

MOTOR CARRIER SAFETY PROGRAMS AND TECHNOLOGY

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INTRODUCTION

Motor carrier safety is a “force multiplier” for the industry: even small changes in safety performance have disproportionate impacts, pro or con. Safety performance dramatically affects human loss and suffering, property damage, company safety ratings, degrees of regulatory oversight and insurance coverage. Safety performance also affects the quality of customer service, customer confidence in a carrier, carrier brand reputation and, very importantly, operating ratios and profitability.

This paper provides an overview of the opportunities for improvement in truck safety and motor carrier safety programs, including the use of technology in those programs. It discusses benefits of safety improvement, including the interplay of tangible and intangible benefits for the ROI of safety programs. It suggests that hard numbers can support the ROI of most safety improvements to a comptroller’s satisfaction, particularly when the safety-related innovation also delivers collateral benefits in efficiency and quality. More importantly, it suggests that those with broad business vision will intuitively temper the hard numbers in an ROI calculation with informed judgments about the realism and value of harder-to-measure benefits of safety improvements. Examples include improved customer service, brand differentiation and market share possibilities.

THE TRUCK SAFETY PROBLEM

Truck safety is an important problem for the motor carrier industry. According to the Occupational Safety and Health Administration (OSHA),¹ trucking industry employees experienced the most fatalities of all occupations, accounting for 12 percent of all worker deaths in 1992-95. Truck drivers also have more non-fatal injuries than workers in any other occupation.

More recent government statistics offer good news and bad news.² Between 2004 and 2005, fatalities for all types of trucks decreased 0.4% from 5235 to 5212 and injuries decreased 1.7% from 114,000 to 112,000. However, occupant fatalities in large trucks, those greater than 10,000 pounds gross vehicle weight, increased 4.8%.

Taking a longer view from 2000 to 2005, the Federal Motor Carrier Safety Administration's (FMCSA) draft Strategic Plan noted an 11% drop in the fatality rate for crashes involving large trucks while the number of truck vehicle-miles increased by 10%. The personal injury accidents include both truck-only and truck-passenger car incidents.³

Several studies have addressed fatality, injury, and property damages in economic terms. In 2002, the Pacific Institute of Research and Evaluation estimated the annual cost of accidents to the trucking industry to be \$24 billion.⁴ Major components of that estimate were \$13.1 billion for reduced quality of life, \$8.7 billion for lost productivity, and \$2.5 billion for lost resources. The estimates considered medical expenses, emergency services, loss of driver productivity, and quality of life losses (including, for example, the impact of injuries).

Another approach to the economic impact is to estimate the costs per accident. The Pacific Institute, for example, translated their aggregate cost

¹ OSHA webpage on Trucking Industry Safety extracted from "Fatalities and Injuries Among Truck and Taxi Drivers" by Andrew T. Knestaut.

² US DOT's National Highway Safety Administration (NHTSA) publishes annual accident statistics. The information is from report dated August 2006.

³ FMCSA published the Strategic Plan in August 2006. The American Trucking Associations website, citing US DOT and American Automobile Association (AAA) statistics, reports that 70 to 75 % of all truck-related auto fatalities are caused by the car driver. The AAA statistics show that 35% of these truck-car accidents occur in a truck's blind spots.

⁴ "Revised Cost of Large Truck-and Bus-Involved Crashes", November 2002 report for FMCSA.

results into \$180,000 per injury and \$2.7 million per fatality. A recent article by Peter Karlsten, president of Volvo Truck, reported more current—and higher—estimates from the FMCSA: \$245,000 per injury and \$3.4 million per fatality.⁵

Public policy, simple ethics, and raw economics make abundantly clear why truck safety is a priority for the transportation and logistics industry, as well as government agencies. Top level accident data also shows why the industry and FMCSA are focusing their attention on truck drivers and the interactions between trucks and automobiles on the nation’s highways.

