regulators and everyone else on the road.

Speed limiters are a technology commonly used by truck carriers to lower the top speed of the trucks in their fleet. Also commonly referred to as governors, these devices communicate with the vehicle engine to prohibit the vehicle from exceeding a predetermined maximum speed. According to an FMCSA study, trucks equipped with speed limiter devices have a 50 percent lower crash rate than non-equipped trucks.¹⁸

Geofencing

Geofencing provides companies with a mechanism by which to maximize administrative, fleet and driver efficiencies, customer service, asset protection and safety. The term geofencing refers to the practice of restricting employees to a specific geographic boundary by tracking their locations with a global positioning system (GPS). The technology provides companies with a way to ensure that their employees are staying within a particular geographic boundary that the company identifies as the most productive.

Geofencing allows carriers to convert from paper-based operations to an automated environment, saving time and minimizing errors. It can be integrated with exception notifications, dispatch and routing software and in-cab scanning to increase efficiency and reduce costs.

For the drivers, geofencing can be considered a safety technology. Devices installed with an exception notification component can alert carrier dispatch of potential safety issues. For

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example, if a driver who has a nearly perfect on-time record is detained for a pre-determined amount of time (e.g., 30 minutes), the system will automatically notify dispatch. Dispatch can then contact the driver to check on his or her safety and, if necessary, contact the local authorities.¹⁹

Additionally, the technology helps keep drivers on course, which increases both safety and efficiency. Gallagher explains, "When drivers get lost, they often get frustrated because they are wasting fuel and precious time. As a result, the percentage of accidents by drivers who find themselves off route increases significantly." Geofencing technology helps keep drivers and everyone else on the road safer by helping keep drivers on course.

Electronic On-Board Recorders

An electronic on-board recorder (EOBR) is an electronic device that connects directly to a vehicle's engine. The device acts similar to a black box on an aircraft by recording the amount of time the vehicle is being driven in addition to collecting diagnostic and GPS data. EOBRs provide the motor carrier with safety, cost-saving and operational benefits.

Vehicles equipped with EOBRs offer increased safety and help monitor compliance with regulatory mandates. Beginning June of this year, the FMCSA's new Electronic On-Board Recorder requirements will go into effect. These requirements concern Hours of Service (HOS) compliance. The FMCSA will require motor carriers with a 10 percent or higher HOS violation rate to install EOBRs on all of their vehicles to track driver hours. This will ensure that drivers are not driving tired, which helps make the roads safer.

While not yet mandated, EOBRs are an important tool for motor carriers to remain competitive as they improve productivity and increase efficiency. A recent publication by Mentor Engineering identified some potential benefits for carriers using EOBRs, which may include:²⁰

- reduction of DOT violations;
- improvement of safety ratings;
- realization of superior HOS compliance;
- reduction of maintenance costs with real-time data;
- improved resource utilization;
- greater efficiency and productivity;
- better customer service; and
- identification of driver performance problems.

Occupational injuries, especially those of older workers, have long been a significant issue for the trucking industry.

Predictive Modeling

Research has indicated that driver-related factors are the primary cause for the majority of incidents involving large trucks. Most industry-accepted driver safety analyses, such as reviewing Motor Vehicle Records and accident reports, are reactionary and focus only on past performance as an indicator of future performance. While helpful, this information may not always identify the highest risk drivers. This type of analysis does not include other possible risk factors including logged hours, miles traveled, or operating conditions, all of which could increase the risk of a driver being involved in an accident.

Thanks to previously mentioned devices such as GPSs and EOBRs and others, motor carriers are now able to collect an abundance of information, including engine and maintenance data, braking profiles and driver fatigue, to name a few. With this information, motor carriers can utilize smart technology and data modeling programs to help forecast which drivers are more likely to have collisions and be proactive in helping prevent accidents from occurring in the first place. By gaining insight through the analysis of data, carriers now can better understand truck usage and driver behavior, allowing them to not only reduce risk but also maximize their investment.²¹

Seating Improvements

Occupational injuries, especially those of older workers, have long been a significant issue for the trucking industry. As a result, this impacts the cost of and ability to obtain workers' compensation insurance in the standard insurance market. According to Matthew Power, Chief Innovation and Strategic Relationship Officer, Chartis, The Americas, "The U.S. Department of Labor statistics indicate that the transportation and warehousing sector, which includes the broadest categories of truck drivers, has the greatest number of lost workdays and ranks third in terms of occupational illness and injury, among all employment classes."

Power explains that, "Lower back pain and disc injuries are prevalent among this workforce category, as drivers are subjected to constant shaking and vibration from over-the-road exposure. The trucking industry has responded over time with seating improvements, retrofitting cabs of long haul vehicles with passive suspension seating, which replaces traditional seating decks. In years past, traditional seating was attached to the chassis deck, similar to what one might see in a private passenger vehicle. The next generation seating decks for long haul units have created air suspension systems designed to absorb road vibration and reduce the constant shaking and jarring of the driver."

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Occupational Injuries and Safety Technologies

While the vehicles have come a long way, sitting in a truck cab is a far cry from sitting in a luxury automobile. The constant jarring from unmaintained roads often takes its toll on drivers who are required to sit in a cab for up to 10 hours at a time, day after day.

Common occupational injuries include back injuries due to back compression from jarring in the cab, repetitive motion injuries and injuries from getting in and out of the cab as a result of being overweight and in bad physical shape due to the sedentary nature of the profession. Sleeping in truck cab every night does not help the cause either.

Fortunately, most of the aforementioned safety technologies do not require any additional work on the part of the driver, and they often assist in making a more comfortable driving experience. According to Gallagher, “Safer and happier drivers tend to get injured less often and are able to get products to the marketplace in a more efficient manner.”

Training Simulators

Training simulators offer a low-risk option of support training for motor carriers. Utilized as tool for educating novices or as sustainment training for existing drivers, a simulator offers motor carriers a method of improving and/or maintaining specific driver skills, thereby helping improve driver safety.

Simulators have been shown to speed up the training of new hires with minimal large truck experience by teaching the basics of vehicle operation in a safe and secure setting. For new hires who have large truck experience, simulators can help to expedite the time and resources necessary to learn the employer’s policies and procedures, as well as provide the ability for the employer to formally review the new hire’s individual skill set.

Finally, with the understanding that not all driving skills are used with equal frequency, simulators offer employers the ability to provide sustainment training by which a driver can be put into certain scenarios repeatedly so that he or she can learn and remember what to do if a similar event actually occurs. Research has shown that repetition training is an effective way to make the response to an unfamiliar event an instinctive reaction.²²

Conclusion

The trucking industry is essential to economic growth and stability in the United States, but trucks can pose a threat to safety. It is with this in mind that the trucking industry and regulators have made increased safety for vehicle drivers and everyone else on the road a high priority. The challenge, however, has been to balance safety through regulation and oversight without impacting productivity and efficiency, which could affect not only the industry but the economy as whole. Fortunately, what was once the stuff of science fiction is being developed and utilized today and will continue to play a vital role in pushing forward both the safety and the productivity of the trucking industry.

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