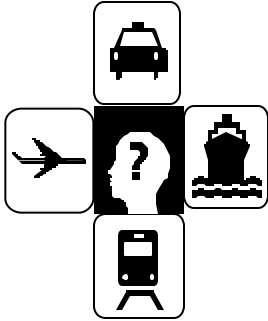


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Tech Brief

IDENTIFYING FACTORS AND MITIGATION TECHNOLOGIES IN TRUCK CRASHES IN NEW JERSEY

FHWA-NJ-2002-021

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Summary

The goals of this research were to identify statistically significant factors that contribute to truck accidents in New Jersey and to recommend technologies and strategies holding potential for use as countermeasures for the most prevalent of these factors.

Truck crashes are of particular importance because the size and weight of these vehicles results in a greater likelihood of fatalities when they are involved in a crash than compared to passenger cars. Truck accidents in the state of New Jersey represent about 8 percent of all accidents. These accidents represent all fatal, injury and property damage accidents for all types of trucks, with the majority of these accidents property damage accidents.

Introduction/Background

According to the National Highway Traffic Safety Administration, one out of eight traffic fatalities in 1999 resulted from a collision involving a large truck. Although these vehicles account for only 3 percent of all registered vehicles and 7 percent of total vehicle miles traveled, 9 percent of all vehicles involved in fatal crashes and 4 percent of all vehicles involved in injury and property-damage-only crashes were large trucks in 1998. The higher gross weight, longer vehicle length, and increase stopping distance of large trucks, when compared to passenger vehicles, contribute to truck-car accidents that result in severe injuries or fatalities. In addition, large trucks find it difficult to accelerate, brake and corner, which combined with roadway geometrics and environmental conditions, make trucks susceptible to crash occurrences.

It is well known that the roadways in New Jersey have the highest design standards: the New Jersey Turnpike, the Garden State Parkway, the Atlantic City Expressway and the Interstate system also have the lowest accident rates. Recognizing this fact, legislation was passed in 1999, restricting through truck traffic to these higher type facilities. This legislation, however, does not address the large number of trucks that make deliveries to locations within the state or that originate at industries and businesses throughout New Jersey. These trucks must use all roadways in the state to reach their destinations. To better assist the state's transportation agencies, this report provides documentation of truck crash characteristics for the state of New Jersey.

Research Approach

To accomplish the objectives of this research, a truck-accident database was developed and the percent distribution of truck accidents determined for truck configuration, roadway system, collision pattern, light conditions, road characteristics, accident event, truck driver characteristics, and temporal distributions. Top locations where truck accidents occurred in the State were also determined. A fatal truck crash analysis was also performed to identify characteristics of these crashes compared to fatal crashes for all vehicles in the State. Truck crash case studies were performed to investigate the roadway geometrics and possible contributing factors at high truck crash locations. Finally, a Truck Accident Information and Management System (TAIMS) GIS system was developed for collecting, storing, processing and displaying truck crash data.

Findings

Variables influencing overall truck crash risk may be grouped into three broad categories: truck equipment, driver performance, and operating environment. Physical characteristics of the truck equipment, including the number of trailers, trailer length, and weight capacity, influence the occurrence and severity of truck crashes. Truck crash data collected for New Jersey showed that among all truck accidents, single-unit 2-axle trucks were found to be the truck configuration most involved in truck crashes. A majority of truck crashes are multi-vehicle accidents. Multi-vehicle truck accidents involve three primary types of collisions: side-swipes in the same direction, angle collision, and rear-end collision. For single-unit 2-axle trucks and tractor/semi-trailers, there is a slightly higher percent of rear-end and angle accidents under wet roadway conditions when compared to all truck accidents under all roadway surface conditions. Rear-end collision types primarily occur on higher speed roadways such as Interstate and State highways.

Driver performance is another key variable that influences overall truck crash risk. The skill level and experience of the driver can be critical in the ability of the truck to avoid truck crashes. The age of the driver is related to skill level. Younger drivers tend to be

involved in a greater percentage of truck fatal accidents than passenger car crashes. In New Jersey, these ages are slightly higher. The highest percent of truck accidents involved truck drivers falling in the age group between 31-35 years old, followed by age group of 36-40.

One of the major contributors related to truck accidents related to driver performance is truck driver fatigue. Although the majority of truck accidents in New Jersey occurred during daylight conditions, a higher percentage of single-vehicle truck accidents occurred in dark conditions when compared to multi-vehicle truck accidents. This indicates the possibility of driver fatigue during dark conditions that may contribute to a higher proportion of single-vehicle truck crashes during these conditions.

The operating environment is also a critical factor in truck crash risk. About half of truck accidents occurred on State highways and municipal roadways. County roadways also showed a large percent of truck accidents with 20 percent of truck accidents on these roadways. Truck accidents occurred on roadways with a variety of speed limits. The highest percentage of truck accidents, however, occurred on roadways with a posted speed limit of 25 mph. This posted speed limit accounted for 26 percent of truck accidents and involved a large percentage of single unit 2-axle trucks and truck trailers. Over 35 percent of truck crashes occurred at intersections in New Jersey. Of the top 10 intersections where truck crashes occurred in New Jersey, 8 of the locations are along Route 1.

Conclusions

The results of the truck accident analysis indicate that there is no one factor contributing to truck accidents on New Jersey roadways. Assigning cause to these accidents cannot be achieved due to large confounding influences from the vehicle, driver, and the environment. The analysis does point to the need for continued monitoring of truck accidents and truck vehicle-miles traveled so that truck accident rates can be calculated and used to better assess the safety performance of trucks in the State.

Case studies performed at high truck accident locations showed that conditions consistent to high truck accident locations include locations with high vehicular and truck volumes where frequent lane changes occur, such as at interchanges, intersections with multiple entry and exit lanes, and approaches to toll plazas. Overall, accidents at high truck accident locations involve a higher percentage of accidents on curve sections or roadways, a higher percentage occurring during dark conditions, and a higher percentage involve sideswipe and rear-end type collisions when compared to all truck accidents. In some cases, accidents could be reduced through additional warning signs and positive roadway guidance. Advanced technologies should be also be explored for their use to alert and warn drivers of changing roadway conditions.

Recommendations

This research provides a first step in improving the safety performance of trucks in New Jersey. The research did not investigate the impact of the 65-mph speed limit and the truck restrictions on truck safety. Further studies are needed to determine the combined impact of these policies on truck safety across the State. The next stop of this research may be to focus on corridors within the State where truck safety improvements are needed.

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A final report is available online at <http://www.state.nj.us/transportation/research/research.html>

If you would like a copy of the full report, please FAX the NJDOT, Division of Research and Technology, Technology Transfer Group at (609) 530-3722 or send an e-mail to Research.Division@dot.state.nj.us and ask for:

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