

#5 DBB Article

Truck Driver Fatigue

I. Background

The connection between over-the-road trucking and driver fatigue is not new. For as long as drivers have had to make certain delivery times and shippers have paid to have their products delivered by truck, drivers have been falling asleep at the wheel. As early as 1935 the National Safety Council issued its report on the problem: Too Long at the Wheel.^[1] Since then, our society has developed into a 24-hour society, and fatigue, in general, has become a broad societal problem. The National Sleep Foundation reports that 37% of American adults are so sleepy during the day that it interferes with daytime activities. Given the demands of the job, this has to be worse for truck drivers. "Just-in-Time" delivery and "rolling warehouse logistics" have made trucking a truly round-the-clock endeavor. Yet, even today, certain trucking groups down-play driver fatigue and portray it as a relatively minor problem, citing their (absurd) position that fatigue plays a role in less than 2% of fatal truck crashes.^[2] Even the FMCSA, which is supposed to be protecting the public from dangerous trucking activities, puts the percentage at a ridiculously low 5.5%. The world's leading sleep experts agree that fatigue is the largest identifiable and preventable cause of accidents in the transportation operation. They further point to official underestimation of the problem as part of the problem^[3]

1995 appears to be the watershed year for taking driver fatigue seriously in trucking. In that year, Secretary of Transportation, Federico Peña, called for the first National Truck and Bus Safety Summit, to be held in Kansas City, Missouri. Trucking industry representatives met with researchers, safety advocates and government representatives with the goal of developing a list of the most pressing safety issues facing the trucking industry. The list would be used to guide research, regulation and training efforts to try to reduce truck crashes, fatalities and injuries. After several days of meetings, sessions, workshops, and speeches, the Summit participants developed a list of 17 safety issues facing the trucking industry and ranked them in priority order. Number one on the list was driver fatigue. In the years following, more emphasis has been put on the fatigue issue, with fatigue training videos being offered by all major industry training suppliers, train-the-trainer sessions have been developed, dozens if not hundreds of research projects have been undertaken, and technological advancements have given us gadgets and algorithms to help detect when a driver might be getting too tired to drive safely.

In spite of the additional focus and attention on the issue, and in spite of the Department of Transportation's announced 1999 goal of reducing truck-crash fatalities by 50% in ten years, we still have no litmus test to determine whether a driver is fatigued when he or she is involved in a crash and we are still suffering more than 5,000 fatalities a year in truck crashes in the U.S. Because of poor investigation in the area of fatigue (there is no "breathalyzer" or other test to give a driver after a crash to determine his or her fatigue level), and because of horrible records regarding involvement of fatigue in crashes, we still have no solid statistics regarding how many or what percentage of truck crashes are caused or contributed to by driver fatigue. Figures as low as 2%^[4] and as high as 58%^[5] of particular types of crashes have been given. Even results from the long-awaited Large Truck Crash Causation Study will not be able to accurately portray the true extent of the problem, because the study included no acceptable protocol to identify fatigue-related crashes and took an "I-know-it-when-I-see-it" approach to identifying fatigue as a cause. The fact of the matter is that driver fatigue is a significant cause of losses in the trucking industry and should be investigated as a possible factor in catastrophic truck crashes.

The investigation into whether fatigue played a part in a particular case will vary, depending upon the type of crash and the information available. What is considered by some to be the classic "fall asleep" case involves a crash with little or no braking with one vehicle running into another vehicle or object (or running straight off the road when the road turns) when there was clear visibility and no obstructions to the driver's view. Not all fatigue related crashes, however, share these characteristics. A driver does not need to fall asleep to have his or her driving impaired by fatigue. Fatigue impairs drivers in much the same way that

alcohol intoxication does; a driver's ability to perceive and react becomes increasingly diminished as the level of fatigue increases. Indeed, even "relatively moderate levels of fatigue impair performance to an extent equivalent to or greater than is currently acceptable for alcohol intoxication."^[6]

When what we know about fatigue is superimposed over what we know about the economics of the trucking industry since it was deregulated in 1980^[7], it becomes clear that our highways are literally full of "accidents waiting to happen." Accordingly, an evaluation of a crash requires an understanding of the interplay among some or all of the following: the economics of the industry^[8], how the crash occurred, the driver's sleep/wake pattern in the days preceding the crash, time on task, time of day, the driver's training, the driver's health, company policies, and the fundamentals of the science of sleep.

