



**Testimony of Joan Claybrook, Consumer Co-Chair,
Advocates for Highway and Auto Safety
and former Administrator, National Highway Traffic Safety Administration**

On

***The Impacts of the Department of Transportation's Commercial Driver
Hours of Service Regulations***

Before

**The House Committee on Transportation and Infrastructure
Subcommittee on Highways and Transit**

June 18, 2013

Chairman Petri, ranking member DeFazio, and Members of the Subcommittee on Highways and Transit of the House Committee on Transportation and Infrastructure, thank you for inviting me to testify before you today. I am Joan Claybrook, Consumer Co-Chair of Advocates for Highway and Auto Safety (Advocates) and former Administrator of the National Highway Traffic Safety Administration. Advocates is a non-profit organization that promotes safety on our roads and highways by advocating for laws and regulations that reduce traffic crashes, fatalities and injuries. Advocates is a coalition of public health, safety, and consumer organizations, and insurers and insurer agents that advances highway safety through the adoption of safety policies and regulations, and the enactment of state and federal traffic safety laws. Advocates is a unique business and consumer coalition dedicated to improving traffic safety by addressing motor vehicle crashes as a public health issue. I appreciate being invited to testify before you today on the impacts of the commercial driver hours of service regulations last revised in a final rule issued in December, 2011.

Introduction

Advocates has been involved in the issue of motor carrier safety and truck driver Hours of Service (HOS) regulations for over 20 years. Truck crashes are a serious and deadly problem. Over the past decade on average, from 2002 through 2011, large truck crashes have claimed the lives of over 4,000 people and injured nearly 100,000 each year.¹ Despite declines during the recent recession, fatalities and injuries in large truck crashes have experienced increases every year since 2009.² Large truck crashes killed 3,757 and injured 88,000 in 2011.³ This is equivalent to a major airplane crash every other week of the year all year long. The annual cost to society of large truck crashes is over \$83 billion.⁴ Truck driving continues to be identified as one of the most dangerous occupations in the United States with 547 large truck drivers being killed in crashes in 2011.⁵ Advocates is concerned with the recent increases in truck crash deaths and injuries as these numbers continue their march toward a return to pre-recession levels.

During the past 20 years, Advocates has participated in numerous truck safety-related events, including the 1995 National Truck and Bus Safety Summit⁶ of experts and stakeholders that identified driver fatigue was the number one safety issue in the trucking industry. Advocates has also filed numerous, detailed and well-documented comments on the HOS rule at every step in the regulatory process since 1997, served as a participating party in the National Transportation Safety Board's (NTSB) 2011 Truck and Bus Safety Forum, and litigated the legality of several versions of the HOS final rules in federal court. Two of the past rules were overturned as a result of our litigation and the most recently case was held in abeyance under an agreement with the DOT that a new rule would be published. Moreover, and most poignantly, Advocates has worked with many families of victims of truck crashes caused by truck drivers who have been pushed beyond their limits and fallen asleep behind the wheel. In the audience today, representing these thousands of families are Jane Mathis, of St. Augustine, Florida, whose son and daughter-in-law were returning from their honeymoon when a truck struck their car from behind and killed them, and Daphne and Steve Izer of Lisbon, Maine, whose son and three friends were killed when their vehicle was struck while in the breakdown lane by a truck driver who had fallen asleep at the wheel. These families have

paid the ultimate price for federal HOS regulations that put corporate profit before the safety of innocent motorists.

There is a stunning disconnect in the way fatigue is treated in commercial truck as compared to commercial air transportation. When an air traffic controller fell asleep on the job at Reagan National Airport in 2011, and when two pilots flew past their destination over Minnesota because they were dozing in 2009, the public, the media and Members of Congress were justifiably outraged over those transgressions and the Secretary of Transportation took immediate action to rectify the problems. Luckily, no casualties resulted from those fatigue incidents. In sharp contrast, however, the Federal Motor Carrier Safety Administration (FMCSA) has not taken similar immediate or effective responsive action to what has become a public health epidemic of truck driver fatigue. The FMCSA's 2011 HOS final rule, which is about to be implemented on July 1, 2013, fails to address driver fatigue in two important ways. First, it does not return to the 10 hour limit on continuous hours of driving, which was in place for nearly 70 years, and, second, it fails to ensure that all truck drivers, regardless of their schedules, could not continually use the minimum 34-hour off-duty period ("restart") to maximize driving hours.

Nonetheless, the final rule does take several small steps in the right direction by requiring drivers who use the minimum 34-hour "restart" to get two nights sleep, by limiting the use of the "restart" to just once a week for some drivers, and by requiring rest breaks after eight (8) hours on duty. These provisions will improve the current situation, even if only incrementally, and because they could save lives, they should be implemented on time, on July 1, without further delay.

Other improvements to the HOS regulations are necessary, however, because studies have found that since the current HOS rule went into effect, large numbers of truck drivers admit to being affected by fatigue behind the wheel while operating commercial motor vehicles that weigh up to 80,000 pounds or more. A survey sponsored by the Federal Motor Carrier Safety Administration (FMCSA) found that:

- nearly *48 percent* of drivers admitted that they had fallen asleep while driving in the previous year;
- about *45 percent* of the drivers said they sometimes or often had trouble staying awake while driving;
- *13 percent* reported that they often or sometimes fell asleep while driving;
- nearly two-thirds of drivers, *65 percent*, reported that they often or sometimes felt drowsy while driving; and,
- a third of the drivers reported that they became fatigued on a half or more of their trips.⁷

The FMCSA estimates that truck driver fatigue is involved in about 13 percent of fatal crashes, killing nearly 500 people a year, a conservative estimate that is likely much higher based on other reports.⁸

While the 2011 HOS final rule makes several changes which will save the lives of some truck drivers and other road users, it fails to address the serious underlying major sources of driver fatigue. .

Background

Driver fatigue was a major safety concern under the HOS rule that was in place for nearly 70 years, from 1937 until 2003. Even though that rule limited drivers to 10 consecutive hours of driving without a rest break, and did not permit a “restart” during the week, driver fatigue and driving while tired were recognized as serious safety problems that led to both fatal and injury crashes. The 1995 National Truck and Bus Safety Summit, sponsored by the U.S. Department of Transportation (DOT), convened experts and stakeholders to discuss all aspects of truck operations and safety issues. The participants, including truck drivers, representatives of motor carriers, researchers, members of the safety community, victims and survivors of truck crashes and government officials, concluded that “driver fatigue” was the number one safety problem in the trucking industry. In response, Congress in 1995 enacted section 408 of the Interstate Commerce Commission Termination Act (ICCTA)⁹ which required DOT to address with fatigue-related issues and adopt necessary “countermeasures for reducing fatigue-related incidents and increasing driver alertness[.]”

Despite this congressional directive to reduce fatigue and improve driver alertness, the FMCSA, in 2003, adopted a final rule that increased the maximum limit on consecutive hours of driving from 10 to 11 hours and instituted the 34-hour “restart” that effectively reduces the end-of-week rest and recovery period for drivers who use up their maximum weekly hours before the end of the week. Both of these changes to the original rule exacerbate driver fatigue by dramatically extending driving tours-of-duty later into the day and by adding to cumulative fatigue or sleep debt from which drivers suffer when driving on short sleep from shift-to-shift and from week-to-week. The effect of the “restart” was to allow drivers to substitute additional work and driving hours, especially more hours of driving, for the rest and recovery off-duty periods that had been required at the end of each work week in order to ensure that drivers obtained sufficient rest.

