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**DOUBLE BOTTOM TRUCK ACCIDENTS
ON INTERSTATE 90:
PROJECT REPORT**

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DOUBLE BOTTOM TRUCK ACCIDENTS ON INTERSTATE 90: PROJECT REPORT

SUMMARY

The increasing use of double trailer trucks on the nation's highways has raised concerns about their safety, especially as compared to the more common single-trailer trucks. The purpose of this study was to examine the accident rate of double-trailer, often known as double-bottom, trucks as compared to single-trailer trucks on the Snoqualmie Pass portion of Interstate-90. Unfortunately, accurate data concerning truck accidents and truck volumes could not be developed from current data sources.

METHODOLOGY

The research methodology attempted to determine and analyze the historical accident rates (accidents/number of trucks) of single-trailer trucks and double-trailer trucks on Snoqualmie Pass. To develop historical accident rates, two types of information were needed: (1) the number of single- and double-trailer truck accidents on Snoqualmie Pass, and (2) the volume of single- and double-trailer trucks on Snoqualmie Pass during the same period for which accident data were collected. Particularly of interest were the accident rates during various seasonal roadway conditions. Collecting accurate accident and volume data for the study area proved to be difficult. The following section discusses the data collection procedures and the problems with the available data sources.

ACCIDENT IDENTIFICATION

The most comprehensive source of accident data in Washington State is the Washington State Patrol's (WSP) accident database. This system contains the data from the standard Washington Traffic Collision Report filled out by law enforcement personnel at the scene of an accident. Using the Problem Identification and Cause Analysis (PICA) system of the Washington State Department of Transportation's Safety Data Branch with the State Patrol's database, the study team extracted the dates and locations for all recorded accidents involving single- and double-trailer trucks between January 1979 and July 1986 on I-90 from North Bend to Cle Elum (mileposts 34 to 81). Initially, 456 accidents involving trailers and trucks (Class 06) and 92 accidents involving trailers, trucks, and semi-trailers (Class 07) were identified. Due to

some concerns over the accuracy of the vehicle classification recording on the original accident report forms, microfilm copies of the accident reports identified as involving single-trailer trucks were examined for

- the number of license plates listed,
- the number of trailers shown in the accident diagram, and
- the number of trailers listed in the accident description.

Sixty-eight (14.9 percent) of the accident forms reporting single-trailer truck accidents probably involved double-trailer trucks and were miscoded. This raised concerns about the number of miscoded forms that could not be identified by the examination process outlined above. Since it was unlikely that a single-trailer truck could have been miscoded as having two trailers, the study team concluded that WSP accident data underrepresented the number of double-trailer trucks.

TRUCK VOLUMES

The second element of this project was to develop truck volume data for accident opportunity information. This process attempted to relate the number of truck accidents to the volumes of single- and double-trailer trucks passing over Snoqualmie Pass during the study period. For the interstate highways, the most comprehensive source of vehicle identification was the Washington State Department of Transportation's 24-hour manual classification counts. The classification counts involved individuals classifying and counting traffic over a 24-hour period at one location. Unfortunately, a number of problems with the use of the classification data became apparent. The counts identified vehicles by the number of axles. This was not a direct count of double- and single-trailer trucks; assumptions concerning truck type and the number of axles had to be made in order to be compatible with the WSP's accident database. Additionally, the manual classification data were not collected as a scientific sample designed for research. Use of the classification data for truck volumes would require

- using data from all Washington interstates to represent Snoqualmie Pass,
- factoring for different data collection techniques for 1979-1980, 1980-1983, and 1983 to 1986,
- assuming that seasonal fluctuation of truck volumes would not affect research results, and

- working with approximately 20 counts to represent a nine-year period which included the Mt. St. Helens eruption, the energy crunch, and other events that might affect truck volumes.

