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Thursday 27 December 2007

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Monday 17 December 2007

On the straight and narrow

Measuring return on investment when dealing with human life as well as injury can be skewed by emotion but no matter how one looks at it, Lane Departure Warning systems (LDWs) are paying off for fleets in saved lives, as well as reduced costs of truck crashes.

The commercial trucking industry is reaching a point of maturity in terms of LDW deployments, making this a good time to take a look at the numbers. The fleets and the US Federal Government's FMCSA (Federal Motor Carrier Safety Administration), an agency of the US Department of Transportation (USDOT), both agree the numbers indicate that LDWs are a sound investment for commercial fleets.

Enhancing driver performance

Accidents involving trucks are often caused by inadvertent lane changes due to drowsiness, fatigue and distraction. LDWs can protect against accidents caused by unintentional lane departures by tracking the position of the vehicle within a roadway and warning the driver if the vehicle begins to move outside the lane.

Simple but effective, the system helps the driver keep off the shoulder, avoiding rollovers or crashes into off-road obstacles. LDW also helps the driver avoid drifting into adjacent lanes which could result in a head-on or side collision.

Today's LDW systems are vision-based systems using cameras mounted on the vehicle to monitor a truck's position relative to lane markings - including solid lines, double lines, dotted lines, dashed lines, and raised pavement markers. Image recognition software detects when a vehicle is about to make an unintended lane change, and the system emits a sound to alert the driver.

[click image to enlarge](#)

Studies undertaken by the Federal Motor Carrier Safety Administration have shown that the adoption of lane departure warnings systems has had a significant positive effect on commercial vehicle accident rates

LDWs only warn the driver when the vehicle's turn signal is not used, so the system does not protect against accidents to intentional lane changes. It is also important to note at current LDWs do not make an automatic corrective

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action, leaving drivers with the ultimate responsibility, although new systems in development will offer a feature that automatically influences the steering wheel in an attempt to bring the vehicle back in the lane.

Current leading providers of LDW systems include Assistware, Delphi Electronics and Safety, Iteris, Mobileye and [Siemens](#) VDO.

Studies validate LDW

The FMCSA was established within USDOT in 2000 as part of the Motor Carrier Safety Improvement Act, with the primary mission of reducing crashes, injuries, and fatalities involving large trucks and buses. FMCSA has been instrumental in the adoption of LDWs, due to several studies conducted by the agency which have indicated that LDWs can help drivers avoid accidents.

The Large Truck Crash Causation Study (LTCCS) conducted by the FMCSA last year produced some enlightening findings that support the use of LDWs. The purpose of the multi-year nationwide study was to determine the causes of crashes involving commercial motor vehicles.

LTCCS showed that approximately 32 per cent of crashes in which the truck driver was the cause were the result of departing from the roadway or crossing over the lane line. The study also found that 40 per cent of crashes caused by the trucker were a result of driver inattention, distraction, fatigue or other physical ailments.

In terms of accidents with fatalities, the report cited statistics from NHTSA's (National Highway Traffic Safety Administration).



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Fatality Analysis Reporting System (FARS), which categorised factors in all 4,881 fatal accidents involving large trucks in 2005, the most recent year with complete data available. The numbers show that failure to keep in the proper lane was the cause of 29 per cent of the single-vehicle crashes - by far the largest influencing factor. The same cause was cited in 9.5 per cent of multiple-vehicle crashes involving large trucks. Driver inattentiveness was also named as a factor in 10.9 per cent of the single-vehicle crashes.

In addition, FMCSA's Evaluation of the Mack Intelligent Vehicle Initiative Field Operational Test is a study that specifically evaluated LDW systems for large trucks. According to the FMCSA report, "The Mack FOT independent evaluation revealed that the use of the LDWS could reduce crashes, injuries, and fatalities in crashes involving large trucks."

Results showed that under the conditions observed in the test, LDWs can reduce driving conflicts by 31 per cent on straight roads and 34 per cent on curves.

"We have tested LDW, and we are seeing a 21-23 per cent reduction in single vehicle roadway departure crashes, as well as a 17-24 per cent reduction in rollover crashes," noted Amy Houser, FMCSA. "We are also seeing similar data from carriers who kept track of crashes before and after they put LDW systems in their vehicles."