Within the confines of this article it is not possible to identify and explore every factor necessary to determine if driver fatigue caused or contributed to cause a crash. Each case will bring its own individual facts that will require its own approach. The basics of the science of sleep, against which the facts may be analyzed, however, can be stated and are set forth below.

II. The Science of Sleep – The Basics

Most of what we know about the science of sleep has been developed in the last 50 years. Although we continue to learn more every year, what we have learned so far indicates that a person's need for sleep grows in direct proportion to that person's lack of sleep (sleep debt) and that, ultimately, sleep is the only safe countermeasure for fatigue.

- What is Sleep?

It has been said that the fundamental essence of sleep in contrast to wakefulness (in which we "perceive and are conscience of the external world") is a "disengagement from the outer world, accompanied by an engagement with the inner world and the dream world... This disengagement from the outer world is an active process in which sensory input is blocked or modified to effect a complete perceptual shutdown; to all intents and purposes, we are blind and deaf. Even if our eyelids are taped open during sleep, we do not see. We know that signals are received by the retina, transmitted to the thalamus and to the visual cortex; likewise, sound is processed by the auditory system. Yet, we have no idea why, the second before sleep descends, we seen an object in the real world, are conscious of it, perceive it; while the seconds afterwards, we are subjectively blind and do not see it at all. Nor can we explain why, during REM sleep stimuli may enter the brain to be "misperceived" in strange and interesting ways."^[9]

This definition, however, does not really "define" sleep, but rather describes it. The description implies that the brain requires rest. This definition, however, is much too simple in that it appears to define sleep as either simply being "not awake." Sleep, however, is more complex and involves different stages.

- The Stages of Sleep

A healthy person first drops off into non-REM (Non-Rapid Eye Movement) sleep which has four successively deeper stages. Non-REM sleep is regularly broken by a period of REM sleep, the characteristics of which are similar to the patterns of alert wakefulness, with the key exception that the body is immobilized.^[10] Stage one non-REM sleep lasts for about five minutes.

Stage two sleep is: still a fairly light sleep, but with reduced mental activity. After about 20 minutes at stage two, the sleeper passes into the deep sleep of stages three and four. Left undisturbed, the first deep sleep of the night will continue for another 30 to 45 minutes. Then, at about an hour of sleep onset, the sleeper passes briefly through the lighter stage 2 non-REM and into REM sleep. During the first REM period, which lasts for about ten minutes, dreaming is apparently continuous. There are usually about five such cycles in an eight hour period, occurring at roughly 90-minute intervals.^[11]

According to the National Sleep Foundation, both non-REM sleep and REM sleep are important to experiencing quality sleep; getting the right mix and enough of both REM and NREM sleep helps one maintain one's natural sleep architecture and have restful and restorative sleep.

Exploring the type and degree of interruptions to this type of quality sleep architecture is part of the inquiry into how and whether fatigue played a role in causing a particular crash. A variety of interruptions may be present, from environmental to inherent (sleep disorders).

- Circadian Rhythm

Having regular times for the onset and ending of sleep helps promote quality sleep. The human body has a "circadian clock" which tends to promote sleep at particular times of the day: The circadian clock controls the timing of physiological activity (e.g. thermoregulation, immune function, digestion), performance, alertness, and mood. Daily, the circadian clock is programmed for its lowest point around 3 a.m. to 5 a.m. This is the period of lowest activity across physiological systems and human functioning. Performance reductions can occur in a larger window from about 12 a.m. to 6 a.m. A second programmed period of sleepiness occurs at about 3 p.m. to 5 p.m. These windows of circadian lull are associated with decreased performance, alertness and mood and are especially relevant in an accident investigation when a critical phase of operation occurs during one of them. However, just operating during these periods is associated with physiological changes that reduce performance and alertness.^[12]