Provided that the manual classification data could be broken into reasonable single- and double-trailer truck percentages, they would still need to be factored from 24-hour counts up to yearly volumes. This research attempted to factor the truck classification data by vehicle volumes obtained from permanent automatic counters located at Cle Elum (Station 6) and North Bend (Station 39). Cle Elum yearly traffic volumes were considerably less than North Bend's. Since there are only a few, low-volume exits between the two counter locations, the larger volume from the North Bend counter was probably due to automobile traffic generated by ski areas and other recreational facilities. Therefore, the study team concluded that data from the North Bend automatic counter could not be used for calculating truck volumes.

CONCLUSION

Tentative double- and single-trailer truck accident rates were developed as part of this effort. These rates were compared to information in a recently released truck safety study completed over a two-year period on the Washington Interstates by the Insurance Institute (*Crash Involvement of Large Trucks Configurations: A Case Control Study*, Howard S. Stein and Ian S. Jones, Insurance Institute for Highway Safety, January 1987). Appendix A contains a summary of the Insurance Institute's study. The tentative accident rates from this project conflicted with the Insurance Institute's conclusions. Because of the problems with the accident data and truck volume counts, and conflicts with the Insurance Institute's statewide accident figures, valid truck accident rates for Snoqualmie Pass were too difficult to develop and the use of existing data sources could not be justified.

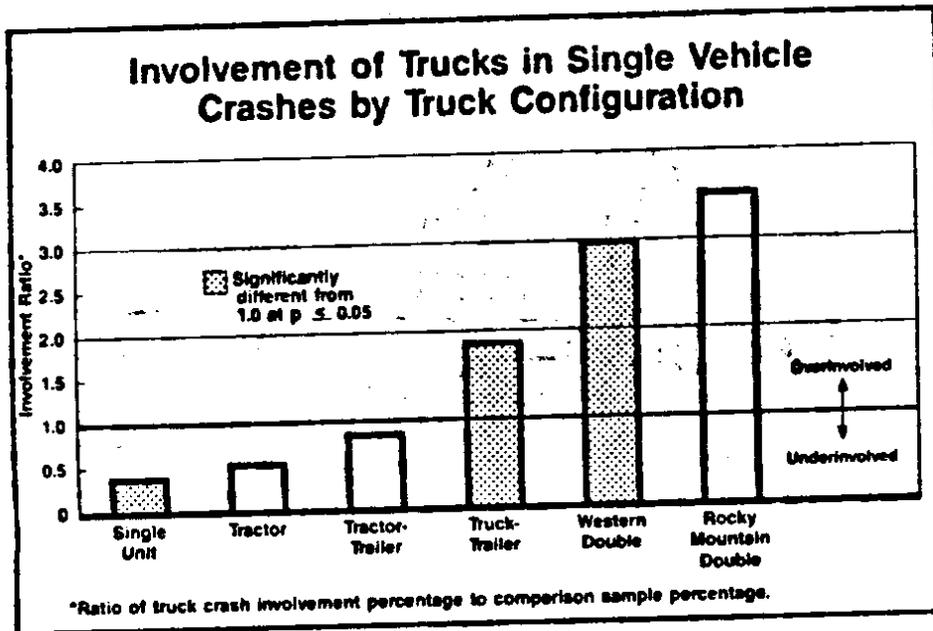
RECOMMENDATIONS

Future research on double-trailer truck safety on Snoqualmie Pass should be conducted in conjunction with a data collection program that specifically addresses the issues of truck safety. Data collection oriented towards analyzing truck accident rates on Snoqualmie Pass would have to occur over enough time (probably several years) to obtain an acceptable sample size of truck accidents. The recording

of the truck accidents on the standard accident form would have to be monitored so that the classification of the type of trucks involved in the accidents was accurate. This might involve education of the Washington State Patrol officers or creation of a truck accident addendum to the standard accident form. The question of truck volumes on Snoqualmie Pass will be of less concern as the WSDOT acquires and installs automated traffic counters that are capable of identifying vehicle types.