In addition, in its analysis accompanying the 2003 HOS final rule, FMCSA failed to consider the health impact that longer driving hours and less rest would have on individual drivers and the driver population as a whole. Federal law, enacted in 1984,¹⁰ requires the Secretary of Transportation to take into account the impact of regulations on the health and physical condition of truck drivers. This congressional mandate was completely ignored by the agency when proposing the significant increases in driving and working hours of truck drivers.

Because the 2003 FMCSA final rule contradicted both the scientific evidence and research regarding fatigue and the agency’s own findings of fact, and neglected to analyze the effect of the rule on driver health, Advocates joined with other health and safety groups to litigate these issues in federal court. In 2004, the U.S. Court of Appeals for the District of Columbia Circuit ruled against the agency and remanded the HOS rule for necessary revisions.¹¹ The Court ruled that, by ignoring the mandatory issue of driver

health, the HOS final rule violated federal law and had to be vacated. The Court went on to state that there were serious problems with the agency's rationale for extending the longstanding 10 hour consecutive driving limit to 11 hours and for failing to address the inherent problem of cumulative fatigue in allowing drivers to take as few as 34 hours off-duty to rest between weekly driving tours of duty. The Court stated that "the agency's failure to address [the increase in the number of weekly driving hours] . . . makes this aspect of the rule's rationality questionable."¹²

The reintroduction of those same flawed provisions in the subsequent 2005 and 2008 versions of the HOS final rules remain at odds with the scientific research, the agency's findings of fact, and the legal criticism voiced by the Court of Appeals. After filing a third lawsuit in 2009,¹³ the parties reached a settlement agreement with DOT in order to avoid prolonged litigation and to provide an opportunity to revise the HOS rule to conform to the overwhelming body of safety research and the deficiencies identified in the 2004 decision of the Court of Appeals.

The latest version of the HOS rule was issued by DOT on December 27, 2011,¹⁴ and included several beneficial changes to the current rule including limiting use of the "restart" to once in every 168 hours (one calendar week), requiring the "restart" to include two rest periods between 1 a.m. and 5 a.m., and requiring a 30 minute rest break for drivers within the last 8 hours of being on duty. Despite these marginal improvements, Advocates and other safety organizations and independent drivers filed suit because the final rule failed to return to a 10, rather than 11, hour limit on continuous driving, and because the modification of the "restart" provision does not apply to all drivers, allowing long-haul drivers who operate 7 days a week to continue to accumulate excessive driving hours and fatigue over multiple weeks. Oral arguments in the case were presented at the U.S. Court of Appeals on March 15, 2013.

Needed HOS Reforms

The current, unsafe and illegal HOS rule adopted in 2003 substantially increased maximum daily and weekly driving and working hours for truckers in two ways.

First, driving time allowed for each shift was increased from the traditional, long standing, limit of 10 consecutive hours of driving per shift to 11 consecutive hours. By extending the limit to 11 hours, the current HOS rule increases the time drivers are on the road when they are most tired, at the end of their shift. More important, historical data clearly shows that crash risk among truck drivers increases exponentially after eight hours of driving, and is at high danger levels during the 10th and 11th hours of driving. Nevertheless, the agency tacked the additional hour onto the maximum driving limit, permitting another hour of exposure at the end of the driving shift – when crash risk is at its highest. This action not only contradicted the scientific data and research but also, as the Court of Appeals pointed out, called into question the legality of the rule since it exposes drivers and the public to an unreasonable risk of crash involvement. The Court of Appeals 3-judge panel stated that "[w]e have our doubts about whether [the agency's] two justifications [for the 11-hour limit] are legally sufficient."¹⁵ The failure of the

revised 2011 HOS final rule to limit the daily driving hours is one of the reasons Advocates filed its most recent suit.

Second, the danger posed by these provisions to the health and safety of truck drivers and the motoring public are made even worse by the 34-hour “restart” provision. The “restart” eviscerates what was previously a “hard number” 60-hour weekly driving cap (or 70 hours for drivers on an 8-day schedule). Instead, the current rule permits drivers to reset their accumulated weekly driving hours to zero and start a new driving week, at any point during the work week they choose, after taking only a 34-hour “restart”, merely one day and 10 hours off. This permits drivers who use the “restart” provision to cram an extra 17 hours of driving into a 7-day schedule, actually operating their trucks for up to a total of 77 hours in seven calendar days instead of the stated limit of 60 hours. Drivers operating on an 8-day schedule can drive an extra 18 hours in 8 days for a total of up to 88 driving hours instead of the legal limit of 70-hours. These hours of working and driving, week after week, month after month, are dangerous and deadly compared to the typical 40 hour work week of most Americans. If a truck driver nods off for even a second of those 11 hours it could result in a deadly crash. The stakes here are very high.

The FMCSA admits that the 2011 HOS final rule does not reverse this problem of excessive driving hours but, at best, only limits drivers who work six days a week to an average of 70 hours of work and/or driving a week.¹⁶ The final rule still allows truckers to drive at least 10 more hours, on average, each week than the supposed maximum limit of 60 hours of driving for these drivers, and does nothing to curb the excessive hours of work and driving performed by long-haul drivers operating seven days a week.

The “restart” permits truckers to drive and work excessive hours which promote driver fatigue. Instead of having a full weekend of 48 to 72 hours off-duty for rest and recovery, as was required under the pre-2003 HOS rule, the 34-hour “restart” permits drivers to trade rest time for extra driving hours in order to maximize income. Fewer hours of rest and more hours of driving and work dramatically increase truck driver crash risk exposure.

The FMCSA acknowledges that sleep research shows that humans need at least 7 to 8 hours of sleep each night to perform well and avoid sleep deprivation.¹⁷ Studies conducted since the current HOS rule went into effect show that drivers are actually getting *less* than 6 hours of sleep, on average on work days and only slightly more than 6 hours on days off.¹⁸ This means that under the current HOS rule, drivers are frequently driving even though sleep deprived, resulting in high rates of tired, fatigued drivers behind the wheel of trucks that weigh up to 80,000 pounds or more.

Beyond this, the current HOS rule did not take into consideration the impact it would have on the health of truck drivers. In 2003, FMCSA completely ignored the issue and the Court of Appeals held that doing so violated federal law and the Court remanded the rule to the agency. The next time around, FMCSA analyzed the driver health issues and, despite finding that the HOS regulations have an impact on numerous diseases and

ailments common among truck drivers, including heart disease, hypertension, sleep disorders, back problems, etc., the agency refused to include in its regulatory analysis any costs associated with allowing drivers to operate trucks for more hours every shift, each week, from month-to-month, year-in and year-out. When the Court of Appeals vacated and remanded this second version of the HOS rule, the Court reiterated its admonitions on the other safety issues in the case, including the need to account for the impact on driver health. This flaw in the agency's cost-benefit analysis for the current rule is another reason it was necessary for the FMCSA to revise the HOS rule and its accompanying analysis.

The 2011 HOS final rule partially addresses concerns about driver fatigue with the "restart" provision in two ways. First, by limiting the use of the "restart" to once every 168 hours (one calendar week), the rule limits the number of consecutive weeks with extensive weekly driving hours but only for those drivers operating six days a week. Advocates and the other petitioners filed suit, however, because the 2011 final rule did not go far enough. The once a week or 168 hour limitation on the use of the short "restart" should also have been applied to long-haul truckers who operate seven days a week. By not also covering those drivers, the final rule allows a huge loophole that limits the safety benefits of the rule.