The irregularity of a driver's schedule frequently presents the danger of causing fatigue. Driver's frequently change schedules and may have very irregular sleep patterns.^[13]

- Sleep Debt

On average, human adults physiologically require about eight hours of sleep. However, there is a range of sleep need from about six to ten hours of sleep. Therefore, the average adult will need about eight hours of sleep for optimal waking performance and alertness. Sleep loss can be considered in two ways: acute and cumulative. Acute sleep loss involves the total amount of sleep obtained in a 24 hour period. An average person that obtains only five hours of sleep one night has an acute sleep loss of three hours. Sleep loss that occurs over several days builds into a cumulative sleep debt. An average person who obtains only five hours of sleep for three consecutive nights has a cumulative sleep debt of nine hours. Recovery from a cumulative sleep debt typically involves more deep sleep and not an hour-for-hour payback of lost sleep that requires extended sleep. Calculating an individual's acute sleep loss or cumulative sleep debt should be based on the person's usual sleep requirement and pattern. A Scientific review found that even two hours of sleep loss can result in impairment of performance and levels of alertness.^[14]

There appears to be some disagreement with regard to recovery from chronic or extended sleep debt. Some scientist have indicated that generally, two nights of usual sleep, at a person's regular bedtime, can reduce the cumulative sleep debt to null.^[15] However, other studies of operational alertness have found that, even after three night of extended sleep, the effects of extended sleep debt are not ameliorated.^[16]

- Microsleeps

Microsleeps are brief, unintended episodes of loss of attention associated with events such as blank stare, head snapping, prolonged eye closure, etc., which may occur when a person is fatigued and trying to stay awake to perform a monotonous task like driving or watching a computer screen.^[17] The Roads and Traffic Authority for New South Wales, Australia, describes microsleeps at follows:

Microsleep episodes last from a few seconds to several minutes, and often the person is not aware that a microsleep has occurred. In fact, microsleeps often occur when a person's eyes are open. While in a microsleep, a person fails to respond to outside information. A person will not see a

road signal light or notice that the road has taken a curve. Microsleeps are most likely to occur at certain times of the day, such as pre-dawn hours and mid-afternoon hours when the body is "programmed" to sleep. Microsleeps increase with cumulative sleep debt. In other words, the more sleep deprived the person is, the greater chance a microsleep episode will occur. In one study of microsleep, participants were asked to press a button when a strobe light was flashed directly in their eyes every few seconds. During a microsleep they did not notice the light and were not even aware that they had been asleep.^[18]

The dangers of microsleeps are readily apparent. At 65 miles an hour, a driver who suffers a 3 second microsleep is "driving" a truck the length of a football field while effectively being unconscious.

- Sleep Disorders^[19]

Almost 90 different sleep disorders exist and are described in a diagnostic classification system (AASM REF). The primary presenting complaint from many of these disorders is excessive sleepiness. There are a broad range of physiological and psychological causes for these sleep disorders and the individual sufferer might be unaware of its existence. Most of these sleep disorders can be diagnosed and treated successfully by a credited sleep medicine specialist. This factor is a consideration because an operator may have a sleep disorder that predisposes the individual for excessive sleepiness. Altered circadian rhythms (e.g., shift work, time zone crossings) and other factors could further exacerbate the preexisting sleepiness. One example is sleep apnea, a condition in which an individual has breathing pauses throughout sleep. This causes waking sleepiness and performance decrements, as well as other related health problems. Studies of individuals with sleep apnea have shown up to a seven times increased risk for car accidents. Sleep disorders, such as sleep apnea, put individuals at increased risk for sleepiness and potential performance reductions.

