A Synthesis of Safety Implications of Oversize/Overweight Commercial Vehicles

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Preface

This synthesis report was prepared as a follow-up to the *Commercial Motor Vehicle Size and Weight Enforcement in Europe* international scan which was conducted from June 17, 2006 through July 2, 2006. It is timely given the pressures of the increasing need to move loads that exceed the established vehicle size and weight limits. While studies have addressed the impact these larger than normal loads have on pavement and bridges, much less information is available on their safety implications. As a supplement to the scan, this report describes what is known and what more needs to be known about the safety implications of overdimensional and overweight loads.

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Executive Summary

This synthesis was prepared to support an International Technology Scanning Tour conducted by the U.S. Federal Highway Administration (FHWA), the American Association of State Highway and Transportation Officials (AASHTO), and the National Cooperative Highway Research Program (NCHRP). This implementation project was associated with a scanning tour of several European countries to investigate commercial motor vehicle size and weight enforcement programs (Honefanger, et al., 2007).

The objective of this project is to identify known relationships between commercial vehicle safety and crash causation factors and to prepare a synthesis of safety implications of oversize/overweight (OS/OW) commercial vehicles. This information can be used to support commercial vehicle enforcement and permitting practices. Another purpose for this information is to justify expenditures and investments on size and weight enforcement to enhance safety.

University Transportation Center for Alabama (UTCA) researchers examined over 100 research reports and journal articles to prepare this synthesis. More than 50 interviews were conducted with domestic and international agency, industry, and enforcement officials.

Insight was gained into the impacts of truck size and weight (TSW) regulations through three case studies. This included the Kentucky Coal Haul Road System and a similar system in West Virginia where legislative exemptions allowed semi-trailer trucks to haul up to 120,000 lbs of coal to keep the states' economies competitive. The third case study involved Minnesota, where agriculture and industries were at an economic disadvantage due to larger TSW limits in adjacent states and Canada. The Minnesota DOT conducted a thorough study of increasing TSWs and found that four new truck configurations would be cost beneficial.

The state of practice in estimating large truck crash rates is complicated because of the many configurations and the wide range of possible weights for any particular configuration. It appears that for single-unit trucks, tractor semi-trailers, and doubles, the findings of *TRB Special Report 225* (1990) can be used in the absence of agency specific rates. For longer combination vehicles (Rocky Mountain doubles, Turnpike doubles, A-, B-, and C-train doubles, triples, and unique international heavy vehicles with multiple axles), three Canadian studies between 1995 and 2004 appear to have developed acceptable estimates of crash rates and crash severity rates (Woodrooffe, 2001; Corredor, et al., 2005; Montufar and Associates, 2007).

During this project, UTCA researchers identified four primary findings regarding the contributions of OS/OW to commercial vehicle crashes:

- In general, crash rates decrease but crash severity increases as commercial vehicles become larger and heavier. This synthesis project did not identify scientific measures of reliability for this trend. The lack of a confirmed relationship suggests *neither* a positive (larger, heavier vehicles are safe) nor a negative (larger, heavier vehicles are unsafe) relationship between CMV size and weight and safety. It suggests *only* that additional research is needed to understand the complex relationships.

- No existing truck crash data set was found to have sufficient information for a scientific analysis of the contributions of size and weight (especially OS/OW) to crash causation or severity. The complex, confounding relationships between the contributing factors and the small sample sizes for different configurations of the largest commercial vehicles are two examples of why existing data is not sufficient.

- Studies in Canada have indicated that the longest combination vehicles, (LCVs), have lower crash rates (all severities) than other trucks and all vehicles as a group. Additional research is required to isolate and identify the reasons for this, but it could be because operation of these vehicles is restricted to higher level roadways, involved shipping firms assign better drivers, or similar reasons.

- Another study in Canada found that large truck performance measures (static roll stability, off tracking, etc.) are highly correlated to large truck crash rates. Controlling truck safety through performance thresholds might offer a better way to enhance U.S. large truck safety than some current programs.