COMMERCIAL CARRIER SAFETY PROGRAMS⁶

Safety is a priority for all trucking companies. Many for-hire and private fleets often have comprehensive safety programs that are implemented hand-in-hand with the shippers that they serve. These programs emphasize to drivers the importance of safety, responsibility, and keeping accidents to a minimum. Key elements of these safety programs include: driver awareness training, performance monitoring, and safe-driving incentives.

The information below is built around the major elements of a leading trucking industry safety program, and also illustrates how it leverages technology to achieve continuous improvement of the level of safety.

The Driver

The driver sits at the heart of most safety programs in the industry. Many drivers are skilled in the use of their sophisticated trucking equipment and most companies have continual or refresher training to keep drivers current on innovations in on-board and related technology. Dow Chemical instituted

⁵“Safety Technology Protects Reputation, Profitability: The Accident That Never Happens is Priceless,” Peter Karlsten, Transport Topics, September 18, 2006.

⁶Despite our focus on commercial programs, it is worth noting that the FMCSA sees reducing congestion as part of a national opportunity to improve safety. Their Strategic Plan, referenced above, points out that the most congested areas have more opportunities for accidents. As freight demand, traffic density, and congestion continue to increase, so does the total exposure of the motor carrier industry to accidents.

a behavior-based program as an adjunct to the safety programs of its cooperating motor carriers.⁷ Dow and its carriers wanted to implement safety improvements that further leveraged and improved their highly skilled drivers. Dow and other companies identified the following driver-related components of safety programs:

- (a) **Training** – Most companies insist on standardized annual behavior-based defensive driving training. The focus is usually on accident prevention. Dow and its carriers identified rear-end collisions as the most frequent accident type and focused training and retraining on preventive skills, including creating work groups of drivers to identify unsafe behaviors and near-miss accidents.
- (b) **Hiring** – Some trucking companies hire drivers based on accident history and specify a minimum number of years of experience. Resumes for top-performing drivers often indicate the number of accident-free miles driven. At least one company believes that most accidents occur during a driver's first two years of employment and works closely with new drivers to assure their understanding of the company's emphasis on safety and safe driving behavior. An FMCSA-sponsored study of the safest motor carriers found that a driver's safety record is more important than years of experience in predicting the likelihood of future accidents.⁸
- (c) **Recognition** – Many companies track driver incidents and provide incentives for accident-free operations. They may institute driver-of-the-month programs, publicize accident-free mileage, or provide monetary or other rewards for exemplary driver safety records.

⁷“Motor Carrier Safety: A Collaborative Approach to Reducing Motor Carrier Incidents,” a March 2006 case study on the OSHA web site.

⁸“Best Highway Safety Practices: A Survey about Safety Management Practices Among the Safest Motor Carriers,” University of Maryland School of Business, March 2003.

(d) **Driver Lead Crash Investigations** – When accidents do occur, companies often conduct internal crash investigations, sometimes with teams of experienced drivers. This helps to emphasize safety amongst the employees and involves drivers more directly in safety practices. (Note that reducing the accident rate would also reduce the lost productive time of other drivers).

Inspection and Maintenance

Inspection and maintenance activities are important components of successful trucking company safety programs, and not just because they are regulated by state and federal agencies. The FMCSA study of best safety performers indicated that 90% of the surveyed carriers do not consider cost of inspections to be an issue when it comes to keeping their vehicles free of defects.

Companies schedule periodic in-shop maintenance so that equipment is in running order and they often conduct their own in-yard vehicle inspections. Efforts are underway at some carriers to develop and use electronic monitoring and communications devices to inspect vehicles and increase the efficiency of safety inspections. By using on-board communications integrated with electronic inspection devices, a carrier can achieve 24/7/365 safety monitoring while also reducing their manual effort and in-shop vehicle time.

