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WHITE PAPER

Myths and Statistics:

Edition I

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Abbreviations and Acronyms

ATA	American Trucking Association
AASHTO	American Association of State Highway and Transportation Officials
AC	Alternative Compliance
ATRI	American Transportation Research Institute
BAC	Blood Alcohol Concentration
BASICs	Behavioral Analysis and Safety Improvement Categories
BLS	Bureau of Labor Statistics
CDL	Commercial Driver Licenses
CR	Compliance Reviews
CSA	Compliance, Safety, and Accountability
CVSA	Commercial Vehicle Safety Alliance
ELD	Electronic Logging Devices
EOBR	Electronic On-board Recorder
ESAL	Equivalent Single Axle Load
FARS	Fatality Analysis Reporting System
FHWA	Federal Highway Administration
FMCSA	Federal Motor Carrier Safety Administration
FMCSR	Federal Motor Carrier Safety Regulations
GHG	Greenhouse Gases
GVWR	Gross Vehicle Weight Rating
HOS	Hours of Service
ICR	Information Collection Request
LCV	Longer Combination Vehicle
LTCCS	Large Truck Crash Causation Study
MCMIS	Motor Carrier Management Information System
MVMT	Million Vehicle Miles Traveled
NPRM	Noticed of Proposed Rulemaking
OOFI	Owner-Operator Independent Drivers Association Foundation
OSOW	Oversize and Overweight
PDO	Property-Damage-Only
PU	Power Unit
RIA	Regulatory Impact Analysis
SNPRM	Supplemental Noticed of Proposed Rulemaking
TL	Truckload
TRB	Transportation Research Board

Introduction

Myths and statistics is a living research report that focuses on a number of statements which are commonly made about the trucking industry and are often accompanied by statistics in order to supposedly verify those statements. Unfortunately, statistics can be very intimidating for many people, and those statements are often taken at face value. Moreover, it appears that if a statement is repeated frequently enough, it becomes self-validating. When considering statistics, it is important to always remember the statement made famous in the United States by author Mark Twain in his autobiography, "there three kinds of lies: lies, damned lies and statistics." The OOIDA Foundation, which is the research and educational arm of the Owner-Operator Independent Drivers Association (OOIDA), has taken some commonly held "statistic backed statements" concerning the trucking industry, and looked at the facts that counter these self-validating statements. Regrettably, many of these statistics have been used, or are being used, to propose regulatory action as well as to promote an agenda which is not founded nor supported by facts.

Myth 1: Driver Shortage

The American Trucking Association (ATA) recently stated that driver shortage is as bad as it has ever been and that the problem is growing worse. Particularly, ATA has stated that currently there is a 35,000 truck driver shortage, which is forecasted to grow to around 200,000 by 2020 and reach as many as 240,000 by 2024, according to ATA projections.

For-hire motor carriers continue to list driver shortage as one of their top concerns, often asserting that as the average age of the drivers continues to rise, the older population of drivers will soon retire. However, according to the ATA, the overall large truckload fleet turnover rate in 2014 was over 90%, and it is not unusual for large carriers to indicate that their turnover rate for drivers is well over 100%. This statistic alone would indicate that there is in fact no shortage of drivers, as these companies must hire 100%+ on an annual basis in order to operate.

While it is very difficult to generate any accurate or realistic number of exactly how many long haul drivers will be needed in the future. The Bureau of Labor Statistics (BLS) predicted in 2012, "Employment of heavy and tractor-trailer truck drivers is projected to grow 11% from 2012 to 2022, about as fast as the average of all occupations.[1]" According to the BLS Occupational Outlook Handbook, there were 1,701,500 truck driving jobs in 2012 with a projected increase of 19,260 jobs annually, or 192,600 over the next ten years,[2] which equates to 1,894,100 jobs by 2022. This compared to ATA's estimates of 240,000 drivers need by 2024.

In order to solve the enigma of the driver shortage problem, the Owner-Operator Independent Drivers Association Foundation (OOFI) researched the number of new commercial driver licenses (CDLs) that are

[1] Bureau of Labor Statistics, "Occupational Outlook Handbook 2012: Heavy and Tractor-trailer Truck Drivers," http://www.bls.gov/ooh/transportation-and-material-moving/heavy-and-tractor-trailer-truck-drivers.htm (accessed May 5, 2015).

[2] Ibid.

obtained each year for interstate trucking. In 2007, the Federal Motor Carrier Safety Administration (FMCSA) released a noticed of proposed rulemaking (NPRM) entitled "Minimum Training Requirements for Entry-Level Commercial Motor Vehicle Operators," which estimated that there are 57,400 new entry-level interstate drivers annually.[3] Utilizing this figure, OOFI calculated that there would be 574,000 new interstate CDL holders over the next ten years, which far exceeds both the 192,600 jobs projected by the BLS and the 240,000 new drivers required by ATA.

However, in 2014, FMCSA published an information collection request (ICR) in the *Federal Register* estimating that there are 657,000 new CDL holders every year, 74% of which, or 486,180, are engaged in interstate commerce,[4] which equates to 4,861,800 new interstate drivers over ten years. Therefore, even comparing just the conservative projections of the BLS and FMCSA's 2007 NPRM with ATA's estimates for a need of 240,000 new CDL holders over the next ten years, there will be a significant surplus of new drivers entering the trucking industry. Moreover, by utilizing FMCSA's projections from their 2014 ICR, there will be a surplus of 4.6 million drivers by 2024, which should more than adequately cover the supposed driver shortage caused by those drivers that will be retiring or quitting.

Table 1: Comparison of Drivers Needed/Projected over 10 Years

Organization	ATA	BLS	FMCSA[1]	FMCSA[2]
Year	2014-2024	2012-2022	2014-2024	2014-2024
Drivers Needed/Projected	240,000[+]	192,600	574,000	4,861,800

[1]Utilizing FMCSA estimates from 2007 NPRM
[2]Utlizing FMCSA estimates from 2014 ICR
[+]ATA forecasted that this is the number of drivers that would be needed

Myth 2: Driver Pay

ATA recently stated in a press release entitled, "Driver Compensation Survey Shows Trucking Provides Competitive Pay, Benefits," that trucking fleets are raising their pay and offering generous benefit packages to drivers in order to attract new drivers and retain current ones. The release stated, "According to new data released today by the American Trucking Associations, median pay for drivers was on par with the national median for all U.S. households, and the industry offers drivers "competitive" benefits.[5]" While annual employee driver compensation varied among carrier and trailer types, the 2013 median pay for truckload (TL) national, irregular route van drivers was just over $46,000, whereas private fleet van drivers earned 58 percent more at $73,000.