The test results also showed that LDWs can improve the safety also reduced the number of times a driver would drift out of the lane. Although

the obvious system advantage is warning the unaware driver of an unintentional lane change, these results seem to imply that just knowing the LDW system is there encourages truckers to drive more carefully.

Embracing LDW technology

Commercial carriers are embracing this new technology for obvious reasons - saving lives, reducing injury, minimising the substantial costs of truck crashes and limiting liability.

For example, Cargo Transporters, based in Claremont, North Carolina, has achieved a 90 per cent decrease in preventable lane departure accidents since deploying LDW systems from Iteris on all of its 500 trucks.

"We've seen more dramatic results after deploying LDW than from any other safety technology we have installed thus far," says John Pope, CEO of Cargo Transporters.

Specifically, Cargo Transporters was experiencing seven crashes per year for accidents caused by unintentional lane departure in 2002 and 2003. After deploying LDWs, that number has been reduced to one crash per year in 2006 and 2007. The rate per million miles for these types of accidents was 0.151 in 2002, reduced to 0.022 in 2006.

Jerry Waddell, Safety Director of Cargo Transporters, points out that it is not just about overall numbers but also about preventing specific incidents. "In one case in 2005, my driver drifted off the right-hand side of the road, where a truck was parked," he explains. "The LDW warned him, and our driver moved back to the left. The right front of his trailer caught the left rear of the trailer on the side of the road. We had some heavy damage to the freight and trailer but my driver walked away from that accident. I am a firm believer that this unit saved a man's life."

Waddell also notes that the system is easy to use, requires little training, and does not impact the driver, other than alerting when necessary.

"I want to be able to say that we gave our drivers every tool they could possibly use to prevent an accident," Waddell added. "I see this investment in technology as an investment in our drivers."

Several other carriers also report recent reductions in accidents since deploying LDW systems. Maverick, an operator of 1,500 power units, had 23 unintentional lane change preventable accidents in 2004. After deploying Iteris LDW systems, the carrier has only had seven related crashes in 2006 and five to date in 2007. This translates to 0.1952 accidents per million miles in 2004, of this type of accident, compared with 0.044 in 2007.

"In less than a year, we have seen a dramatic reduction in runoff-road and rollover accidents on the trucks we equipped with LDW technology, which has saved the company a considerable amount of money," adds Robert Low, Founder and President of Prime, a carrier that has achieved an 85 per cent decrease rate in these types of accidents since implementing the Iteris system.

LDWs save money

By reducing accidents, LDWs not only save lives and reduce injuries, but also save the carriers a significant amount of money. Accidents can cost \$100,000 or more, while accidents with fatalities can cost in the millions of dollars. Vehicle and freight damage, worker's compensation, medical expenses, liability, and fuel spills all contribute to the costs.

"An off-the-road accident is costly in every manner," explains Jerry Waddell, "and I can't defend an accident like that at settlement time because it gives the appearance that the truck is out of control."

On the other hand, Prime estimates the company will save approximately \$551,000 annually by avoiding off-the-road accidents via LDWs. When compared to the cost of equipping trucks with LDW systems, a company can achieve a return on investment in less than a year.

Looking to the future

"Through our field tests and what we have heard from carriers who have been early adopters, there is a reduction in certain types of crashes due to the use of Lane Departure Warning systems," says Amy Houser. Her organisation, the FMCSA, provides information on LDWs to the industry. "In

general we are encouraging voluntary use of LDW systems. Deployment of these systems is one of our administrator's priorities."

In the US, the number of deaths caused by crashes involving commercial vehicles has levelled at approximately 5,000 per year but, considering the fact that commercial truck mileage has increased significantly every year, this indicates that attempts to increase safety by both FMCSA and the carriers are having a positive impact.

But the efforts do not stop here. Driving the adoption of LDWs is just a small part of the FMCSA's comprehensive efforts to improve truck safety. In addition, it is important to note that LDW is just one of many safety technologies currently deployed by carriers. Roll Stability Control and radar-enabled Collision Warning Systems are examples of other essential technologies, and FMCSA's vision of the future includes an integrated system that ties all these technologies together - the Integrated Vehicle-Based Safety System (IVBSS), which will be the subject of a follow-up article.

Published in ITS International November - December 2007 (ITSNA EDITION)

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