Sleep apnea is a condition in which a narrowing or closure of the upper airway during sleep causes repeated sleep disturbances, and possible complete awakenings, leading to poor sleep quality and excessive daytime sleepiness. An obstructive apnea occurs when the muscles on the back of the throat are not able to keep the throat open to breathe. This process makes the person literally "wake up to breathe," and interrupts the opportunity to obtain restorative sleep. From 1996 to 1998 the University of Pennsylvania Center for Sleep and Respiratory Neurobiology collected data for a study on the prevalence and consequences of obstructive sleep apnea among commercial vehicle drivers. Their study found that 36% of commercial truck drivers suffered mild to severe sleep apnea, which the study concluded was approximately the same percentages as found in the general population.^[20] Some researchers say the problem is much more serious among commercial truck drivers.^[21] Indeed, two indicators that a person may suffer from sleep apnea are obesity (a neck size of 17 inches or greater) and if the person snores loudly. Increased risk factors include smoking and being more than 40 years old.

Given what we know about the dangers of drivers who suffer from sleep apnea, and the relatively simple treatment for it, a nationally known sleep expert has said it is "absolutely indefensible" that Federal Highway Safety officials do not have commercial truck and bus drivers screened for sleep disorders.^[22]

- Fatigue Countermeasures

Although there are many stories or "myths" about ways to combat fatigue, such as opening a window, turning up the radio, turning down the air conditioner, walking around the truck, etc., the only real countermeasure against fatigue is adequate sleep. Caffeine can help overcome drowsiness for short periods, but it cannot replace sleep. Its effect may be to compound a sleep debt because the caffeine is keeping the subject from falling asleep when the body wants to. When the caffeine wears off or it loses its effect, the person will be even more sleep deprived. Part of an effective fatigue management training program is to teach drivers that other methods of combating fatigue are simply not effective and should not be relied on.

III. Industry Pressures and Fatigue Awareness

Although a truck driver's job has never been easy, competitive forces since the industry was deregulated in 1980 have created an environment in which most, if not all of the variable costs involved in trucking are attempted to be placed directly on the backs of the individual drivers. The situation has been described by one expert as follows:

Imagine a world in which there is no effective minimum wage and no 40-hour workweek or time-and-one-half for overtime.

Imagine a world in which most people work more than 60 hours per week – not to "get ahead" but just to make ends meet.

Imagine a world in which most of us compete to offer our services at the lowest possible price but which is so competitive that we get what we want – and end up working longer hours just to earn enough to subsist.

Imagine a world in which people work like this with no regular schedule – irregular days and irregular hour, switching from day to night and back again with little predictability.

Imagine a world in which production workers' wages stop abruptly with every hiccup in the assembly line.

Imagine a world in which employers decide which work to pay you for and which you have to perform for free – and that work comprises 25% of your day! Imagine no further, because that is the life of the truck driver today in the hyper-competitive trucking industry.^[23]

The number of authorized motor carriers in the United States exploded after deregulation from less than 30 thousand to more than 500 thousand by the turn of the century.^[24] Today, no exact figure is available, but it is believed to be between 600 and 700 thousand motor carriers. The resulting unfettered competition has been effective in keeping rates (and driver pay) low. Throughout the long-haul industry, the most common method of payment is still pay "by the mile." This means that the longer and farther the driver travels, the more pay he or she can make. Because the per-mile rate has been kept relatively stagnant, drivers feel a great deal of pressure to continue driving when they know they should stop to rest. Add this to the fact that most drivers are not paid for time they spend waiting to load and unload, and you have great pressure to drive as many miles as possible to make up for lost time.

Many drivers have left the industry and many drivers that stay in the industry change jobs frequently. The driver turnover rate for large truckload companies during the second quarter in 2005 jumped to 129%, the second highest on record.^[25] The turnover rate (or "churn" rate) at smaller truckload companies recently dropped from approximately 100% to 81%, and turnover rate for less than truckload (LTL) carriers is in the 15% to 17% range.^[26] The industry refers to the present situation as a "driver shortage." The reality, however, is that there is no shortage of workers in this country, as is proven by national unemployment statistics. The fact is, there is a shortage of people who want to work 70 to 100 hours per week, be gone from their families for extended periods of time, and make an average hourly rate that would be approximately equivalent to a senior fast-food service job.^[27] Truck drivers are not protected by the overtime provisions of the Fair Labor Standards Act.

The result is that well-run, safe companies have been challenged by companies willing to cut corners to obtain or keep business. As carriers compete for the shrinking profit margin, working conditions for many drivers have worsened, leading to these high attrition rates and attracting more poorly qualified drivers into the industry. With this downward spiral, the biggest question is why there are not even more truck crashes on our highways.

