

An Analysis of Truck Size and Weight: Phase I – Safety

Summary of Findings

Commercial motor vehicles carrying heavier loads or employing multiple trailers present significant concerns regarding the impact of their use in terms of increased accidents, accident severity and fatalities. In 2011, the most recent year for which data is available, 3,757 people were killed in crashes involving large trucks and 88,000 more were injured – absent any increase in truck size and weight.¹

Several proposals have been made in recent years to increase limits for truck size and weight yet significant disputes exist about the safety of heavier and longer truck configurations. The Multimodal Transportation and Infrastructure Consortium (MTIC) performed a critical evaluation of available crash rate data, prominent safety claims and operating characteristics. Our findings are presented below.

Assessment of Crash Data

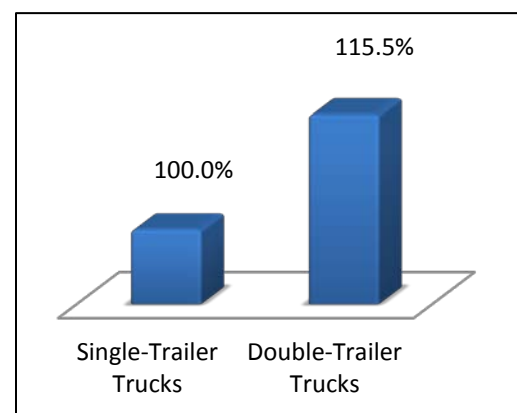
National crash rate data, though limited in several respects, show disturbingly higher crash rates for trucks that are longer or heavier than the current standard 80,000-pound, five-axle truck.

For our analysis, we used average annual fatality data from the Trucks in Fatal Accidents (TIFA) dataset for 2005-2009 and vehicle miles traveled (VMT) estimates from the Federal Highway Administration. TIFA is the most accurate and complete dataset of fatal truck crashes available. It includes reliable information on the number of trailers and axles of trucks involved in fatal accidents. It does not, however, contain the relevant length or weight information needed to calculate crash rates for specific configurations. Nevertheless, existing data shows significantly higher crash rates for multi-trailer configurations and single-trailer trucks with six or more axles relative to the rate for all singles.

Multi-Trailer Configurations

- The raw data show a 13 percent higher fatal crash rate for double-trailer configurations compared with single-trailer trucks. When the data are normalized to compare similar nation-wide operation, the gap increases. **In nation-wide operation similar to single-trailer combinations, double-trailer trucks are likely to have a fatal crash rate 15.5 percent higher than single-trailer trucks.**
- This finding is consistent with the results of the 2000 US DOT Comprehensive Truck Size and Weight Study, which found an 11 percent higher fatal crash involvement rate for multi-trailer configurations.

Normalized Crash Rate Comparison



¹ <http://www.fmcsa.dot.gov/documents/facts-research/CMV-Facts.pdf>. Retrieved May 13, 2013.

- The same raw data show that triple-trailer trucks have a higher fatal crash involvement rate than both doubles and singles. The average number of annual fatalities involving triples and the percentage of VMT attributable to triples are too small to yield a scientifically reliable fatal crash rate finding for triples. However, the data suggest that the finding for doubles is illustrative for longer combination vehicles generally.

Single-Trailer Configurations with Additional Axles

- Single-trailer combination trucks with six or more axles – presumably the heaviest trucks – have dramatically higher crash rates than five-axle singles. **An analysis of TIFA data indicates that single-trailer combination vehicles with six or more axles have a fatal crash involvement rate 867% higher than the rate for all single-trailer trucks.**
- Here, too, the relatively small population of six or more axle trucks traveling the nation’s highways precludes a scientifically reliable finding. Further, we have significant concerns about the quality of underlying data, especially VMT estimates for sub-classes of vehicles. Many data collection problems exist, and the smaller the class of vehicles considered, the larger the potential sources for error.
- Even if more reliable data were to show a fatal crash rate increase even a fraction of that above, the negative implications for highway safety would be vast. It would seem unwise to allow expanded operation of six-plus-axle trucks without further serious consideration of the possible impact on fatality rates.