An alternative approach would be to utilize the data collected as part of the Insurance Institute's study. While the computerized files developed by the Institute are proprietary, the accident and truck inspection forms completed by the WSP for the Insurance Institute are available. Since the Insurance Institute's study used case control statistics, about 700 truck accidents and three times as many nonaccidents were included in the raw data forms. It might be possible to extract the reports involving trucks on Snoqualmie Pass. From this data, accident involvement rates possibly could be developed. The major problem with this technique is a question of sample size; the Insurance Institute study covered only two years and the number of truck accidents on Snoqualmie Pass might not be large enough to draw statistically valid conclusions.

**APPENDIX A
INSURANCE INSTITUTE STUDY
SUMMARY**



Double-Trailer Trucks More Than Double Danger on Highways

Compared with their numbers on the highways, double-trailer trucks are two to three times more likely to be in crashes than are single-trailer trucks, says a new study by the Insurance Institute for Highway Safety.

"If the use of doubles becomes more widespread throughout the interstate highway system and connecting roads, an inevitable result will be increased truck crashes," say the Institute researchers.

These findings are from a major new study conducted by the Insurance Institute for Highway Safety in cooperation with the Washington State Patrol. The study covered two years and included 734 large trucks involved in crashes on interstate highways, compared with a sample of trucks that were not involved in crashes.

"In our comparisons, we had to account for the fact that different types of trucks have different travel patterns," the researchers explained. "To do this, we investigated truck crashes on the interstate highways and collected information on the type of truck, driver, and condition of the equipment. Then we went back to the crash sites a week later and collected the same information on randomly selected trucks, thereby establishing a sample of crash-involved trucks and a comparison, or control, sample. This is really the only way to compare the effects of truck and driver characteristics for different configurations

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The Public Prefers Air Bags

A new survey conducted for the National Highway Traffic Safety Administration (NHTSA) reveals that 60 percent of all respondents had never heard of automatic safety belts and, given a choice between manual belts and automatics, only 30 percent said they would prefer automatics.

Conversely, over 90 percent of the 1,213 persons surveyed had heard of air bags. More than 90 percent of all respondents said air bags provide good protection, while at the same time, they expressed lingering concerns about how well they will work, say researchers for SRA Technologies, Inc., an Alexandria, Virginia, research firm.

The survey found that the public is generally unaware of automatic safety belts and had concerns about them breaking down and trapping them in an accident. A substantial minority said they would un-

buckle automatic belts but a smaller number reported they would permanently disconnect them. . . . Air bags were preferred by the majority of the public and a third were willing to pay the estimated cost of air bags," the researchers report.

The chief inhibitor of public acceptance of air bags is cost, the researchers report. In order to discern the level of acceptance of air bags when cost is not a consideration, they asked whether respondents would prefer a rental car equipped with manual belts and air bags, compared to a car equipped with automatic safety belts, or manual belts only. Fifty percent said they would prefer the car with air bags, compared with 37 percent who said they prefer manual belts and 13 percent who said they would want automatic seat belts.

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Plymouth Voyager and Dodge Caravan have substantially lower injury claims records than do most cars.

The issue is a broader one, the Institute says. The chief problem is that NHTSA needs to update its outmoded classification system and begin rulemaking "to establish new definitions of vehicle types that are consistent with current manufacturing and marketing strategies and that are based on vehicle use, rather than arbitrary design characteristics, and to set a timetable to extend the passenger car safety standards or appropriate equivalents to all vehicles sold primarily for personal transportation."