Based upon these findings and many more-detailed findings within the synthesis, UTCA researchers made several recommendations to increase the collection of pertinent data and to otherwise enhance the opportunity to understand the relationship of large commercial vehicle size and weight to crash causation and severity. These recommendations are intended to address the need for additional data and for enhanced awareness of the complexity of heavy truck crashes:

- Make data available, if possible online, from weigh stations, weigh-in-motion (WIM), and virtual WIMs, especially when weight and dimensional data can be attributed to specific vehicles that are later involved in traffic crashes. This data can add significant scientific merit to truck safety studies. The weight data can also be used for state and federal planning and enforcement activities.

- Expand the number of WIM and virtual WIM stations to provide more data at relatively small incremental costs compared with alternative labor intensive methods to collect the same data.

- Expand the "Truck Involvement in Fatal Accidents" and "Large Truck Crash Causation" databases. They are prepared by supplementing crash data with specific information about the configuration of each involved truck, driver information, citation information, load information, and much more. It seems realistic to use weight databases to expand these files for individual truck crashes.

- Conduct a regional study of OS/OW vehicles. Since triples are restricted to the northwest, that might be a good location for such a study. One desirable outcome of such a study is to distinguish between legal and illegal OS/OW vehicles in crashes.

- Inventory states with categorical exclusions to TSWs that allow very heavy commercial vehicles, to see if any of them have comprehensive records of crashes of OS/OW vehicles. If a significant number of states contribute data, it might provide a suitable national database.

- Examine load and weight distribution of commercial vehicles involved in collisions to find the relationship between weight and factors like braking capacity and handling characteristics. That could provide a breakthrough in CV safety knowledge.

- Conduct an intensive project to gather significant, high-quality data to analyze OS/OW commercial vehicle crashes, including follow-up crash-site investigations to collect truck-specific data using a crack team of experts. This can be patterned after the Fatality Analysis Reporting System (FARS), a data collection system.

- Where needed, provide specialized training to troopers, police officers, and other personnel to help them determine the cause or contributing causes of heavy-truck crashes. This can affect the type and amount of data that they collect.

- Encourage FHWA and FMSCA to continue to work together to develop and administer policies and programs that address the big picture of roadway safety, of which heavy truck safety an important element. This would include sharing of agency specific data and research programs to optimize the results.

SECTION 1

Introduction

Objective

The specific objective of this research project was to prepare a synthesis of safety implications of oversize/overweight (OS/OW) commercial vehicles. The purpose was to identify and document known relationships between commercial vehicle safety and causal factors like vehicle type, weight, length, speed, load, driver, etc. This information can be used to modify commercial vehicle enforcement and permitting practices, and it can justify investments and expenditures on size and weight enforcement in the interests of safety. A secondary purpose of this project was to identify research needed to guide future safety and enforcement enhancements.

Background

This project was conducted as part of implementation efforts associated with an International Technology Scanning Tour conducted by the U.S. Federal Highway Administration (FHWA), the American Association of State Highway and Transportation Officials (AASHTO), and the National Cooperative Highway Research Program (NCHRP). Scanning tours seek innovative solutions for U.S. transportation challenges. This implementation project was associated with a scanning tour of several European countries to investigate commercial motor vehicle size and weight enforcement programs (VSW Scan Tour).

When granting permits to OS/OW vehicles, U.S. officials make their decisions based primarily on minimizing infrastructure damage (bridges and pavements). However, European officials include safety when making similar permit decisions. Members of the VSW Scan Tour were impressed with the European approach and made safety a priority research recommendation upon returning to the United States (Honefanger, et al. 2007).

One of the pivotal observations by the scan team occurred in Belgium, where officials had observed a safety relationship involving excessive weight and excessive speed of OS/OW vehicles. As a result, regional administrative regulations had been directed toward commercial vehicles to diminish crashes.