Operating Characteristics

Serious safety concerns about the relative operating characteristics of heavier and longer truck configurations have been documented in both government and independent studies conducted over the past 30 years. Our review of existing research leads us to conclude that in many cases, credible new research does not exist to dispel these concerns. In some cases, new concerns have arisen in recent years. Among the concerns over the operating characteristics of heavier and longer configurations are:

- State safety inspections suggest that brake maladjustment and equipment defects continue to be widespread issues among current truck operations. Heavier loads require more braking capacity and can exacerbate braking issues.
- Heavier vehicles are likely to increase accident severity as they have more kinetic energy at any given speed. This may be exacerbated as autos become smaller and lighter to meet ever more stringent fuel efficiency standards.
- Increases in allowable vehicle weight may mean higher trailer loadings and a higher center of gravity thus increasing the risk of rollover and cause compensatory heavy vehicle operator behavior that will result in greater interference with other vehicles.
- Heavier and longer configurations can cause greater interference with other traffic (including longer acceleration times and increases in speed for trucks traveling up and down hills) that could exacerbate conflicts with other motorists.

Non-Federal Studies

Proponents of increases in truck size or weight often cite state-specific studies or statistics from other nations to support their claim. Our analysis of prominent studies leads us to conclude that these studies have little applicability to nationwide operation of heavier or longer configurations in the US. For example, the VMT and crash exposure findings from a recent Wisconsin study are insufficient for a national analysis that would require more precise truck and rail diversion assumptions. In Idaho, the Transportation Department was unable to make a statistically significant finding about the safety of long doubles because they represent such a small percentage of truck traffic in the State, preventing the application of the Idaho study results nationally. Also, statistics from the United Kingdom showing decreased truck crash rates cannot be distinguished from a decrease in crash rates for all vehicles, have been criticized by the UK Department of Transport for significant underreporting and should not be considered applicable to US operations because of significant geographical, infrastructure and regulatory policy differences between the US and the UK.

Professional Experience

Concerns over the quality of available data and the lack of substantiated claims of safety improvements led RTI to conduct interviews with law enforcement officers with expertise conducting truck safety inspections and accident investigations and to conduct a survey of truck drivers themselves.

- 20 of the 21 officers interviewed indicated flatly that heavier and longer trucks would be “more dangerous” because the additional weight and length would add new factors to an already complicated chain of events.
- Officers offered real world observations reinforcing many of the concerns about the operating characteristics of longer and heavier trucks raised in the literature.
- With specific regard to crash severity, officers often noted that larger trucks almost always increase the severity of the crash remarking that it was a simple physical equation of kinetic energy with the potential for significantly more damage.
- Similarly, surveyed truck drivers are consistent in their opinion that heavier and/or longer trucks raise significant concerns over the impacts of these configurations on safety. Full results can be seen in the charts below, but the overall conclusions are that:
 - 90 percent of those surveyed believed that increased use of 97,000-pound, six-axle trucks would negatively impact highway safety, and
 - 88 percent believed that greater use of longer combination vehicles would negatively impact highway safety.

Illustrative Quotes from Law Enforcement Interviews

“Maximum braking efficiency is only achieved in the lab.”

“A driver would have to be on his ‘A’ game if he is going to control a vehicle that is 17,000 more pounds.”

“We can replace bridges and roads. We cannot replace people.”

Truck Driver Views of Heavier Trucks' Safety

Characteristic	Positive Impact	Negative Impact	No Impact
Braking distance	9 %	73 %	18 %
Require additional effort to prevent rollover	5 %	86 %	9 %
Turning radius	5 %	70 %	25 %
Emergency maneuver	0 %	90 %	10 %
Impact on equipment	5 %	76 %	19 %

Truck Driver Views of Longer Combination Vehicles' Safety

Characteristic	Positive Impact	Negative Impact	No Impact
Braking distance	2 %	91 %	7 %
Require additional effort to prevent rollover	0 %	77 %	23 %
Turning radius	0 %	66 %	34 %
Emergency maneuver	0 %	86 %	14 %
Impact on equipment	2 %	81 %	17 %

Conclusion

The existing literature, research, interviews and statistics provide clear, if not conclusive, evidence. With confidence, we can say that additional axles, vehicle length and weight place pressure on the equipment, maintenance and drivers, which ultimately increases the potential for error, accident and fatality. Further, existing data, though limited, suggests that heavier and longer trucks are likely to have higher fatal crash rates than the most common trucks on the road today. To better assess the safety impacts of future proposals to increase truck size or weight will require information not currently available. To that end, we make the following recommendations.

1. **Improve data collection efforts.** Data on fatal accidents by configuration and reliable VMT estimates will be required to fully answer questions about the safety of specific truck configurations. Federal agencies should work to require the collection and reporting of more specific information (including weight and configuration) for vehicles involved in fatal accidents and should significantly improve the collection of VMT data.
2. **Conduct off-road operating characteristic testing.** Industry states that technology has enhanced the operating characteristics of commercial motor vehicles yet there is no research directly comparing the operating characteristics of proposed vehicles. This analysis should be completed on a test track to avoid experiments involving the motoring public.