Driver Compensation

According to the BLS, the median pay for heavy and tractor-trailer truck drivers is $38,200 per year, which is similar to the OOFI's Owner-Operator Member Profile Surveys and is consequently comparable

[3] 72 FR 73226 (December 26, 2007).
[4] 79 FR 44961 (August 1, 2014).
[5] "Driver Compensation Survey Shows Trucking Provides Competitive Pay, Benefits," American Trucking Associations (2014), http://www.trucking.org/article.aspx?uid=4566f04a-ea8a-47e4-a73c-f6d0e4fc956b (accessed December 15, 2014).

with ATA's assertion that the average income for drivers is parallel with the United States median household income. It is important to keep in mind however that the median is used to indicate the value above and below which 50 percent of the figures fall. Nonetheless, what is not considered in the equation of median pay is the number of hours that the drivers are truly working. Even the BLS, which has a general understanding of how many hours a driver actually works, listed the hourly pay of drivers at $18.37 per hour.[6] This hourly pay rate is very misleading simply because the figure was calculated as if the driver works an average of 40 hours per week.

It is important to note that drivers can, and frequently do, work more than 60 hours in a 7 to 8 day period. Thus, when utilizing driver compensation figures, it is critical to understand that truck drivers are often exempt from the wage and hour regulations under the Fair Labor Standards Act, meaning that there is no over-time pay afforded for any time spent working over 40 hours per week.

The BLS stated that the hourly pay of drivers was $18.37, however, by taking into account that most drivers work beyond the typical 40 hour work week, a driver which works on average of 50 hours a week will earn $14.69 per hour. If the driver works 70 hours per week, the hourly pay would be equal to $10.49. Later, this paper will discuss about the misconception of how many hours a driver can work and how the FMCSA regulates or does not regulate that time.

Myth 3: Large Trucks Represent a Disproportionate Percentage of all Crashes

Although it is often quoted that large trucks represent a disproportionate percentage of fatalities, injuries, and property-damage-only (PDO) crashes, the facts clearly demonstrate that this is not a true statement. FMCSA's *Large Truck and Bus Crash Facts 2012*[7] acknowledged that large trucks accounted for 4% of all registered vehicles, 10% of all vehicles involved in fatal crashes, 4% of all vehicles involved in injury, and 6% of all vehicles involved in PDO crashes.

Table 2: Passenger Vehicle and Large Truck Crash Statistics 2012

Statistic	Passenger Vehicles	Large Trucks	Total	Percentage of Trucks
Registered Vehicle's	253,639,386	10,659,380	264,298,766	4%
Million Vehicle Miles Traveled	2,968,815	268,318	3,237,133	8%
Total Crashes	5,615,000	317,000	5,932,000	5%
Total Fatalities	30,800	3,464	34,264	10%
Total Injuries	1,634,000	73,000	1,707,000	4%
Total PDO	3,950,000	241,000	4,191,000	6%

[6] "Occupational Outlook Handbook 2012."

[7] FMCSA Analysis Division, *Large Truck and Bus Crash Facts 2012*, Federal Motor Carrier Safety Administration (2014).

Focusing only on the percentage of registered vehicles that trucks represent and the percentage of fatal crashes that trucks are involved in would seem at first glance to be an indictment against large truck drivers. Nevertheless, a number of variables need to be considered first in order to investigate further into the truth behind this statement. First, it is vital to understand the fact that all trucks with a gross vehicle weight rating (GVWR) of 10,000 lbs. or more are included in this statistic instead of only including Class 8 trucks, which predominately make up the large truckload segment of the industry, thereby skewing the results.

The smaller class trucks are often referred to as single-unit trucks or straight trucks. According to FMCSA, when considering all truck fatalities, straight trucks are involved in 29% of all fatal crashes, while heavy trucks are involved in 71% of all fatal crashes. Therefore, combination trucks, which account for 61% of all vehicle miles traveled, were actually involved in 2,484 fatalities in 2012.

Table 3: Single-Unit and Combination Trucks Crash Statistics 2012

Statistic	Single-Unit Truck	Combination Truck	Total	Percentage of Combination Trucks
Registered Vehicles	8,190,286	2,469,094	10,659,380	23%
Million Vehicle Miles Traveled	104,960	163,358	268,318	61%
Total Crashes	151,046	177,484	328,530	54%
Total Fatalities	1,046	2,484	3,530	70%
Total Injuries	34,000	40,000	74,000	54%
Total PDO	116,000	135,000	251,000	54%

Furthermore, a variety of sources including the University of Michigan Transportation Research Institute, the Commercial Vehicle Safety Alliance (CVSA), the National Highway Traffic Safety Administration, the AAA Foundation for Traffic Safety, and FMCSA's *Large Truck Crash Causation Study*, have demonstrated that the passenger vehicle is attributed with fault in most fatal accidents involving trucks and passenger vehicles. According to FMCSA's *Large Truck and Bus Crash Facts 2012*, the passenger vehicle was coded with the driver-related factor in almost 84% of fatal crashes involving trucks in which there was a driver-related factor recorded.[8] However, by incorporating a conservative figure of 65% of all fatal crashes involving both large trucks and passenger vehicles are at fault of the passenger vehicle, the number of fatal crashes decreases to 869.

Next, it is crucial to focus on the number of miles traveled per truck and the fatality rate per 100 million vehicle miles traveled (MVMT). According to the Federal Highway Administration (FHWA), there are approximately 2,469,094 combination trucks which travel on average 66,161 miles per year, equaling 163 billion miles annually[9] (2,469,094 trucks X 66,161 average miles traveled = 163,357,728,134 miles annually) with a fatality rate of 1.52 per 100 MVMT (2,484 crashes ÷ 163,357,728,134 miles X

[8] Ibid, pg. 60.

[9] Office of Highway Policy Information, *Highway Statistics 2012*, Federal Highway Administration (2014), http://www.fhwa.dot.gov/policyinformation/statistics/2012/vm1.cfm (accessed February 20, 2015).

100,000,000 = 1.52). Nonetheless, by subtracting the passenger at fault crashes from the equation, the fatality rate decreases to 0.53 per 100 MVMT (869 crashes ÷ 163,357,728,134 miles X 100,000,000 = 0.53). Interestingly, this fatality rate is approximately one-third of what is normally attributed to heavy trucks in transportation statistics.

Next, OOFI considered the risk involved for trucks as compared to passenger vehicles (critical crash risks), meaning the risk attributed to exposure. OOFI found that the average passenger vehicle travels 13,476 miles per year,[10] whereas stated previously, the average combination truck averages 66,161 miles per year. Hence, the crash risk exposure in miles alone for large trucks is five times greater than for the passenger vehicle.

In addition, there are other statistics that must be examined when considering the safety of large trucks verses passenger vehicles, such as blood alcohol concentration (BAC) levels and speeding. While examining the BAC of drivers involved in fatal accidents, OOFI found that 22.8% of passenger car drivers had a BAC equal to or greater than 0.08, while only 2.1% of large truck drivers had the same level.[11] Similarly, OOFI discovered that in fatal crashes in which a driver-related factor was recorded, speeding, which also includes driving too fast for conditions, was cited for the cause of 20.2% of passenger vehicle fatal crashes, compared to 7.8% for large trucks.