Second, the 2011 final rule improves safety by requiring that the "restart" rest period include two night-time rest periods from 1 a.m. to 5 a.m. This ensures that drivers will be able to take two periods of off duty time in which to obtain sleep under optimal conditions (at night and in sync with the natural circadian rhythm of the body). As discussed below, in the original proposed HOS rule, the FMCSA specifically stated that any "restart" should include two nighttime rest periods.

Because these two changes afford modest safety benefits for the travelling public, implementation of the 2011 final rule, even though deficient in other important respects, will have a positive impact on public safety and the implementation of the rule should not be delayed any longer. While these positive changes should be implemented, more effective safety reforms, that will have a greater impact on driver fatigue, need to be adopted.

Scientific Evidence and Research

Over the past 20 years, scientific research has documented the adverse effects of long working hours, especially in industries involving shift work. Advocates has highlighted the numerous research studies and scientific findings which conclude that there is an increased risk of crashes associated with more driving and working hours among commercial drivers.¹⁹ Advocates' bibliography of relevant scientific studies and sleep research is attached to my testimony as **Appendix A**. Among the findings and conclusions in the scientific evidence are the following:

- Crash risk increases geometrically after the eighth (8th) consecutive hour of driving;

- Under the current HOS rule drivers are not getting sufficient sleep, obtaining, on average, less than six (6) hours of sleep on work nights;
- Because humans have a biological diurnal schedule that normally requires nighttime sleep, attempts to sleep during daytime result in shorter and less restful sleep periods as compared to nighttime sleep; and,
- Lack of sufficient sleep from day-to-day and week-to-week results in cumulative sleep deprivation, or sleep debt, that can only be overcome through extended periods of off-duty time for rest and recovery.

Despite unfounded assertions that the current HOS rule is working well and contributing to safety, fatigue is still a major problem that drivers readily acknowledge. Studies have found that a substantial percentage of truck drivers admit to high levels of fatigued driving and actually falling asleep behind the wheel.

Regarding the need for the two night requirement during the “restart”, the FMCSA stated, in the 2000 notice of proposed rulemaking (NPRM) that:

...the research indicates that to negate the effect of accumulated weeklong sleep deprivation and restore alertness to the human body it is necessary to have at least two consecutive nights off-duty that include the periods from midnight to 6:00 a.m. For long-haul CMV drivers, this “weekend” (i.e., a period to permit recovery from cumulative fatigue, not necessarily falling on a Saturday and Sunday) should be up to 56 hours long, but could be reduced to 32 hours as long as that period included two nights covering two periods from midnight to 6:00 a.m. The research suggests that drivers may need even more nights off duty if they have a severe sleep deficit.²⁰

Additionally, in the 2010 NPRM, the agency cited work by Washington State University which identified that the 34-hour “restart” was effective for daytime workers who obtained 2 nights of sleep but not for night workers who received only one night of sleep. The agency cited other works which found that daytime sleep is less restorative than nighttime sleep and that time spent sleeping during the day is often less than at night even when the same amount of time is available for sleep.²¹

With regard to the once per week (168 hour) limit on the use of the “restart”, the agency summarizes its analysis on a driver outreach page when it states:

The purpose of the [168-hour provision] is to limit work to no more than 70 hours a week on average. Working long daily and weekly hours on a continuing basis is associated with chronic fatigue, a high risk of crashes, and a number of serious chronic health conditions in drivers.²²

These findings of fact were based on the agency’s review of the applicable scientific research and available studies.

The Court Decisions

In two separate unanimous decisions, in 2004 and again in 2007, the U.S. Court of Appeals vacated previous, nearly identical versions of the current HOS rule and remanded the rules to the agency for changes consistent with the Court's rulings. In each case, the Court questioned the basis for the agency's decision-making in allowing longer driving hours despite the safety threat, adverse health effects and increased crash risk posed by the rule, indicating that the current HOS rule was not based on sound reasoning.²³

In the 2004 decision, the Court held the HOS rule invalid because of the FMCSA's failure to address the impact of the rule on driver health, a statutorily mandated concern. The Court, however, went on to point out, issue by issue, the many deficiencies in the agency's reasoning and the problems in logic and law that the Court perceived the agency would need to address in order to correct the flaws in the HOS rule.

The Court's 2007 decision turned on a critical point of administrative law, the agency's failure to make its statistical analysis available to the public for comment. However, the Court also reiterated its previous statements from the prior decision regarding the safety issues that were still pending. Attached to my testimony as **Appendix B** is a document that quotes excerpts from the Court decisions regarding each of the safety issues²⁴ and I have also included a chronology of the HOS rulemaking and litigation history.

Despite back-to-back judicial decisions overturning the rule in each case, FMCSA refused to make changes to the maximum daily and weekly driving and work hours allowed by the current HOS rule.

The current HOS rule is substantially similar to the two prior HOS rules which were struck down twice by the Court of Appeals and truck driver fatigue remains a serious problem that is killing and injuring too many motorists and truck drivers. While the 2011 final rule takes several steps toward improving truck driver fatigue, overall the rule falls short of making the necessary improvements for safety that are needed to reduce the annual toll of truck-involved crash deaths and injuries as outlined by the court.

Thank you for the opportunity to testify before the Subcommittee and I would be pleased to respond to any questions you may have.

Endnotes.

¹ NHTSA Traffic Safety Facts, Large Truck fact sheets 2002 through 2011.

² *Id.*

³ [*Traffic Safety Facts 2011 Data: Large Trucks*](#), DOT HS 811 752, NHTSA (Apr. 2013).

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- ⁴ *Commercial Motor Vehicle Facts – March 2013*, FMCSA, available at <http://www.fmcsa.dot.gov/documents/facts-research/CMV-Facts.pdf>.
- ⁵ *Traffic Safety Facts 2011*, DOT HS 811 754, NHTSA (2013). *National Census of Fatal Occupant Injuries in 2011 (Preliminary Results)*, USDL-12-1888, Bureau of Labor Statistics, (Sep. 20, 2012).
- ⁶ 68 FR 22456 (Apr. 28, 2003), reissued in substantially the same form at 73 FR 69567 *et seq.* (Nov. 19, 2008).
- ⁷ Dinges, D.F. & Maislin, G., “Truck Driver Fatigue Management Survey,” May 2006, p. 29, FMCSA–2004–19608–3968.
- ⁸ Hours of Service of Drivers, Final Rule, 76 FR 81134 (Dec. 27, 2011).
- ⁹ Interstate Commerce Commission Termination Act, Pub. L. 104-88, § 408 (Dec. 29, 1995).
- ¹⁰ The Motor Carrier Safety Act of 1984, Pub. L. 98-554, Title II, 98 Stat. 2832 (Oct. 30, 1984) *codified at* 49 U.S.C. § 31136(a), requires that regulations prescribing minimum safety standards for commercial motor vehicles shall, at a minimum, ensure that:
- (1) commercial motor vehicles are maintained, equipped, loaded, and operated safely;
 - (2) the responsibilities imposed on operators of commercial motor vehicles do not impair their ability to operate the vehicles safely;
 - (3) the physical condition of operators of commercial motor vehicles is adequate to enable them to operate the vehicles safely; and,
 - (4) the operation of commercial motor vehicles does not have a deleterious effect on the physical condition of the operators.
- ¹¹ *Public Citizen, et al., v. FMCSA*, 374 F.3d 1209 (D.C. Cir. 2004).
- ¹² *Id.*, page 1223.
- ¹³ *Public Citizen et al., v. FMCSA*, No. 09-1094 (D.C. Cir. 2009).
- ¹⁴ 76 FR 81134.
- ¹⁵ *Public Citizen v. FMCSA*, 374 F.3d 1218.
- ¹⁶ Questions & Answers – HOS Final Rule (December 2011) for CMV Drivers, FMCSA Feb. 2012, <http://www.fmcsa.dot.gov/rules-regulations/topics/hos/qanda.aspx>.
- ¹⁷ Hours of Service of Drivers, Notice of Proposed Rulemaking, 75 FR 82169, 82176 (Dec. 29, 2010).
- ¹⁸ *Id.*, citing Hanowski, et al., “The Sleep of Commercial Vehicle Drivers Under the 2003 Hours-of-Service Regulations,” *Accident Analysis and Prevention*, Vol. 39, No. 6, pp. 1140-1145, Nov. 2007. The study documents that between work shifts drivers are currently getting only 5.6 hours of sleep a night, only just slightly more than five (5) and one-half hours each night.
- ¹⁹ See Research Reports and Studies Showing The Adverse Health and Safety Effects of Longer Working Hours and Inadequate Rest Time, Advocates for Highway and Auto Safety (2011).
- ²⁰ Hours of Service of Drivers, Notice of Proposed Rulemaking, 65 FR 25540 (May 2, 2000).
- ²¹ 75 FR 82182.
- ²² Questions & Answers – HOS Final Rule (December 2011) for CMV Drivers, FMCSA Feb. 2012, <http://www.fmcsa.dot.gov/rules-regulations/topics/hos/qanda.aspx>.
- ²³ *Owner-Operator Independent Drivers Ass’n v. FMCSA*, 494 F.3d 188 (D.C. Cir. 2007); *Public Citizen v. FMCSA*, 374 F.3d 1209 (D.C. Cir. 2004).
- ²⁴ Truck Driver Hours of Service (HOS) Rule Overturned Twice by Unanimous Decisions, Advocates for Highway and Auto Safety (Dec. 2010).