When a truck crash is caused by driver fatigue, the claims that arise from the crash will focus on whether the driver and the carrier complied with the regulations regarding the hours the driver can work, and whether they otherwise took reasonable steps to minimize this ever-present danger.

Safety directors can no longer claim that they did not realize fatigue is a problem. Although the official industry line is that fatigue causes a low percentage of fatal truck crashes, the world's foremost experts who have honestly looked at the fatigue problem have formulated a "consensus statement" and have concluded that fatigue "is the largest identifiable and preventable cause of accidents in transport operations (between 15% and 20% of all accidents), surpassing that of alcohol or drug related incidents in all modes of transportation."²⁸ The expert consensus statement also identified poor government statistics as one of the contributing factors: "Underestimation of the impact of fatigue can lead to the underutilization of important countermeasures."²⁹

Although a wide variety of fatigue training materials are available from all truck industry general supply companies, most trucking companies do not screen their drivers for sleep disorders and do not provide training to their drivers about problems associated with fatigue. Only recently have the federal regulations provided specifically (and vaguely) for any driver training related to "fatigue countermeasures" and this only applies to entry level drivers.³⁰ Nonetheless, the regulations do provide, albeit, somewhat indirectly, that a motor carrier must provide effective training regarding fatigue to all of its drivers. This requirement is found in 49 CFR §392.3 which provides:

No driver shall operate a commercial motor vehicle and a motor carrier shall not require or permit a driver to operate a commercial vehicle while the driver's ability or alertness is so impaired, or so likely to become impaired, through fatigue...as to make it unsafe for him/her to begin or continue to operate the commercial motor vehicle.

This requirement clearly states that the motor carrier shall not permit a fatigued driver to continue driving when it is unsafe for him or her to do so. Unless that company has someone sitting in the seat next to the driver, monitoring the driver's alertness, and telling him when to pull over, the motor carrier must have in place a training system to comply with this directive. Interpretations for the federal regulations published in the federal register of April, 1997, by the Office of Motor Carriers (predecessor to the FMCSA) confirmed that "carriers are liable for the actions of their employees. Neither intent to commit, nor actual knowledge of, a violation is a necessary element of that liability. Carriers "commit" violations...of ...regulations by their employees if they fail to have in place management systems that effectively prevent such violations."³¹

Accordingly, in order to comply with this regulation, a motor carrier must have in place a management system that effectively prevents a driver from continuing to drive when he or she is too fatigued to do so. Merely informing a driver that he should pull over when he is too tired to drive would be similar to a motor carrier merely telling a driver not to violate the hours of service provisions, without having an audit system in place, and clearly would be indicative of irresponsible and incompetent management.

Many times, the safety department of a trucking company is interchangeably called its "compliance" department. Sometimes it may be referred to as the "safety and compliance" department. Too often, they focus more on the compliance side than the safety side. The regulations provide for the minimum standards and framework that must be met by a motor carrier. "Compliance" is too often focused on making sure that the motor carrier does not violate the specific terms of the regulations. A focus on safety, however, involves an assessment of the risk of a particular operation and the implementation of measures to reduce the risk. The difference, especially in the area of truck driver fatigue, is the difference between life and death. For example, a driver who drives 11 hours straight followed by ten hours off duty for four cycles, is absolutely compliant with the regulations, but is even more absolutely an imminent threat of serious injury and death to the public because the driver will have been subjected to a rearward rotating schedule with a dangerous alteration of his sleep cycles and, in the next driving period will be driving throughout the period of time at which he was sleeping at the beginning of his tour of duty. "Compliance" seeks to avoid a literal violation of a regulation. "Safety" seeks to prevent crashes, serious injuries and deaths. Compliance is simply not sufficient.