Moreover, FMCSA reported that collision with a vehicle in transport was recorded as the first harmful event in 74% of fatal crashes, 83% of injury crashes, and 77% of PDO crashes involving large trucks.[12] Again, as previously mentioned, a majority of crashes involving large trucks are at the fault of the passenger vehicle.

OOFI also researched rollover crashes and found that 74% of all fatal rollover crashes were single-vehicle crashes, meaning that the driver or a passenger of the large truck was killed and no other vehicle was involved. Unfortunately, this statistic is often utilized by agencies and various organizations to suggest that these crashes were due to fatigue without any evidence to support that allegation. Instead, however, there is one particular crash type defined as a vehicle crossing the center median head-on that is indicative of fatigue. In FMCSA's *Large Truck and Bus Crash Facts 2012* the following is listed under Vehicles Table 9, Large Trucks in Crashes with Passenger Vehicles by Crash Type and Severity, 2012:[13]

- Large Truck Crossing Center Median (Head-On) represents 1.8% of all fatal crashes involving large trucks.
- Passenger Vehicle Crossing Center Median (Head-On) represents 17.7% of all fatal crashes involving large trucks.

Additionally, when considering this fact from FMCSA, another alternative for the cause of a fatal single-vehicle rollover crash might be suggested. A truck driver encountering a passenger vehicle crossing the

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[10] Ibid.
[11] *Large Truck and Bus Crash Facts 2012*, pg. 23.
[12] Ibid, pg. 45.
[13] Ibid, pg. 60.

median or center line would force the trucker to take quick evasive action causing a sudden steering action, coupled with hard braking, that could easily lead to a rollover of a large truck. Combine this with the fact that almost two-thirds of fatal crashes occurred on rural two-way roads that were not divided, it would appear that this scenario based on current evidence of fatalities offers a better explanation than simply classifying the cause related factor as fatigue, in that the passenger vehicle could easily adjust their position and continue on without realizing that the truck has left the roadway or crashed because of the evasive action.

Myth 4: Fatigue is one of the leading causes of large truck crashes and fatalities according to the FMCSA.

In recent years, there has been a great deal of focus on fatigue and how it affects the truck driver, along with the relationship that fatigue might have in crashes involving large trucks. The physiological definition of fatigue is:

- Decreased capacity or complete inability of an organism, organ or part to function normally due to excessive stimulation or prolonged exertion.[14] The primary definition is physical or mental weariness due to exertion.

In almost every definition of fatigue, the word exertion is utilized and incorporated with the outcome being a decreased capacity for an individual to function normally. Nevertheless, this definition does not fit the use of fatigue being touted by several regulatory agencies when discussing truck driver fatigue. It becomes immediately clear that these agencies are confusing sleepiness with fatigue. The definition of sleep is:

- A natural, periodically recurring physiological state of rest marked by relative physical and nervous inactivity, unconsciousness, and lessened responsiveness to external stimuli.[15]

Currently, fatigue and sleepiness are being discussed and emphasized by various federal agencies as one and the same, yet as shown above, these are two completely separate physiological states. Therefore, it is imperative that fatigue is no longer equated with sleepiness and sleepiness equated with fatigue. Fatigue does not have a circadian rhythm, which is the physical, mental, and behavioral changes that follow a 24-hour cycle, nor is fatigue based on alpha, beta, or theta waves that occur in sleep.

In a recent study conducted in Switzerland, the researchers recognized that there is indeed a problem with trying to make the terms of fatigue and sleep synonymous with each other, and instead proposed an operational definition of fatigue. The following is an excerpt of the said report:

> An important issue to address when operationalizing fatigue is whether or not the concept should be treated as synonymous with sleepiness. Sleepiness is a clear and serious threat to transport safety. We understand sleepiness a lot more than we understand other components of fatigue, at

[14] Webster's II, New College Dictionary 1995.
[15] Ibid.

operational, theoretical and physiological levels. Based on homeostatic and circadian influences, we can make reasonably successful predictions of average sleepiness for a groups of operators at varying times of the day, after they have followed a given work schedule, or have been given a certain series of sleep opportunities. An obvious question then is why not focus on sleepiness as a safety risk for human transport operators, and ignore the confusing concept of fatigue altogether? There are several answers. Firstly, we wish to understand the effects of sustained work and working while tired on performance, and sleepiness models say little about this. Secondly, even though they may not be sleepy, human operators may still be fatigued such that performance or latent performance is affected. Thirdly, vigilance is a central task for all transport operators, and task-related fatigue can have strong effects on vigilance. And fourthly, we are interested in accounting for how cumulative fatigue related to stress and other energetic constructs may lead to performance reductions. We therefore wish to operationalise fatigue as a broad concept that can capture not only the effects of sleepiness on safety in human transport operators, but those of task- and job-related effects, in addition to the longer term interactive effects of health and safety.

A review of existing attempts at definition finds that the broader concept of fatigue cannot be distilled to a single dimension, but has multidimensional aspects, which are dynamically interdependent and do not fully correlate. These aspects describe how fatigue manifests itself in subjective experience, physiology and performance. The impact of these multiple components of fatigue on the operator must be considered together within a systems perspective. From our review we have evolved a broad multidimensional definition of fatigue that is useful for the study of fatigue in human transport operators, and other researchers may wish to converge on this. It is meant as a contextual definition that can be used as the basis for narrower operational definitions to be used for specific studies of aspects of fatigue. The definition is as follows.

Fatigue is a suboptimal psychophysiological condition caused by exertion. The degree and dimensional character of the condition depends on the form, dynamics and context of exertion. The context of exertion is described by the value and meaning of performance to the individual; rest and sleep history; circadian effects; psychosocial factors spanning work and home life; individual traits; diet; health, fitness and other individual states; and environmental conditions. The fatigue condition results in changes in strategies or resource use such that original levels of mental processing or physical activity are maintained or reduced.

The definition implies that psychological (experiential) and physiological aspects of fatigue need to be measured in order to understand the state of fatigue. In order to understand the fatigue *process*, we need in addition to characterise the form, dynamics and context of exertion, in addition to performance. The definition also accounts for sleepiness as a component of fatigue. The inclusion of exertion as a cause of increased homeostatic pressure in models of sleepiness explains the overlap between fatigue and sleepiness. Exertion in the face of homeostatic and circadian sleep pressure may also increase sleep propensity, and exacerbate the sleepiness component of fatigue. In fact

> fatigued states may be revealed in terms of performance decrements in circadian lows, as fatigue becomes too great for the operator to be able to compensate.[16]

The federal agencies have yet to conceptualize fatigue and still mistakenly confuse the two concepts. Taking some of the information from above, "**The definition implies that psychological (experiential) and physiological aspects of fatigue need to be measured in order to understand the state of fatigue.** In order to understand the fatigue *process*, we need in addition to characterize the form, dynamics and context of exertion, **in addition to performance.**" Not one of the various agencies which have utilizing the terms fatigue and sleepiness interchangeably, have conducted such research.