RESEARCH REPORTS AND STUDIES SHOWING THE ADVERSE HEALTH AND SAFETY EFFECTS OF LONGER WORKING HOURS AND INADEQUATE REST TIME

Jovanis, P., Wu, K., Chen, C.; *Hours of Service and Driver Fatigue: Driver Characteristics Research*, FMCSA, May 2011:

- ◇ Examined the patterns of driving and work in the week before a crash.
- ◇ “There is a consistent increase in crash odd as driving time increases.”
- ◇ “LTL drivers experienced increased crash odds after the 6th hour of driving.”
- ◇ “Breaks from driving reduced crash odds.”
- ◇ “There was an increase in crash odds associated with the return to work after a recovery period of 34 hours or more.”
- ◇ TL drivers who drive during the day have increased odds of a crash with long driving hours.
- ◇ LTL drivers:
 - Driving time substantially associated with crash odds.
 - Highest odds in the 11th hour.
 - Consistent increase in odds after the 5th through the 11th hours.
- ◇ Decrease in odds of a crash were significant for two breaks (sleeper or off duty).
- ◇ Using all of the data the crash exposure ratio gradually increases, especially after the 6th hour of driving.

Blanco, M., Hanowski, R., Olson, R., Morgan, J., Soccolich, S., Wu, S., Guo, F.; *The Impact of Driving, Non-Driving Work, and Rest Breaks on Driving Performance in Commercial motor Vehicle Operations*, FMCSA, May 2011:

- ◇ Studies 100 drivers, 4 companies, naturalistic data collection over 4 weeks for each driver.
- ◇ Analyses of driving hours/safety-critical event (SCE) risk found a time-on-task effect across hours.
- ◇ Analysis on work hours found an increase risk of SCE as work hours increased.
- ◇ SCE risk increased with driving late into the 14-hour workday.
- ◇ Breaks from driving were effective to counteract the negative effects of time on task.
- ◇ SCE rate in the 11th hour was statistically significantly higher than in hours 8, 9, or 10.
- ◇ No statistically significant difference between SCE rate in 11th and 10th.
- ◇ As work hour increases from beginning to end, there is a statistically significant increase in SCE rate.
- ◇ Rest breaks of at least 30 minutes were shown to decrease the SCE rate in the hour after the break compared to the hour before.
- ◇ Off duty break provided the greatest benefit.
- ◇ *Analysis of all of the data indicated increase in SCE risk with increasing driving time.*

APPENDIX A

Sando, T., Mtoi, E., Moses, R.; *Potential Causes of Driver Fatigue: A Study on Transit Bus Operators in Florida*, Transportation Research Board 2011 Annual Meeting, Nov. 2010:

- ◇ Studied data from transit agencies in Florida.
- ◇ “Scientifically and average person needs eight hours sleep every 24-hours cycle.”
- ◇ “Most of the accidents (56.69%) occur when the operators are exposed to red fatigue conditions” (“red fatigue” is a highly fatigued state identified by the software utilized in the study, the Fatigue Audit Interdynamics (FAID) program).
- ◇ “The survey also revealed that the minimum off duty period of eight hours might not be adequate. It is likely that this could be another cause of fatigue among operators because it leads to inadequate rest and sleep.”
- ◇ A fatiguing work schedule includes: split schedules, less sleep, long driving hours and early starting – late ending schedule patterns.
- ◇ Fatigue is cumulative, “after the accumulation of fatigue, the operator needs enough off duty period to recover from critical fatigue condition. To start with a green fatigue condition (full recovery) in a weekly schedule the operator needs at least two days off duty.”
- ◇ “there is a statistically strong association between fatigue condition and crash occurrence.”

Sando, T., Angel, M., Mtoi, E., Moses, R.; *Analysis of the Relationship Between Operator Cumulative Driving Hours and Involvement in Preventable Collisions*, Transportation Research Board 2011 Annual Meeting, Nov. 2010:

- ◇ Studies four transit agencies from the state of Florida.
- ◇ “The results show a discernable pattern of an increased propensity of collision involvement with an increase in driving hours. . . According to the findings of this study, it is clear that the present regulation that limits driver’s on-duty time to a maximum of seventy hours per week should be revisited.”
- ◇ Bus driver with straight schedules in preventable collisions drove an average of 49.8 hours in the week before the collision (95% confidence interval).
- ◇ Bus driver with split schedules in preventable collisions drove an average of 53.7 hours in the week before the collision (95% confidence interval).
- ◇ On average, drivers who were involved in preventable collisions drove over six hours more per week than that of the general population of drivers.
- ◇ Preventable collisions are more prevalent as the length of the driving period increases.

Park, S., P.P., Jovanis., *Hours of Service and Truck Crash Risk: Findings from 3 national U.S. Carriers during 2004*. Presented at 89th Annual Meeting of the Transportation Research Board, Washington, D.C., 2010.

- ◇ “The study reported a non-linear increase in crash odds after the 6th hour of driving. According to the study, the odds ratios increase from 50% to 200% in the 10th and 11th hour.”

APPENDIX A

F. Saccomano, M. Yu, and J. Shortread, Effect of Driver Fatigue On Truck Accident Rates, *Urban Transport and the Environment For the Twenty-First Century* (ed. L.J. Sucharov), Computational Mechanics Publications, Southhampton, U.K., 1995, 439-446; and, F. Saccomano and J. Shortread, A Truck Safety: Perceptions and Reality, *The Institute for Risk Research*, Ontario, 1996, 157-174.

- ◇ Found a significant increase in crash rates for truck driving shifts of more than 9 hours.
- ◇ The strong relationship between single-vehicle truck crashes and length of continuous driving time held regardless of the time of day.
- ◇ Findings confirmed earlier Federal Highway Administration research.