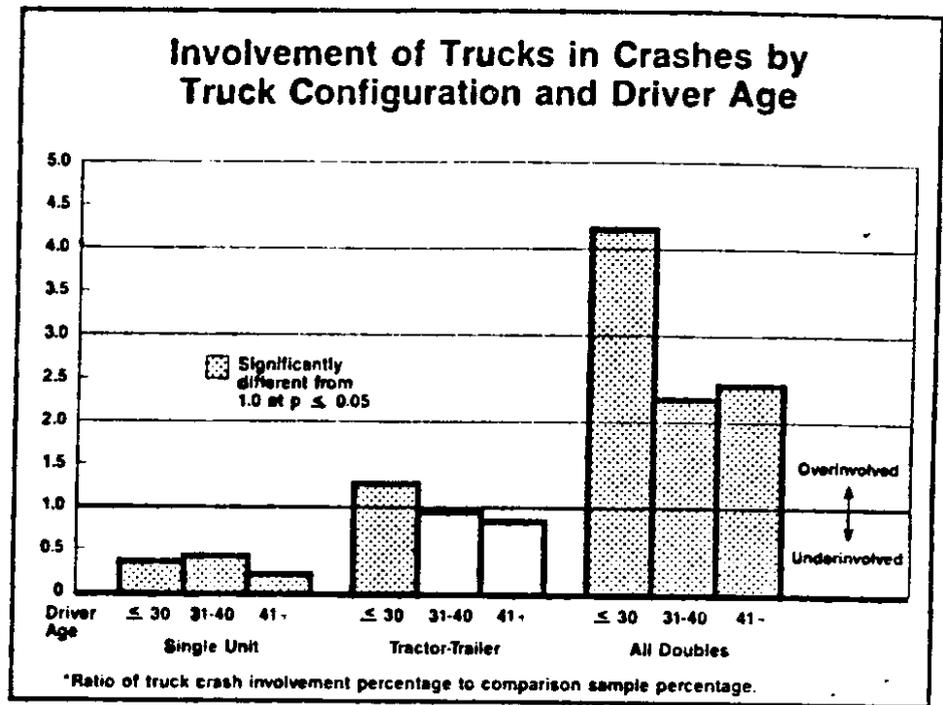
Double-Trailer Trucks More Than Double Danger on Highways

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of trucks under similar travel conditions," the researchers said.

Doubles have been operated in Washington State, where the study was conducted, for more than 25 years, but many states prohibited their use until the 1982 Surface Transportation Act specifically allowed them on all interstate highways. An earlier study by the National Research Council estimated that their greater cargo carrying capacity would reduce overall truck mileage by about 10 percent, which would compensate for their increased crashes. At the time of the Council's study, there were no definitive data on the relative crash risk of doubles and singles. However, the Institute researchers conclude, "This reduction in mileage clearly does not compensate for the up to threefold increase in the crash involvement of doubles over tractor-trailers."

Truck configuration — tractor only, tractor-trailer, truck-trailer, double trailer, or single unit — was the single most important factor affecting crash involvement. Double-trailer trucks were significantly overinvolved in both single vehicle and multiple vehicle crashes. Their involvement



was greatest in single vehicle crashes, which the researchers suggest is related to the instability of the two-trailer combination.

Doubles jackknifed more often than single trailer trucks and it was common for the second trailer of a double trailer combination to break free as the result of the crash.

Doubles were consistently overinvolved in crashes despite the effects found for operating and driver characteristics and roadway conditions. Compared with fully loaded trucks, empty trucks were more likely and partially loaded trucks were less likely to be in crashes. The overinvolvement of empty trucks was greater for doubles than for tractor-trailer or single unit trucks.

Younger drivers were overinvolved in crashes in all truck configurations, and drivers who had been driving for six or more hours were more likely to crash than drivers with fewer hours driving. Crash involvement was particularly high for doubles' drivers who had driven for more than six hours.

Some motor carriers with large fleets argue they can operate their double trailer rigs without increased risk because of careful attention to maintenance and safe-

ty. But although doubles in larger fleets have lower crash rates than those in smaller fleets, their rate still is higher than the crash involvement of tractors with only one trailer, according to the new Institute study.

For a copy of the report, "Crash Involvement of Large Trucks by Configuration: A Case-Control Study" by Howard S. Stein and Ian S. Jones, write: Publications, Insurance Institute for Highway Safety, Watergate 600, Washington, D.C. 20037.