The lack of scientific research combined with the stumbling attempt at enforcement of violations of driving due to fatigue, was exemplified by the lawsuit which was brought against the Minnesota Highway Patrol by OOIDA in response to the Highway Patrol utilizing a particular checklist at the roadside inspections in which they purported that fatigue could be accurately measured. If the truck driver was diagnosed with fatigue, he or she was placed out-of-service. The court's decision against the Minnesota State Highway Patrol should have provided a clear warning to all governing bodies, that unless there is "reasonable articulable suspicion" of fatigue there can be no enforcement action. The Plaintiff's witness, an expert in sleep studies and fatigue, clearly indicated that there is no device or checklist that can be used at the roadside to determine how fatigued a person is.

Of late, there is speculation that CVSA is considering to promulgate a new rule concerning fatigue. However, in light of the court's decision and testimony by sleep and fatigue experts, it would seem unconscionable that the CVSA, of which the Minnesota Highway Patrol is a member, would decide to institute a policy change where inspectors can take drivers off the road not only for fatigue, but also if they are "likely to become impaired" by fatigue. The CVSA is not offering any definition of fatigue nor are they offering as to how an inspector is going to measure the experiential and physiological aspects of fatigue.

Myth 5: Hours-of-Service Regulations limit how many hours a driver can work

One of the most misunderstood parts of the hours-of-service (HOS) regulations is the amount of time that a driver can work in any day. The FMCSA often states that they limit the amount of time a driver may work to 14 consecutive hours in any day and 60 or 70 hours every 7 or 8 days depending on the business cycle of the carrier. However, this is not true. According to the Federal Motor Carrier Safety Regulations (FMCSRs), no motor carrier shall permit or require any driver used by it to drive a property-carrying commercial motor vehicle, nor shall any such driver drive a property-carrying commercial motor vehicle unless the driver complies with the following requirements:[17]

[16] What is fatigue and how does it affect the safety performance of human transport operators?, Institute of Transport Economics, Norwegian Centre for Transport Research
[17] 49 CFR 395.3 (a)(1)(2)(3)

(1) ***Start of work shift.*** A driver may not drive without first taking 10 consecutive hours off duty;

(2) ***14-hour period.*** A driver may drive only during a period of 14 consecutive hours after coming on duty following 10 consecutive hours off duty. The driver may not drive after the end of the 14-consecutive-hour period without first taking 10 consecutive hours off duty.

(3) ***Driving time and rest breaks.*** (i) ***Driving time.*** A driver may drive a total of 11 hours during the 14-hour period…

(ii) ***Rest breaks.*** Except for drivers who qualify for either of the short-haul exceptions in § 395.1(e)(1) or (2), driving is not permitted if more than 8 hours have passed since the end of the driver's last off-duty or sleeper-berth period of at least 30 minutes.

Each of the above HOS regulations is predicated either on the number hours that a driver can *drive*, or on how many hours a driver must be off-duty or in the sleeper berth before he or she is allowed to *drive*. Notice that there is no limit to the number of hours a driver can be on-duty not driving. Thus, the reality is that the driver can technically be on-duty all 168 hours of any given week, and if he or she obtains 10 hours of off-duty in a sleeper berth, the driver can drive 11 hours within the next 14 consecutive hour period, with the stipulation that he or she takes their 30 minute break within 8 hours of their last off-duty period. False statements made by FMCSA that a driver's working time is limited to 60 or 70 hours in 7 or 8 days, suggest that driving is the only real "working time," which results in FMCSA losing a lot of credibility among drivers and allows them to ignore detention time as a problem.

A majority of carriers and drivers will attempt to utilize every hour that they are afforded in order to produce maximum efficiency and cents per mile from their driving time. It is not atypical for a TL, long-haul driver to utilize the HOS regulation on driving time by getting 60 hours a week of driving in 7 days, or 70 hours of driving time in 8 days. It is also typical for these drivers to spend an additional 10-20 hours of their time in on-duty not driving work, which adds to their duties without adding to their income, as drivers are primarily paid by the miles that they drive.

The mean work week then is somewhere between 60-80 hours per week and it is doubtful that recruiters for trucking companies make this known to new drivers. To reiterate again what was emphasized in Myth 2: Driver Pay, if a driver continually works 80 hours a week and makes $38,200 per year (U.S. Bureau of Labor Statistics, 2012), then their hourly wage is $9.18 per hour, and remember there is no overtime pay for drivers. In other words, a driver working 80 hours a week is giving essentially 1,040 hours a year of free time to their motor carrier.

An additional HOS myth is one concerning the 34-hour restart. In particular, this myth proclaims that the 34-hour restart is mandatory for all drivers to take. In fact, federal agencies, such as the BLS, have stated, "drivers also are limited to driving no more than 60 hours within 7 days or 70 hours within 8 days; then drivers must take 34 hours off before starting another 7-or 8-day run.[18]" However, without

[18] "Occupational Outlook Handbook 2012."

going into great detail about the provision, there is **NO** regulation that states that a driver is ever required to use the 34-hour restart**.**

Myth 6: Electronic Logging Devices Improve Safety

In FMCSA's supplement notice of proposed rulemaking (SNPRM) for the mandating of electronic logging devices (ELDs), previously referred to as electronic on-board recorder (EOBR), the Agency claimed that the proposed rule would ultimately reduce HOS violations by making it more difficult for drivers to misrepresent their time on logbooks and avoid detection by FMCSA and law enforcement personnel. The Agency's analysis suggested that the mandate would help reduce crashes by fatigued drivers and prevent approximately 20 fatalities and 434 injuries each year for an annual safety benefit of $453.8 million.

This claim by FMCSA is a point of contention between the Agency and most truck drivers, as an assumption is made that drivers misrepresent their time on logbooks intentionally thereby allowing themselves to become fatigued and involved in a fatal and/or injury crash.

In January 2011, FMCSA published their regulatory impact analysis (RIA) for the EOBR NPRM, in which the Agency stated that truck driver fatigue was a factor in 13% of all crashes. However**,** it is important to note that the Agency revised the actual percentage of crashes that are fatigue related because "about 7% limited the attainable safety benefits from any changes in the HOS rules or improved enforcement of those rules.[19]" In other words, the fact that 7% of crashes were fatigued related did not meet FMCSA's criteria, therefore they raised the percentage of fatigue to 13%. The Agency attempted to justify the alteration by stating that it was based on data from both the *Large Truck Crash Causation* Study (LTCCS) and from public comments, but the LTCCS showed that only 2% of large truck drivers were judged to be fatigued at the time of the crash and using public comments to statistically expand the percentage doesn't pass the scientific smell test.