T. Lin, P. Jovanis, and C. Yang, Modeling the Effect of Driver Service Hours On Motor Carrier Accident Risk Using Time Dependent Logistic Regression, 72nd Annual Meeting of the Transportation Research Board, Washington, DC, 1993; and, T. Lin, P. Jovanis, and C. Yang, Time of Day Models of Motor Carrier Accident Risk, *Transportation Research Record* 1467: 1-8, Transportation Research Board, National Academy of Sciences, 1994.

- ◇ Found a consistent elevation of crash risk from about the 8th to the 9th hour of driving.
- ◇ Found a dramatically increased risk if driving exceeded 9 continuous hours.
- ◇ Confirmed earlier Federal Highway Administration research.

T. Kaneko and P. Jovanis, *Multiday Driving Patterns and Motor Carrier Accident Risk: A Disaggregate Analysis*, U. of CA at Davis, Research Report UCD-TRG-90-9, April 1990.

- ◇ Driving patterns over the previous 7 days significantly affected crash risk on the 8th day.
- ◇ Consecutive driving hours have a consistent crash risk relationship.

T. Kaneko and P. Jovanis, Multiday Driving Patterns and Motor Carrier Accident Risk: A Disaggregate Analysis, *Accident Analysis and Prevention*, 25:5, 1992, 437-456.

- ◇ Consecutive hours of driving were the most significant predictor of accident risk.

I. Jones and H. Stein, *Effect of Driver Hours of Service on Tractor-Trailer Crash Involvement*, Insurance Institute for Highway Safety, Arlington, VA, 1987; and, I. Jones and H. Stein, Defective Equipment and Tractor-Trailer Crash Involvement, *Accident Analysis and Prevention*, 21: 469-481.

- ◇ Study used case-control design (3 matching controls for each case), controlled for time of day.
- ◇ Widely regarded as one of the most rigorous in-depth studies of fatigue ever conducted (e.g., Haworth, Triggs, and Grey (1988)).
- ◇ Found a substantial increase in crash risk if drivers exceeded 8 continuous hours of driving.
- ◇ Crash risk for drivers whose reported driving time exceeded 8 hours was almost twice that for drivers who had driven fewer hours.
- ◇ Crash risk estimates conservative because number of driving hours based on driver self-reporting.

APPENDIX A

W. Frith, A Case-Control Study of Heavy Vehicle Drivers Working Time and Safety, *Proceedings of the 17th Australian Road Research Board Conference*, 1994, 17(5): 17-30.

- ◇ Case-control methodology, matched-pairs.
- ◇ Crash risk substantially increased for drivers with greater than 8 hours of driving but less than 9 hours.
- ◇ Crash risk rose even higher if driving exceeded 9 hours.
- ◇ Emphasized that his findings confirmed the 1987 research of Jones and Stein, and the 1993 research of Lin, Jovanis, and Yang.

S. Folkard, Time On Shift Effects In Safety: A Mini-Review, Abstract in the *Shiftwork International Newsletter*, May 1995, 12:1, Timothy Monk, ed., presentations from the 12th International Symposium On Night- and Shiftwork, Ledyard, CN, June 13-18, 1995.

- ◇ Major meta-analysis of relative risk of performance lapses over the course of various shift durations.
- ◇ Increase in relative risk of crashes over time was exponential.
- ◇ Risk was approximately doubled after 12 hours of work and trebled after 14 hours of work.
- ◇ Found that safest work duration is 6 to 9 hour long shifts.

P. Krauth, et al., A Systematic Selection of Shift Plans for Continuous Production With the Aid of Work-Physiological Criteria, *Applied Ergonomics*, 1979, 10:1, 9-15.

- ◇ Working times of more than 8 hours must be avoided because of long-term deleterious effects on worker health.
- ◇ Longer shift times found to reduce effective daily recuperation, produce adverse impacts on sleep length and quality [e.g., see Smiley and Heslegrave (1997)], and reduce leisure activities.
- ◇ Showed that research literature consistently demonstrates that only in exceptional cases have 12 hours shifts, in particular, proved successful without measurable deterioration in safety, sleep quality, and worker health.
- ◇ Cites corroborative research findings, such as Rutenfranz (1973); Knauth and Rutenfranz (1972); Rutenfranz et al. (1974).

C. Abrams, T. Shultz, and C. Wylie, *Commercial Motor Vehicle Driver Fatigue, Alertness, and Countermeasures Survey*, Report FHWA-MC-99-067, Federal Highway Administration, U.S. Department of Transportation, August 1997.

- ◇ Survey of 511 commercial motor vehicle drivers undertaken concurrently with the 1997 Driver Fatigue and Alertness Study.
- ◇ Twenty-eight (28) percent of surveyed drivers admitted falling asleep at the wheel during the previous month.
- ◇ One-third of these fall-asleep drivers admitted falling asleep at the wheel from 3 to 6 times in the prior month.
- ◇ The majority of drivers who fell asleep at the wheel reported that they sometimes or always are aware of the danger of falling asleep, but nevertheless continue to drive.
- ◇ Nearly 47 percent of surveyed drivers stated that they sometimes cut their sleep short to make delivery schedules.

APPENDIX A

- ◇ Drivers often begin trips already fatigued, *e.g.*, more than 38 percent have already been awake for 6 to 12 hours before beginning to drive.
- ◇ More than a third of drivers surveyed said that loading/unloading contributed to their fatigue and lowered their alertness.
- ◇ Ninety-one (91) percent of surveyed drivers slept in tractor sleeper berths, 6.7 percent in motels.
- ◇ About one-quarter of sleeper berth drivers split their sleeping time and overall slept fewer hours than drivers who rested in one period.
- ◇ Most drivers use breaks for other than napping purposes, *e.g.*, eating, fueling, restroom use, *etc.*
- ◇ Authors conclude that fatigue, drowsiness, difficulty of preventing falling asleep at the wheel may be more prevalent in the driver community than previously thought.

J. Rutenfranz and P. Knauth, Hours of Work and Shiftwork, *Ergonomics*, 19:3, 1976, 331-340.

- ◇ Found that the primary protection afforded workers against undue health risks were achieved by limitation of working hours as a direct means of curtailing risk exposure.
- ◇ A daily working time limit of 8 hours is shown to be optimal.

Simon Folkard, Black Times: Temporal Determinants of Transport Safety, *Accident Analysis and Prevention*, 29:4, 1997, 417-430.

- ◇ Showed that circadian rhythms are insufficient to account for the variation in crash risk over the 24-hour day.
- ◇ Deleterious effects of time on task overarch those derived from circadian effects (time of day).
- ◇ Safest continuous task duration, except for very short duty periods of about 2.5 hours, is about 8 to 10 hours of maximum shift length.

E. Grandjean, *Fitting the Task to the Man: An Ergonomic Approach*, London 1982.

- ◇ Shows that many studies have demonstrated that shortening the work day actually raises worker efficiency.
- ◇ Making the working day longer causes worker hourly efficiency to decline.
- ◇ Shows that many studies of actual workplace productivity demonstrate that increasing daily working hours beyond 10 hours actually results in a decline in productivity as a natural product of increasing fatigue which more than offsets the increased working hours.
- ◇ Found that work time of 8 hours a day cannot be increased to 9 hours or more without ill effects.

D. Linklater, Fatigue and Long Distance Truck Drivers, *Australian Road Research Board Proceedings*, 10:4, 193-201, 1980.