Use of Technology to Enhance Safety

Either as a part of internal initiatives to improve safety or in response to federal mandates and recommendations, many trucking companies have employed sensor devices and computing technologies to enhance safety. Examples include collision warning applications, electronic braking systems, electronic on-board recorders (EOBRs), tire pressure sensors, lane

departure warning systems, driver fatigue sensing devices, and roll-over prevention and stability systems. Many of these device sensors and computing technologies are in fact useful in achieving multiple differing business objectives. For example, tire pressure sensors provide much needed information for safety programs, as well as vehicle maintenance programs.

The significant market penetration of GPS positioning and mobile communications systems provides the enabling platforms needed to realize tremendous additional value from these device and sensor technologies in areas such as business operations, security and, most certainly, safety. Innovators in the field of mobile computing and communications have now tied into on-board data buses and can provide over-the-air updates regarding maintenance needs, vehicle performance, and safety indicators. These data buses provide raw information such as engine temperature and RPM, road speed, shift points, brake usage and wear, and tire inflation which is then analyzed by the on-board mobile computers, organized into meaningful statistics of vehicular operation, and immediately transmitted back to fleet managers. With access to this data, mobile computing platforms can also identify immediate dangers, such as under-inflated tires, failed brakes, or incipient roll-overs, and can alert the driver as well as the driver manager to the potentially threatening situation.

The electronic on-board recorder (EOBR) is becoming an increasingly important component of trucking today. The principal incentive toward installing an EOBR was automated recording of driver on- and off-duty times for automated hours-of-service compliance logs. Automated and certifiably accurate logs simplify paperwork for drivers and can help assure sufficient rest and reinforce road safety. A recent report by the American Transportation Research Institute (ATRI) contained two positive items about EOBRs.⁹ First, they asserted that driver morale and retention

improved with the use of EOBRs, easing industry concerns that drivers might resent these devices and try to subvert the automated monitoring. Second, the ATRI report noted an increase in the use of EOBRs for other applications, such as tax and fee compliance, real-time vehicle-dispatcher communications, and fuel management. These developments are net positives for truck safety because they imply faster and wider adoption of the EOBR, itself a safety enhancement tool.

SAFETY BENEFITS AND ROI

A lack of confidence in economic returns can be seen as the principal barrier to the adoption of intelligent freight technologies, and that includes safety innovations. Conversely, clear and convincing evidence of economic benefits is a potent trigger for accelerated deployment. The unsurprising implication for improving truck safety, especially through the use of new technologies, is that ROI analyses are important swing factors. However, as noted in the North River Consulting Group's report on intelligent freight technologies, the *Freight Technology Story*, softer data and a broader, more subjective economic analysis can be sufficient for some firms, especially market leaders.¹⁰

Defining the scope is a critical issue for a safety-related ROI analysis. A tightly focused assessment, based only on 'hard' numbers related to safety changes, can produce a misleading and negative assessment. One clue of the need for a wider scope is that many trucking company executives and customers believe that safety, efficiency, and quality are inexorably linked. Many companies have found that safety can be a selling point with customers, and that important shippers consider carrier safety records and performance as major decision factors. In other words, safety improvements can be tied to other outcomes.

⁹ "Electronic On-Board Recorder Adoption in the Trucking Industry: Issues and Opportunities," ATRI, September 2006.

¹⁰ Wolfe and Troup, *The Freight Technology Story: Intelligent Freight Technologies & their Benefits*, Federal Highway Administration (FHWA), 2005.

As discussed above, many sensors and related innovations provide simultaneous support for multiple objectives, especially when tied together with mobile communications systems. When safety innovations are in this domain, they may yield collateral benefits in efficiency, quality and security. This concept is especially useful when defining the scope for ROI calculations, to assure that the full range of costs and benefits are included in the calculations.

The method and standards of measurement are another important area in setting up a useful ROI analysis. Clearly quantifiable indicators, the hard numbers, provide the foundation for any ROI analysis. The challenge is in deciding how to handle qualitative and subjective factors. Although these 'softer' measures are more difficult to quantify, they may be no less important to the question at hand. Qualitative benefits and illustrative or speculative quantitative benefits are areas where the senior executives' business judgment is critical; they must separate subjective but powerful benefits from smoke and mirrors.