After using outdated data and altering percentages to justify the rulemaking, FMCSA also declared, **"There is little research on the effectiveness of EOBRs in reducing crashes and HOS violations."** In fact, studies done by Cambridge Systematics, Inc. at the request of FMCSA concluded:

- There have been no documented improvements in compliance or safety in carriers that use EOBRs.
- "Even the most effective on-board technology will not enable regulators to determine how drivers have conducted themselves while they are off duty and/or on duty, not driving. Most on-board devices were not developed to provide this functionality; however, this is critical because research suggests that the amount and/or quality of sleep that drivers get while they are off duty is a key safety factor."

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[19] FMCSA Analysis Division, *Electronic On-Board Recorders and Hours-of-Service Supporting Documents Preliminary Regulatory Evaluation*, Federal Motor Carrier Safety Administration (2011), pg. 54.

Further, although FMCSA estimated that driver fatigue occurs in 13% of crashes, the Agency failed to establish how EOBRs would relieve or stop fatigue. In fact, FMCSA admitted that EOBRs could only eliminate 1.5% of total crashes by eliminating all crashes that occur during illegal driving times. However, the LTCCS showed only 2% of crashes occurred after 10 hours of driving, and roadside inspection data indicated that only 2.8% of all violations in 2013 were for driving beyond the allowed 11 hours. The RIA stated, "The Agency is uncertain about the degree to which "form and manner" violations are the result of simple negligence or mask other time limit violations, *but believes* the latter reason is prevalent enough to justify its adjusting the estimate of EOBR effectiveness upward slightly.[20]" Therefore, the Agency changed the overall effectiveness of EOBRs from 34% to 40% when "form and manner" violations were added. It is important to note that an uptick of 6% is not considered slight in terms of scientific research.

The Agency has stated previously that the Fatality Analysis Reporting System (FARS) is the best source of fatal crash data. Nevertheless, FMCSA has failed to notice that according to FARS, only 1.4 percent of fatalities in large truck crashes are fatigue related. Furthermore, the Motor Carrier Management Information System (MCMIS) Crash File has shown that only 1.3 percent of all truck crashes were fatigue related. For some unexplained reason the Agency's analysis repeatedly utilizes the 13% figure for the non-defined fatigue estimate.

For a more comprehensive look at data manipulation by FMCSA agency analyst see the OOFI's white papers entitled *The Case Against FMCSA* and *Review of FMCSA Studies*, which are available on the OOFI web site http://www.ooida.com/OOIDA%20Foundation/WhitePapers/WhitePapers.asp.

Myth 7: Alternative Compliance will Improve Safety

Alternative Compliance (AC) or what FMCSA refers to as "Beyond Compliance," is simply the belief that motor carriers should be rewarded for installing strategies and technologies to reduce truck and bus crashes. The theory is to offer credit on the carriers Compliance, Safety, and Accountability (CSA) scores for installing devices that are perceived as safety technologies, such as ELDs, lane departure devices, speed limiters, forward warning collision devices, etc.

In order to better understand AC it is important to first learn where the concept originated. In 2009, a number of large motor carriers questioned the value of compliance reviews (CRs), which FMCSA defines as "an on-site examination of motor carrier operations, such as drivers' hours of service, maintenance and inspection, driver qualification, commercial driver's license requirements, financial responsibility, accidents, hazardous materials, and other safety and transportation records to determine whether a motor carrier meets the safety fitness standard,[21]" after they received less than satisfactory ratings and were required to make adjustments to their safety management practices.

[20] Ibid, pg. 58.
[21] 49 CFR 385.3

In response to the CRs, the carriers requested that the American Transportation Research Institute (ATRI) research the subject of AC. Therefore, ATRI examined large data sets in order to analyze carrier safety during pre- and post-CR time periods. After stratifying the data by fleet size ATRI discovered that while small carriers' safety scores and inspections improved after a CR, the inverse was true for large carriers. Carriers with fleet sizes between 1 and 5 trucks experienced a 51% reduction in crash rates following a CR, while larger carriers with fleets of 251-1,000 and 1,000 or more trucks experienced almost no change, and in one year actually experienced a higher crash rate after receiving a CR.[22] As a result, these large carriers challenged the value of CRs and proclaimed that traditional compliance was not as effective or beneficial for larger carriers.

Rather than examine their safety management, such as hiring practices, business practices, and driver training, large motor carriers turned to technology to solve their many compliance issues. In the past, these carriers have attempted to encourage FMCSA and other federal agencies to offer incentives for purchasing safety equipment. It is vital to note that these mega carriers did not purchase so called safety technology for safety purposes, but instead they purchased them for cost savings and business assessments.

Before the implementation of CSA in 2010, poor safety scores generated from a CR were never really a serious deterrent. Thus, in an attempt to circumvent their poor safety ratings, these large carriers have opted to purchase better CSA scores through technology, which is clearly evident in ATRI's report entitled *Assessing the Benefits of Alternative Compliance*.

A CR, along with the CSA Behavioral Analysis and Safety Improvement Categories (BASICs), are purportedly based on performance and thereby directly related to the carrier's safety management program. The graph in ATRI's Brief[23] clearly indicates that even if the performance of the carrier is poor they would "potentially receive a lower score in a respective BASIC for each alternative compliance tool implemented." The carriers then formulated the following suggestions for if a carrier has a high score in one of the BASICs.

Table 4: Alternative Compliance Suggestions

BASIC	Suggestion	OOFI Rebuttal
Unsafe Driving	The score reduced by installing speed limiters	However, this is regardless of whether the Unsafe Driving score was related to speeding and/or what speeds were the most problematic
Fatigued Driving	The score lowered by instituting a fatigue management program	In other words, simply have their drivers watch a couple of videos or a power point presentation and get their scores lowered
Driver Fitness	The score lowered if the carrier uses an employer notification system	Nonetheless, carriers are already required by regulation to check their

[22] *Research Results: Assessing the Benefits of Alternative Compliance,* ATRI (2011), pg. 2.
[23] Ibid.

	established by FMCSA	drivers' records each year
Controlled Substance	The score lowered if the motor carrier starts using hair testing for drugs	A few larger carriers have already been pushing for this, but as yet this method is not accepted by the medical field for accurately testing for drugs
Vehicle Maintenance	The score lowered by installing tire pressure monitoring	Tire pressure is not a leading cause of vehicle maintenance problems, instead this is more of a fuel mileage concern for the carrier
Crash Indicator	The score lowered by having other on board safety systems	Simply a catch all in order to get credit for anything that the carriers purchase

Interestingly, data from FMCSA clearly indicates that those mega carriers that incorporate on-board safety technologies have a higher crash rate per 100 power units (PUs) than the smaller one-truck carriers, as demonstrated in the table below.