- ◇ Interviewed drivers of all types of vehicles at roadside restaurants and found that relative crash rates of truck drivers increased when weekly driving time exceeded 55 hours.
- ◇ Cites U.S. Bureau of Motor Carrier Safety finding in 1969 that 30 percent of single-vehicle truck crashes involved commercial drivers asleep at the wheel with 13 percent of those drivers verified to have exceeded maximum permitted hours of driving.
- ◇ New South Wales commercial drivers limited to a maximum of 72 hours driving per week, yet the crash risk of drivers has already begun to rise before this limit is reached.

APPENDIX A

Mark Rosekind, et al., From Laboratory to Flightdeck: Promoting Operational Alertness.

- ◇ All estimates of fatigue-related accidents in transportation are underestimated.
- ◇ Many shiftwork studies have found reductions in performance, lowered alertness, and increased proneness to error and injuries for 12 hour shifts.
- ◇ Cite many supporting research studies such as Rosa (1991); Rosa and Bonnet (1993); Rosa (1995).
- ◇ Authors point out that in Rosa (1995), analysis of a national occupational-injury database showed a constant accident/injury rate through 9 hours of work, but then a rapid and progressive increase to three times the rate at the end of 16 hours of work.

Raymond Fuller, *Prolonged Heavy Vehicle Driving Performance: Effects of Unpredictable Shift Onset and Duration, and Convoy vs. Independent Driving Conditions*, U.S. Army Research Institute for the Behavioral and Social Sciences, Tech. Report 585, Sept. 1983.

- ◇ Found that symptoms of fatigue were most typical near the end of the driving shift, becoming evident from about the 9th hour of driving.
- ◇ Asserts that his research shows that prudence dictates a driving regime of no more than 8 or 9 hours long.

Gunther Hildebrandt, *A12 & 24 H Rhythms In Error Frequency of Locomotive Drivers and the Influence of Tiredness*, *International Journal of Chronobiology*, Vol. 2, 175-180 (1974).

- ◇ Tiredness was shown to play an important role in error frequency by train engineers, especially in the afternoon.
- ◇ Found that the increase in error frequency was linearly related to the number of hours previously worked.

Federal Highway Administration Report to Congress On Commercial Driver Hours of Service, November 1990.

- ◇ Openly endorses research findings showing the adverse effects of longer continuous driving times and of cumulative fatigue resulting from several consecutive days of driving.
- ◇ Asserts at the outset that the risk of crashes increases with the number of hours driven.
- ◇ Supports the 10-hour maximum regulatory restriction on continuous driving time because it is consistent with research showing that the potential for crashes rises as the hours of driving increase due to increasing driver fatigue.
- ◇ Favorably cites the Jones and Stein (1987) study by the Insurance Institute for Highway Safety that driving in excess of 8 hours may be associated with a significantly increased risk of crash involvement.
- ◇ Asserts that this increase in relative risk with increasing time of driving also confirms the 1978 FHWA study of Mackie and Miller.
- ◇ States that research has shown a cumulative fatigue effect after several successive days of driving.
- ◇ States that research indicates that time spent on-duty may be a more important factor in driver loss of alertness.

APPENDIX A

◇ These statements repeat previous assertions to the same effect made in 1980 (45 FR 82284, 82286, 82288, 82290).

◇ FHWA in 1987 again endorsed the findings that both increased consecutive driving hours and consecutive days of driving directly contribute to driver errors and crashes (52 FR 45215).

◇ Assertions to the same effect were made by FHWA in its November 29-30, 1988, Proceedings of the Federal Highway Administration Symposium On Truck and Bus Driver Fatigue.

W. Harris and R. Mackie, *A Study of the Relationships Among Fatigue, Hours of Service, and Safety of Operations of Truck and Bus Drivers*, Bureau of Motor Carrier Safety, Federal Highway Administration, BMCS-RP0-71-Z, June 1971-November 1972; and, R. Mackie and J. Miller, *Effects of Hours of Service Regularity of Schedules and Cargo Loading On Truck and Bus Driver Fatigue*, Federal Highway Administration, DOT-HS-803-799, May 1975-October 1978.

◇ Classic federal studies funded through the Federal Highway Administration whose findings have been sustained by numerous later studies.

◇ Found that drivers suffered increased risk of crashes whether they were on regular or irregular driving schedules.

◇ Even on regular daytime schedules, adverse safety effects were clearly seen after about 8.5 hours of driving.

◇ Significant increases in driver errors and significant decreases in driver level of alertness began to show as early as the 4th hour of driving time on irregular schedules in particular (at about 8 hours on regular schedules) and increased throughout the trip.

◇ Frequency of crashes increased disproportionately after 7 hours of driving and remained significantly higher than expected for all driving times longer than 7 hours.

◇ Amount of driver recovery declined with each successive rest break; drivers taking a third rest break, after about 9 hours, showed no recovery and an actual further decline in alertness [See Lisper, Laurell, and VanLoon (1986): taking breaks had no lasting effects on reducing sleepiness among drivers].

◇ About twice as many crashes per mile traveled occurred in the second half of the trip as in the first half.

◇ Significant increases in driver errors and decreases in alertness occurred within the current 10-hour consecutive driving limit.

◇ Cumulative effects of fatigue appeared after the first 4 consecutive days on duty.

◇ Later U.S. Department of Transportation study (J.P. Eicher (1982)) relies heavily on the findings of these two studies.

◇ These findings further evaluated and relied on by the Office of Technology Assessment of the United States Congress in its September 1988 report (OTA-SET-382).

Benjamin F. Jones, et al., *Fatigue and Hours of Service of Interstate Truck Drivers*, U.S. Public Health Service, Public Health Bulletin No. 265, Washington, DC, 1941.

◇ Tests conducted showed lowered functional efficiency with increasing hours of work per week.

EEC Council Regulation No. 3820/85 (December 1985); EEC Council Regulation No.

APPENDIX A

98/0319SYN Amending Reg. 3820/85 and Directive 93/104/EC.

- ◇ Regulations establishing the European Economic Community policy on worker hours as based on extensive research and consensus agreements among member states.
- ◇ Regulations curtail weekly driving time to an average of no more than 48 hours per week as averaged over 4 months, with some derogations permitted (48 hours a week averaged over 6 months, 39 hours a week over 9 months, and 35 hours averaged over 12 months).
- ◇ Another EEC publication of November 18, 1999, emphasizes that 18 percent of fatal crashes in the European Union involve trucks or motor coaches, with 45,000 people killed each year.

F. van Ouwerkerk, Sub-Topic 4: Quality of Life and Social Costs - c) Working Conditions, *Resources For Tomorrow's Transport: Introductory Reports and Summary of Discussions*, ECMT, Brussels, September 12-14, 1988.

- ◇ Found serious, adverse health and social impacts from truck driver hours of service demands.
- ◇ High percentages of drivers admit to falling asleep or almost falling asleep at the wheel.
- ◇ Sixty (60) percent of drivers report anxiety, chronic heart problems, and hypertension.
- ◇ Relies heavily on B. Jansen (1987) study which showed that shiftwork produces pervasive problems of fatigue, sleep deprivation, gastrointestinal complaints, low family contact time, no community life, personal isolation, inability to pursue education, inadequate access to commonly available public facilities and activities such as public transportation/schools/sports, etc.
- ◇ Drivers have little leisure time and are disengaged from common social activities.
- ◇ More than one-quarter of drivers are not home on one of two weekend days.
- ◇ Drivers cannot schedule reasonable social time because much of their weekends are spent recovering from fatigue and sleep deprivation accrued from previous week's driving.
- ◇ Drivers report adverse impacts on spouses and households where the net effect of international driving is a one-parent home.
- ◇ Nearly half of all drivers have high rates of domestic discord with spouses and children.
- ◇ Drivers have more problems and more severe problems than the general population.
- ◇ Relatively high percentage of drivers reporting crash involvement due to falling asleep at the wheel of a moving truck probably a considerably low estimate because many drivers fell asleep and died in the crashes.