IV. Conclusion

The danger of driver fatigue is obvious. Long before a fatigued driver falls asleep, he or she suffers from degraded judgment and decision making capabilities, cognitive fixation, decreased coordination, reduced reaction time, perseveration, decreased memory and mental functioning, and indifference to normal stimuli. The degradation in performance capability is directly proportional to the degradation found in alcohol impairment and should be considered every bit as dangerous. It is the responsibility of every motor carrier to provide its drivers with the tools necessary to perform the job demanded of them and to prohibit them from driving while fatigued. Since 1995, the industry has literally been flooded with information about the dangers of driver fatigue, educational and training materials for their drivers, and more information for their management. A company that does not provide its drivers with adequate information, training, and supervision to insure that the drivers do not drive while they are fatigued is closing its eyes to the greatest risk to the public that their operation presents. Such conduct demonstrates an indifference to and conscience disregard for the safety of others and should be dealt with accordingly.

[1] National Safety Council, *Too Long at the Wheel – A Study of Exhaustion and Drowsiness as They Affect Traffic Accidents* (1935).

[2] This position cites the study "Estimates of the Prevalence and Risk of Fatigue in Fatal Accidents Involving Medium and Heavy Trucks", by Kenneth L. Campbell, which internally admits that "the overall proportion [of fatigue involvement] in fatal accidents...underestimates the true value."

[3] Consensus Statement: *Fatigue and Accidents in Transportation Operations*, 2000.

[4] Campbell, *Estimates of the Prevalence and Risk of Fatigue in Fatal Accidents Involving Medium and Heavy Trucks* (2002)

[5] *Factors That Affect Fatigue in Heavy Truck Accidents*, NTSB Number SS – 95/01

[6] Dawson & Reid, "Fatigue, Alcohol and Performance Impairment", *Nature*, Volume 288, July-August 1997.

[7] Michael Belzer, "Sweatshops on Wheels", (2000).

[8] Jeffrey A. Burns, "Asleep at the Wheel", *Trial*, November, 2002, Pg. 58.

[9] William C. Dement, M.D., "The Sleep Watchers", p. 39.

[10] *Id* at 48.

[11] *Id* at 49-50.

[12] Mark R. Rosekind, "Examining Fatigue Factors in Accident Investigations: Analysis of Guantanamo Bay Aviation Accident", p. 2-3.

[13] *Id* at 2.

[14] *Id* at 2.

[15] Id at 2.

[16] Balkin, et al. (2000)

[17] Martin Moore-EDE, "Alertness & Fatigue: Microsleeps",
www.circadian.com/learning_center/biological_clock.htm

[18] [HTTP://www.rta.msw.gov.au/roadsafety/fatigue/factsaboutsleefatigue.html](http://www.rta.msw.gov.au/roadsafety/fatigue/factsaboutsleefatigue.html)

[19] This material is from: Mark R. Rosekind, "Examining Fatigue Factors in Accident Investigations: Analysis of Guantanamo Bay Aviation accident"

[20] Federal Motor Carrier Safety Administration tech brief: "Sleep Apnea Crash Risk Study".

[21] William DeMent, M.D., "Sleep Apnea and Hypertension in Commercial Truck Drivers", Sleep Disorders Research Center, Stanford University School of Medicine.

[22] Bus Department News, www.utu.org/depts/busfiles/busnews/2000news/bsnews3.htm, quoting Dr. Mark Mahowald, Director of the Minnesota Regional Sleep Disorders Center and past president of the American

Academy of Sleep Medicine.

[23] Michael Belzer, *Sweatshops on Wheels*, Preface (2000).

[24] Economics & Statistics Group, American Trucking Associations, *American Trucking Trends* (2002).

[25] Transport Topics, "Driver Turnover Gains at Large Fleets", October 3, 2005, p. 1.

[26] Id.

[27] Bendel, Op-Ed Washington Post, April 29, 2000.

[28] Consensus Statement: Fatigue and Accidents in Transport Operations, Compiled by Dr. Torbjörnakerstedt (2000).

[29] Id.

[30] 49 C.F.R. §380.530

[31] This official "guidance" was specifically drafted with regard to §395.3 which provides that no motor carrier shall require or permit any driver used by it to drive in excess of the allowable hours of service. This

regulation uses the same "require or permit" language as found in §392.3.

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