Table 5: Crash Rates per 100 PUs

Carriers	PU	Crashes	Crash Rate per 100 PU
J.B. Hunt	11,664	817	7
Schneider National	11,103	901	8.11
Swift Transportation	17,989	1,601	8.9
Werner Enterprises	8,391	1,064	12.68
US Xpress	5,748	647	11.26
C.R. England	5,257	686	13.05
New Prime/Prime	5,187	601	11.59
Crete Carrier	5,077	373	7.35
Average for TL Mega Carriers	**8,802**	**836**	**9.99**
Total for TL Mega Carriers	**79,218**	**7,526**	**9.5**
One-Truck Carriers[a]	**138,750**	**7,720**	**5.56**
One-Truck Carriers[b]	**125,902**	**6,534**	**5.19**

[a] Data from Volpe Report[24]
[b] Data from GAO[25]

In a white paper entitled, *Examination of Publically Available Data from FMCSA on CSA Scores and Motor Carriers,* OOFI conducted an analysis of publically available information on FMCSA's CSA website in order to present data that represented the real-world safety outcomes of ELDs and speed limiters. As part of the analysis, the OOFI examined the CSA SMS scores of large carriers that had both ELDs and SLs installed, as well as those carriers that did not have these devices installed, which OOFI separated into

[24] Kent Hymel et al., *Financial Responsibility Requirements for Commercial Motor Vehicles*, FMCSA (2012), pg. 46.
[25] *Federal Motor Carrier Safety: Modifying the Compliance, Safety, Accountability Program Would Improve the Ability to Identify High Risk Carriers*, GAO (2014), pg. 74.

two cohorts (asset carriers and non-asset carriers). The non-asset carriers were carriers that primarily utilize leased-on owner-operators and traditionally do not have any on-board safety technology.

In the research, OOFI compared the number of miles driven between crashes by gathering MCS-150 data for each of the carriers. Three of the top four safety performing carriers were non-asset carriers, in other words, the three carriers had the highest vehicle miles traveled before recording a crash. For asset and non-asset carriers, the average number of miles before a crash was approximately 1 million and 1.4 million, respectively. For more information, please visit the OOFI web site at the following link http://www.ooida.com/OOIDA%20Foundation/WhitePapers/WhitePapers.asp.

Table 6: Average Number of miles to crash

Carriers	Miles to Crash
Landstar Ranger Inc.	1,593,016
Knight Transportation Inc.	1,456,311
Dart Transit Company	1,415,859
Landstar Inway Inc.	1,389,091
Schneider National Carriers Inc.	1,182,075
Bennett Motor Express LLC	1,096,742
Swift Transportation Corporation	1,088,111
J B Hunt Transport Inc.	1,040,242
Maverick Transportation LLC	979,339
U S Xpress Inc.	902,779
Werner Enterprises	819,133
C R England Inc.	815,150

*** The non-asset carriers are bolded**

Ultimately, the actual safety performance of a motor carrier should be the criteria for their rating, not their financial ability to buy technology, as most equipment is cost prohibitive for the small business owner and the one-truck owner-operator who dominate the trucking industry (96% of the industry consists of fleets of 20 trucks or less). The table below adequately shows the cost of these on-board safety technologies as well as the expense involved if they were to be mandated for all owner-operators, of which there is approximately 350,000-400,000. Clearly, owner-operators would be unable to compete with large carriers for the privilege of purchasing lower scores to improve their CSA rating.

Table 7: Cost of On-Board Safety Technologies

Crash Avoidance Technologies	Low Cost	High Cost	Low Estimate *(350,000)*	High Estimate *(400,000)*
Lane Departure Warning	$1,000	$1,500	$350,000,000	$600,000,000
Forward Collision Warning	$2,000	$2,300	$700,000,000	$920,000,000
Blind Spot Detection	$250	$700	$87,500,000	$280,000,000
Backover Crash Avoidance	$325	$325	$113,750,000	$130,000,000

Tire Pressure Monitoring	$339	$1,200	$118,650,000	$480,000,000
Electronic Stability Control	$1,800	$2,400	$630,000,000	$960,000,000
Roll Stability Control	$800	$1,600	$280,000,000	$640,000,000
TOTAL*	**$5,714**	**$8,425**	**$1,999,900,000**	**$3,370,000,000**

* The totals do not include RSC because NHTSA's NPRM called for ESC

The Walmart truck crash involving comedian Tracy Morgan and the FedEx truck crash in Orland, California, both of which were serious fatality accidents that made headline news in 2014, clearly indicated that on-board safety equipment is not the panacea for truck crashes, as both carriers have installed a number of "safety technologies" in their trucks. OOIDA has long supported mandated entry-level driver training as the best approach to lower the crash rates while improving efficiency and productivity. FMCSA's own studies indicate that driver error is far and away the leading cause of accidents and OOIDA has proposed specific actions that need to be taken to make the highways and roads safer for all drivers.

Myth 8: Longer and heavier combination vehicles are just as safe as or safer, more productive, and less expensive to use than traditional combination vehicles

Longer combination vehicles (LCVs) and the initiative to increase the allowable weight on the interstate highway system has been proposed for many years by primarily large carriers and the Chamber of Commerce on behalf of shippers. Oversize and Overweight (OSOW) vehicles have always been seen as a way to relieve the driver shortage issue but recently OSOW vehicles have been touted as a way to improve safety and reduce the carbon footprint of large diesel trucks. In the name of efficiency, the theory is to move more freight with fewer drivers while simultaneously paying the drivers at the same rate that they presently earn hauling 80,000 lbs.

Supporters of LCVs often state that the statistics do not demonstrate that LCVs are involved in any more accidents than other CMVs and maybe even less. However, these statements are extremely vague as there are very few states that even allow LCVs, and there is no good safety measurement that has ever been conducted on LCVs, though the Federal Highway Administration is currently studying the issue. Essentially, there is no real hard evidence in either direction. That being said the proponents of LCVs generally use the following arguments:

- **LCVs are more productive due to an increase of cargo-carrying capacity, thereby reducing truck trips at a lower cost and fewer miles driven.** It is difficult to argue with this point because obviously there is in fact more cargo-carrying capacity with LCVs. Nonetheless, there is one definite concern here that LCV supporters never allude to, which is that about 20% of all miles driven by trucks are empty miles. Therefore, having more capacity does not necessarily translate that more capacity is being used. As will be discussed later, the cost of running an LCV to another location in order to pick up a load, referred to as deadheading, is more expensive.

- **Cost: Fewer drivers' needed and more efficient use of fuel.** While this may be true, assuming that all the cargo is going to the same location, if there has to be several stops or if the trailer is not weighted out or cubed out, this statement would not be true. In fact, the opposite would be true. LCVs need bigger engines with lower end power (torque), which is where the greatest amount of fuel is utilized as well as where the greatest amount of greenhouse gases (GHG) is produced. In other words, if an LCV has to travel to more than one stop or is not fully weighted or cubed, it is using more fuel and producing more GHG than a single truck or possibly even two trucks. The wind drag on a truck and trailer is the most significant source of fuel use along with the engine and the rolling resistance of the tires when traveling at highway speeds. LCVs use a great deal more fuel per mile than a single truck or possible two trucks and produce much more GHG.
- **Traffic: May result in fewer trucks on the road.** Again, while this may be true, LCVs may also be more of a safety hazard because they typically travel at a slower rate of speed, and require more time to pass and be passed. Further, because of their inability to accelerate, they often back-up traffic at interchanges and they require greater distances to merge with traffic causing all kinds of maneuvering by other traffic.