Torbjorn Akerstedt, Readily Available Countermeasures Against Operator Fatigue, *Managing Fatigue In Transportation: International Conference Proceedings*, April 29-30, 1997, 105-117.

- ◇ Valuable review of research literature on shift work, sleep/fatigue, and related risk.
- ◇ Allowing the same minimum off-duty or layover time for driver recovery following successive nights of driving are not equivalent to the restorative effects of the same amount of time allowed for recovery from the fatigue of daytime driving.
- ◇ Stresses other major research findings on the effects of extended shiftwork hours (Kurumatani (1994): very high correlation between length of free time between shifts and proportional sleep duration; Hamelin (1987): fast rise in crashes beginning before the 11th hour of driving).
- ◇ Emphasizes that all studies since 1971 show rest breaks induce only very short-lived increases in alertness with a return to sleepiness and error proneness almost immediately afterwards.

APPENDIX A

C.D. Wylie et al., *Commercial Motor Vehicle Driver Fatigue and Alertness Study*, FHWA Report No. MC-97-001, U.S. Department of Transportation, 1997; and, C.D. Wylie et al., *Commercial Motor Vehicle Driver Rest Periods and Recovery of Performance*, Transportation Research Centre, TP 12850E, Transport Canada, Montreal, Canada, 1997.

- ◇ Major study effort conducted over 5 years by the Trucking Research Institute of the American Trucking Associations in cooperation with Transport Canada.
 - ◇ Prospective cohort study of commercial operators driving different schedules, truck equipment, time of year, and routes in U.S. and Canada.
 - ◇ Severe methodological deficiencies, including threshold errors in sample size and subject selection, also unrecorded sleep and unmonitored naps.
 - ◇ Many data gathering inadequacies, including acquisition of data from intermittent vigilance tests of drivers, *e.g.*, authors failed to acknowledge the well-known phenomenon resulting from use of secondary task techniques which provide extratask stimulus (alerting effect) offsetting effects of fatigue on alertness and capacity (see, *e.g.*, Brown (1978); Brown, Simmonds, and Tickner (1967); Brown, Tickner, and Simmonds (1966); Home and Wilkinson (1985); Haworth, Triggs, and Grey (1988); Dinges and Kribbs in Monk (ed.) (1991)).
 - ◇ Study adversely criticized by peer review panels and in peer review journals for study design.
 - ◇ *Post hoc* statement by researchers of hypothesis of interest, *viz.*, whether time of day of driving (circadian effect) overarches driving duration or time-on-task.
 - ◇ Evidence of drowsiness in drivers not found in physiological testing but through visual interpretation of drivers' faces recorded on camera; drowsiness judgments uncorroborated in research community because face videos protected from disclosure.
 - ◇ Primary reliance on judgments made from face videos confuses drowsiness indicators with fatigue -- drivers can be fatigued, *i.e.*, increasingly unable to perform a task well or safely, without appearing drowsy because of, *e.g.*, drooping eyelids.
 - ◇ Due to lack of adequate data and multiple research design failures, study could not demonstrate a dominant circadian effect in comparison with performance and alertness deficits associated with duration of time-on-task.
 - ◇ The follow-up study by Wylie et al. for Transport Canada studied 25 of the original 40 Canadian drivers participating in the DFAS, but statistical power of the follow-up is quite low (primarily from small sample size), especially as regards the study premise of whether adequate driver recovery from fatigue and sleep debt following 60 hours of driving within a seven-day period occurs after no (actually a nominal 12 hours), one (actually a nominal 36 hours), or two workdays (nominally 48 hours) of off-duty time.
 - ◇ The follow-up study also relied on EEG, face video interpretation, vehicle lane tracking, and surrogate performance testing data as collected for the DFAS, all of which had various major deficiencies as described above.
- ◇ Use of these drivers during the layover days during the DFAS study further confounded the findings of both the DFAS and the follow-up study, and constitute a major research design failure.

APPENDIX A

◇ However, the initial study and its follow-up produced corollary information which is nevertheless highly suggestive:

- (1) No objective evidence that drivers could sufficiently recover from consecutive days of driving with a 36-hour or even a 48-hour off-duty period [e.g., see Smiley and Heslegrave (1997)];
- (2) All driver cohorts, whether driving 10-hour or 13-hour shifts, suffered severe and chronic sleep deprivation throughout the length of the study.

A. Smiley and R. Heslegrave, *A 36-Hour Recovery Period for Truck Drivers: Synopsis of Current Scientific Knowledge*, Transportation Development Centre, Transport Canada, 1997.

- ◇ Excellent literature review of studies specifically relating to driver recovery time needs.
- ◇ Evaluation of known research (e.g., Lille (1967)) indicates serious concerns over the sufficiency of a 36-hour driver clock reset provision after several consecutive days of driving – drivers still fatigued and carrying unresolved sleep debt, resulting in quickly deteriorating performance when resuming work.
- ◇ Thirty-six- (36) hour layover especially inadequate following night shift work.
- ◇ Several studies strongly indicate inadequacy of even 48 hours off for full performance recovery (e.g., Hildebrandt, Rohmert, and Rutenfranz (1975); Mallette (1994)).
- ◇ Authors conclude that commercial drivers need minimum of 48 hours off after several consecutive days of driving, but this still does not secure full performance and alertness recovery -- 72 hours or more are needed.
- ◇ Research literature also consistently shows that long work shifts result in accumulation of sleep debts.
- ◇ Concludes that Wylie study strongly indicates that even four 13-hour consecutive driving shifts results in significant performance deterioration.
- ◇ Long work shifts and associated inadequate sleep/recovery results in family and social dysfunction, increased substance abuse and health problems.

Roger Rosa and Michael Colligan, *Extended Workdays: Effects of 8-Hour and 12-Hour Rotating Shift Schedules On Performance, Subjective Alertness, Sleep Patterns, and Psychological Variables, Work and Stress*, 1989, 3:1, 21-32.

- ◇ Demonstrated the lower performance and alertness produced by an extra 4 hours added to shifts which result in more sleep reduction, disruption of personal activities, and increased self-reported stress.
- ◇ Use of a 12-hour rather than an 8-hour shift caused an increasing accumulation of unresolved sleep debt, as shown by substantial diminishment of sleep latency.
- ◇ None of these adverse effects was found on an 8-hour shift.
- ◇ Shift workers make inroads on sleeping time to perform normal personal activities within less off-duty time.

Roger Rosa, *Performance, Alertness, and Sleep After 3-5 Years of 12 H Shifts: A Follow-Up Study, Work and Stress*, 1991, 5:2, 107-116.

APPENDIX A

- ◇ Confirmed findings of earlier study.
- ◇ Also showed the adverse health effects of 12-hour versus 8-hour work shifts.

Roger Rosa and Michael Bonnet, Performance and Alertness On 8 H and 12 H Rotating Shifts At a Natural Gas Utility, *Ergonomics*, 1993, 36:10, 1177-1193.

- ◇ A review of the data of the 1991 study confirming the lowered performance, decreased alertness, reduced quality of social life, and increased health complaints associated with 12-hour shifts.

Ivan Brown, Driver Fatigue, *Human Factors*, June 1994, 36:2, 298-314.