The following points expand on the potential benefits of safety improvements. The listing is roughly arranged from harder to softer, or from relatively easy to measure to very difficult to measure.

Reduction of injury and death, and associated costs. As discussed earlier, motor carrier accidents impose an estimated \$24 billion burden on the industry as a whole, the lion's share for deaths and injuries. Individual firms usually have hard numbers on their accident deaths and injuries.

Reduced liability costs. These costs reflect patterns of safety performance and risk exposure, not simply the human and property costs associated with particular accidents. Safety programs that focus on reducing accidents help reduce overall insurance, tort and risk management costs.

Environmental liability costs. Hazmat haulers are particularly exposed to liability for potential environmental costs of chemical spills, the release of radioactive materials, or explosions of trucks and their cargo. Successful safety programs can help mitigate risk exposure and its related costs.

Improved driver behavior. Driver training programs and the incentives often instituted as part of safety programs help to improve driving behavior. Additionally, on-board monitoring systems (for RPMs, speed, shift points and braking) enable managers to proactively identify and coach drivers on improving habits related to both the safety and fuel efficiency.

Improved quality of life for drivers. Given the importance of driver retention, quality of life issues have measurable economic impacts. While drivers may be the most important single factor in the effectiveness of a safety program, studies indicate that drivers are major beneficiaries of a company's safety program. A sense of safety is a quality-of-life issue for drivers, and at least one firm recommended that analysts identify it as such after achieving a significantly reduced employee turnover rate as a result of safety improvements.¹¹

Better brand differentiation. Better safety performance improves the quality and reliability of service delivered to trucking customers. Better safety performance can pay off directly and indirectly: safety records may be an important carrier selection criterion; and an accumulating reputation as a safe, high quality and efficient carrier can help build market share and a more profitable customer portfolio over time.

¹¹ Shaw Industries, a Georgia-based furniture-manufacturer, reported in a Fleet Owner Magazine article (August 2006) by Gary Petty; referenced on the National Private Truck Council web site.

CONCLUSION

A goal of this paper has been to add context and support to our initial assertion that motor carrier safety is a “force multiplier” for the industry: that safety benefits can offer simultaneous improvements in other business metrics, such as efficiency and security. It has provided an overview of the \$24 billion in accident costs and of the important components of successful motor carrier safety programs. It has addressed the potential safety contributions of new technologies, and then clarified the differences between more and less effective approaches to cost-benefit and ROI analyses. Finally, it has listed six clusters of potential benefits, ranging from hard, traditional benefits to softer, harder-to-measure benefits.

For the reader’s convenience, this list summarizes the main conclusions in a bulleted format:

1. The degree of confidence in perceived economic benefits of a safety innovation is the biggest non-regulatory factor in decisions to proceed.
2. Beyond contributions to society and ethical concerns, there are significant economic incentives for the trucking industry and individual firms to improve safety performance. The incentives—the potential payoffs—are clearest when ROI analysts and senior executives scope an innovation decision broadly and holistically.
3. A broad scope for an economic decision about a safety innovation would look for collateral benefits in quality, efficiency or security. It would also look at qualitative issues, such quality of customer service, customer confidence and brand differentiation.
4. All else being equal, firms that use broad scopes to make safety innovation decisions will realize greater benefits than firms that choose a narrow, ‘just the numbers’ scope.

5. Driver behavior appears to be largest single factor in determining fleet safety performance.
6. Technology can help improve fleet safety in several ways: by capturing and providing empirical feedback on behind-the-wheel driver behavior and performance; by assembling on-board mechanical data to enable preventive action prior to a failure on the road; and by providing real-time mechanical adjustments and feedback to drivers to avoid or mitigate an impending incident or accident.

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