Off-Tracking

One of the major safety problems associated with LCVs that is rarely mentioned or considered is off-tracking. All combination trucks experience off-tracking to some extent. It is important to understand that as a tractor-trailer transverses a curve, the path of the front wheel and the path of the rear inside wheel are different. When tractor-trailers turn in an intersection, the outside wheels of the truck take a wider path than the inside wheels. One of the most difficult things to learn when driving a CMV is how to turn in an intersection without going into the adjacent on-coming lane. For instance, the driver on an urban or rural road especially has to swing out of his or her lane in order to avoid going over the top of a car that might be parked in the adjacent on-coming lane.

This action is a function of the wheelbases of the tractor and trailer, along with the number of articulation points. In low-speed off-tracking, the rear wheels track inside the path of the front wheels. In high speed off-tracking, the rear wheels track outside the path of the front wheels. There is a definite safety factor when the wheels of the trailer or trailers go into an adjacent lane or shoulder of the road. Road maintenance or city maintenance crews where LCVs are allowed frequently have to repair curbs and shoulders at intersection used by combination vehicles. These types of maintenance repairs will undoubtedly escalate if LCVs are more common.

A research article based on off-tracking and length characteristics published in the *Transportation Research Record*, the journal of the Transportation Research Board, found that fewer than half of urban and rural interchanges could handle 48 foot tractor trailers, and this number "decreased dramatically" for LCVs. With current designs less than 25% of urban or rural interchanges could handle turnpike doubles.[26] The following table[27] details the percentages of interchanges determined adequate for various truck configurations by the State Departments of Transportation. The cost to the federal, state, and local governments to widen all interchanges or constantly repair curbs and shoulders would be substantial.

Table 8: Percentage of Interchanges Determined Adequate for Various Truck Configurations

Type of Development	Rocky Mountain Doubles	Turnpike Double	Triple
Rural	27%	23%	23%
Urban	29%	24%	39%

Another cost that is seldom considered is that similar to interchanges, a majority of rest areas would need to be reconfigured, and because LCVs require more space for parking, as LCVs cannot be backed like a traditional CMV, longer ramps to enter and to exit out of the rest area are needed in order to create straight ahead parking. Moreover, it is very possible that the practice of parking on off- and on-ramps would be more prevalent, which of course would then require wider and stronger reinforced concrete to accommodate the weight and length of the LCV.

The research article also stated that some truck combinations when confronted by a 90-degree intersection with a 45-foot curb radius, which is normal, may "encroach into adjacent lanes on existing or receiving leg of the intersection." One study showed that Rocky Mountain doubles and turnpike doubles would be forced into opposing traffic lanes far more often than semitrailers to avoid running over curbs when negotiating right turns at intersections.[28]

Safety Concerns

While examining LCVs, it is imperative to also examine the stability of the vehicle. In particular, OOFI found that LCVs are more likely to rollover and are subject to additional trailer sway and rearward amplification. Stability is affected greatly by the length of the trailer as well as the number of articulation points. The greater the number of articulation points, the greater the chance of a rollover. Tractor-semitrailers have one articulation point, whereas a double normally has three, and triples have five.[29] Other research has concluded that:

- An LCV is more likely to be involved in a rollover because of the nature of the connections used between the tractor and the second and/or third trailer.

[26] David Harkey et al, *Operational Characteristics of Longer Combination Vehicles and Related Geometric Design Issues*, Transportation Research Record 1523 (1997).

[27] "Study Discussed Characteristics of Longer Combination Vehicles (LCVs) in Relation to Roadway Design," Road Management & Engineering Journal, http://www.usroads.com/journals/rej/9708/re970806.htm (accessed May 8, 2014)

[28] Ibid.

[29] U.S. Department of Transportation, *Comprehensive Truck Size and Weight Study,* Publication Number: FHWA-PL-00-029 (Summary Report) pg. 22.

- Trailer sway has been shown to be a significant problem for triples which can sway up to one foot and encroach into adjacent lanes.
- Rearward amplification occurs when the truck makes a sudden steering movement.

According to ATA, the addition of a sixth axle on an LCV preserves stopping distance by adding braking power and with properly adjusted brakes an LCV might have more ***potential*** braking capacity than conventional semitrailers. However, surveys conducted in California and Maryland revealed that half of all air-braked vehicles that were inspected had at least one brake out of adjustment. The data from FMCSA's Motor Carrier Management Information System demonstrates that brakes are one of the most common violations cited in the Vehicle Maintenance BASIC, approximately 21%. Hence, sudden braking conditions certainly will create problems for OSOW loads. Further, the percentage and length of a downgrade can also present significant safety concerns, and because of the increased weight, LCVs typically must rely more on their brakes.

Table 9: Brake Violations reported in MCMIS (2014 Fiscal Year)

Violation Description	# of Violations
Abs— All Cmvs Manufactured On Or After 3/1/1999 With Hydraulic Brakes	2,345
Abs— All Other Cmvs Manufactured On Or After 3/1/1998 Air Brake System	13,169
Abs— All Tractors Manufactured On Or After 3/1/1997 Air Brake System	13,501
Abs— Malfunction Indicators For Hydraulic Brake System	2,115
Automatic Brake Adjuster Cmv Manufactured On Or After 10/20/1993— Hydraulic Brake	127
Automatic Brake Adjuster Cmv Manufactured On Or After 10/20/1994— Air Brake	96,127
Brake - All Wheels Not Equipped With Brakes As Required.	117
Brake - Missing On A Trailer Steering Axle.	94
Brake - Missing Required Brake.	163
Brake Adjustment Indicator Cmv Manufactured On Or After 10/20/1994— External Automatic Adjustment	438
Brake Connections With Constrictions - Connection To Power Unit	731
Brake Connections With Constrictions Under Vehicle	655
Brake Connections With Leaks Under Vehicle	9,151
Brake Connections With Leaks/Constrictions	48,322
Brake Connections With Leaksâ - Connection To Power Unit	5,881
Brake Hose Or Tubing Chafing And/Or Kinking - Connection To Power Unit	4,454
Brake Hose Or Tubing Chafing And/Or Kinking Under Vehicle	20,907
Brake Hose/Tubing Chaffing And/Or Kinking	127,955
Brake Out Of Adjustment	1,479
Brake Tubing And Hose Adequacy	41,569
Brake Tubing And Hose Adequacy Under Vehicle	8,532
Brake-Air Compressor Violation	4,914
Brake-Defective Brake Drum	746
Brake-Reserve System Pressure Loss	13,790
Brakes - Hydraulic Brake Caliper Movement Exceeds 1/8' (0.125') (3.175 Mm)	77
Brakes - Missing Or Broken Components	2,378

Brakes - Rotor (Disc) Metal-To-Metal Contact	45
Brakes - Severe Rusting Of Brake Rotor (Disc)	360
Brakes (General)	68,456
Clamp/Roto-Chamber Type Brake(s) Out Of Adjustment	200,701
Defective Brake Limiting Device	259
Failing To Secure Brake Hose/Tubing Against High Temperatures	2,735
Failing To Secure Brake Hose/Tubing Against Mechanical Damage	49
Inadequate Brake System On A Cmv	820
Inadequate Brakes For Safe Stopping	28,106
Inadequate Reservoir For Air/Vacuum Brakes	1,017
Inadequate/Contaminated Brake Linings	6
Inoperative/Defective Brakes	65,419
Insufficient Brake Linings	12,148
Insufficient Braking Force As Percent Of Gvw Or Gcw	301
Mismatched Brake Chambers On Same Axle	2,189
Mismatched Slack Adjuster Effective Length	3,394
No Brakes As Required	3,101
No Or Defective Automatic Trailer Brake	8,875
No Or Defective Brake Warning Device	15,234
No Or Defective Parking Brake System On Cmv	5,309
No/Defective Lamp/Reflector-Tow-Away Operation	664
Wedge Type Brake(S) Out Of Adjustment	696
TOTAL BRAKE VIOLATIONS	**839,621**

Speed and Acceleration Safety Concerns:

Speed and acceleration is also a major safety concern as an increase in weight means that the LCV will naturally have difficulty accelerating and merging with traffic on the highways. In addition, the increased weight means that in order to operate efficiently the horsepower, engine torque, and drive-train must operate without speed differentials among other vehicles on the roadway. "Crashes are more likely when LCVs travel under the prevailing speed. For example, when a truck travels 16 km/hr (10mi/hr) under the prevailing speed, the likelihood for a crash increases by 3.7 times." If 20mi/hr under the prevailing speed, the chance of a crash goes up by a factor of 15.5.[30] The LCVs lower acceleration speeds, coupled with its need for more longitudinal space, might very well affect the roadway capacity.

Bridge and Pavement Damage

Damage to highway structures represents the most critical infrastructure cost of allowing larger and heavier trucks on the nation's highways. All of the studies performed by the FHWA, the Transportation

[30] *Western Uniformity Scenario Analysis: A Regional Truck Size and Weight Scenario Requested by the Western Governors' Association*, Federal Highway Administration (2004).

Research Board (TRB), and several universities in the last ten years that examined potential impacts of truck size and weight increases have found that the estimated damage to bridges would be the greatest single infrastructure cost caused by larger, heavier trucks.[31]

However, supporters of LCVs have attempted to make the argument that because an LCV has an additional axle, the weight distribution will be improved thus resulting in less pavement damage. Regardless of the additional axles to support the extra weight, while an LCV is traveling across a bridge the entire weight is on the infrastructure, and of course 100,000 lbs. is heavier than 80,000 lbs. The states' bridge formulas would prohibit most LCVs as their load would exceed the weight limit of a majority of bridges. Therefore, every state would need to reevaluate their bridge formulas as a result. Nevertheless, bridge formulas are influenced by the vehicle gross weight, the weight on various groups of axles, the distance between axles, and the type and length of bridge.

According to the Bureau of Transportation Statistics, in 2011 there were 67,522 bridges considered structurally deficient and 76,356 bridges considered functionally obsolete.[32] In addition:

- 1.9% of urban bridges were considered structurally deficient
- 8.8% rural bridges were considered structurally deficient
- 5.4% of urban bridges were considered functionally obsolete
- 6.8% rural bridges were considered functionally obsolete

There are so many variables involved with pavement fatigue that the weight of the truck, or more accurately the weight distribution on each axle, is somewhat irrelevant. It is true that pavement deterioration accelerates with axle weight, the number of axle loadings, and the spacing within axle groups, our roadways are generally designed to accommodate a certain weight limit. Thus, it is crucial to not only examine pavement fatigue, but also pavement failure.

Similar to pavement fatigue, pavement failure is also dependent on numerous variables, including climate, environmental factors, materials, design, traffic, and usage. Today, most interstates are designed with a flexible pavement which is deeper and designed to handle 80,000 pound loads, whereas the arterial roads are usually designed to handle loads of approximately 58,420 lbs. Since pavement damage increases with time, it is virtually impossible to pinpoint any specific illegal overweight truck in order to quantify its individual contribution to such damage. The American Association of State Highway and Transportation Officials (AASHTO) determined in 1993 that new pavement construction costs are allocated based on the relative equivalent single axle loads (ESALs) for each vehicle class. The ESAL is a measure of the relative contribution to pavement wear associated with different single and tandem axle loads, using an 18,000 pound single axle as the benchmark.[33]

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[31] Ibid, pg. V-1.

[32] Bureau of Transportation Statistics, *Transportation Statistics Annual Report 2012*, U.S, Department of Transportation, Research and Innovative Technology Administration (2013).

[33] *1997 Federal Highway Cost Allocation Study: Final Report*, U.S. Department of Transportation, FHWA, pg. V-5. http://www.fhwa.dot.gov/policy/hcas/final/index.htm

Axle groups, such as tandems or tridems influence pavement load distribution. These groups allow for greater weights to be carried on pavement, resulting in the same or less pavement distress than that of the single axle at a lower weight. While this is true for pavement, it is different for bridges. As discussed previously, the number of axles means little when considering bridges, as they are designed with a specific weight limit. As a side point, it is interesting to mention that the wide-base single tires that the Environmental Protection Agency and SmartWay are encouraging lack strong rut resistance, and as such tend to cause 1.5 times more rutting than dual tires on flexible pavements.

Supporters of LCVs state that increasing truck size and weight limits will reduce both the number of trucks on the road and GHG emissions. Nonetheless, while TRB and other groups have expressed difficulties in obtaining sufficient information to produce a cost and benefit analysis, we do know that pavement costs are dependent on materials, thickness, quantity and quality, and that heavy axles cause greater and faster pavement fatigue.

Ultimately, it was determined in a study conducted by the Transport and Road Research Laboratory that "[t]he relative damaging effect of an axle is considered to be approximately proportional to the fourth power of the load.[34]" Hence, if the weight of a vehicle is doubled, then the damage that the vehicle does gets doubled four times. In other words, if the weight of the vehicle is doubled, it causes 16 times the damage, or to put it another way, an increase in axle weight of 10% will increase pavement damage by about 46%.

Conclusion

Again, this report is a living research product and as such, the OOFI will continue to update it as the media, various organizations, and governmental agencies continue to produces myths and statistical fallacies to further their own political agenda. Upcoming research will include the myth that the trucking industry does not pay its fair share of transportation costs, as well as the myth that CSA is an accurate predictor of a crash. For additional updates, periodically check the OOFI web page at http://www.ooida.com/OOIDA%20Foundation/WhitePapers/WhitePapers.asp.

[34] R.R. Addis and R.A. Whitmash, *Relative Damaging Power of Wheel Loads in Mixed Traffic*, The Transport and Road Research Laboratory (1981).

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