- ◇ Drivers may be fatigued, yet sustain performance effectiveness, but at an increasing cost of experienced fatigue until performance begins to collapse.
- ◇ Long work shifts produce reactive inhibition in which the human brain becomes disinclined to continue producing the same repeated response to the same environmental stimuli.
- ◇ Typical 8-hour shift has no adverse implications for drivers.
- ◇ However, research has long established that extended work periods both impair task performance and increase sickness absence and injuries (*e.g.*, Vernon (1921)).
- ◇ Daily hours and weekly hours must be balanced to avoid fatigue and performance degradation (*e.g.*, Rosa et al. (1985) showed that a 12 hour/4-day week more detrimental to performance and produces more self-reports of drowsiness and fatigue than 8-hour/6-day week).
- ◇ The longer the duty period, more stressful the task, and more hazardous the working conditions, the more restitutive sleep a driver will be obliged to take.
- ◇ Performance deterioration more severe in performance of tasks which are long, familiar, monotonous, and complex such as driving.

T. Sanquist, et al., *Fatigue and Alertness In Merchant Marine Personnel: A Field Study of Work and Rest Sleep Patterns*, U.S. Coast Guard Report No. CG-D-06-97, June 1996.

- ◇ One hundred forty-one (141) mariners in commercial maritime industry studied for their work and sleep patterns on shipboard duty.
- ◇ Major fatigue/sleep deprivation problem in commercial maritime industry.
- ◇ Mariners averaged 6.6 hours of sleep in each 24 hours and quickly accumulated large sleep debts with pervasive symptoms of fatigue, including critically low alertness levels and extremely short sleep latencies.
- ◇ Response of Congress to sleep deprivation of watch mate prior to grounding of Exxon Valdez was enactment of legislation limiting tank vessel personnel to 15 hours duty time in each 24 hour period, 36 hours duty in 72 hour period.
- ◇ This statutory regime promotes sleep deprivation and accumulated sleep debt coupled with deteriorating performance over consecutive days.
- ◇ Minimum off-duty period of 9 hours provides insufficient opportunity for enough sleep by mariners.
- ◇ Once diurnal alertness is achieved, even with some accumulated sleep debt, mariners avoid afternoon naps in particular because of high sleep inertia following them.

- ◇ Conversely, mariners often report poor sleep following duty periods because of work inertia,

APPENDIX A

resulting in insufficient sleep even with enough time available to secure needed sleep.

◇ Cites numerous research findings that fragmenting sleep into shorter, intermittent periods [*e.g.*, in truck sleeper berths] results quickly in sleep deprivation, reduced alertness, and lowered performance, a practice explicitly avoided for flight crew in commercial aviation because FAA regulations require 9 consecutive hours of rest following a flight of 8 hours or less.

◇ Cites research (*e.g.*, Kecklund and Akerstedt (1995)) showing that at least 16 hours between work shifts is necessary to consistently achieve sleep durations of 7-8 hours.

A. Fletcher and D. Dawson, Cabin Safety and Hours of Work: Developing a General Risk-Control Model for Fatigue, *Journal of Centre for Sleep Research*, 2: 9-26, 1997.

◇ Surveys research literature showing that the longer a work period, the more fatiguing it is likely to be.

◇ Fatigue impact of longer working hours is compounded by also abbreviating the available time for rest and restorative sleep.

◇ Confirms previous studies that laboratory-based studies such as those showing no differences in performance between shifts of varying lengths are unreliable for making generalizations applying to specific workplaces.

◇ Experimental studies typically oversimplify the complex psycho-social context in which shiftwork occurs and fail to model real-world shift schedules.

◇ Stresses that many organizations view financial and service imperatives as overriding determinants of shift schedules.

◇ Without reliable empirical tools to accurately quantify actual relationships between fatigue and organizational costs, there is little incentive to implement coherent hours of work schedules.

◇ In developing fatigue policies, organizations will ignore objective scientific information not suiting their economic goals.

Patrick Hamelin, Lorry Driver's Time Habits In Work and Their Involvement In Traffic Accidents, *Ergonomics*, 1987, 30:9, 1323-1333.

◇ Cites MacDonald (1984) and concludes that, based on a comparison with exposure to risk, both long hours of work and driving at night are associated with a much higher rate of accidents than shorter hours and daytime driving.

◇ The accident rate in the second half of driving trips is twice as high as in the first half.

◇ Risk rate linked to work span duration is probably underestimated.

◇ Points out that several authors (*e.g.*, Pokorny et al. (1981)) have shown the existence of a slight excess-risk rate immediately after work resumption following a break.

James C. Miller, *Fundamentals of Shift Work Scheduling*, 2nd ed., c1992.

◇ Manual sets forth quantitatively-based recommendations for shift work scheduling, including shift rotations.

◇ Most current work schedules are not based on worker efficiency and health needs, but on productivity goals which have been abstracted from the workers' needs.

◇ Stresses that real-world policy investigations of shiftwork impacts have clearly shown that 12

hour shifts are not appropriate for continuous operations (citing P.M. Lewis, *Recommendations*

APPENDIX A

for NRC Policy On Shift Scheduling and Overtime At Nuclear Plants, U.S. Nuclear Regulatory Commission, NUREG/CR-4248, PNL-5435, 1985).

◇ Also cites J.T. Mets, AAdverse Effects of Working 12-Hour Shifts, *Proceedings of the 2nd Annual Conference of the Ergonomics Society of Southern Africa*, Cape Town, April 14-15, 1986, who showed the increased injury rates for workers in auto manufacturing plants when management changed plant policy from 9 to 12 hour shift lengths.

◇ Also cites Gardner and B.D. Dagnall, AThe Effect of 12-Hour Shift Working On Absence Attributed to Sickness, *British Journal of Industrial Medicine*, 1977, 34, 148-150, who showed the consistent increase in work absence rates for sicknesses among process workers in an oil refining/petrochemical plant as a direct consequence of switching from 8 hour to 12 hour shifts.

P.M. Lewis, *Shift Scheduling and Overtime: A Critical Review of the Literature*, Nuclear Regulatory Commission Contract DE-AC06-76-RLO, 1985; and, P.M. Lewis, *Recommendations for NRC Policy On Shift Scheduling and Overtime At Nuclear Power Plants*, Division of Human Factors Safety, Office of Nuclear Reactor Regulation, U.S. Nuclear Regulatory Commission, Washington, DC, 1985.

◇ Found that the number of hours worked in a 7-day period must be limited.

◇ Basis of recommendations was a comparison of findings from studies of work/risk relationships in other industries.

◇ Relied on federal regulations limiting airline pilots/flight crew to 30 hours aloft in 7-day period.

◇ Cites Nicholson's (1972) findings of total duty time of 55 hours in 7 days and Mohler's (1976) physiological index for pilots and crew indicating that 56 hours/7days is a high work load and that 84 hours in 7 days is far too much.

David Dinges and Nancy Kribbs, *Performing While Sleepy: Effects of Experimentally-Induced Sleepiness, Sleep, Sleepiness, and Performance*, Timothy H. Monk, ed., John Wiley and Sons, Ltd., c1991, 97-128.

◇ Inadequate sleep is endemic in industrialized societies that prize irregular hours and view sleep as a potential source of additional work time.

◇ More attention has been paid to the physiological, neurological, and psychopathological effects of sleep loss than to performance effects.

◇ The most powerful determinant of lapsing [on tasks] and decreased performance in a sleepy person is the required task duration -- the longer the task duration, the greater likelihood that performance will show evidence of impairment early on during sleep deprivation.

◇ Cites studies to support this conclusion, including Williams, Kearney, and Goodnow (1959) who consistently found that reaction time was an increasing monotonic function of task duration.

◇ Even providing enough time for gaining off-duty sleep cannot by itself offset the increased risk from longer exposure to high-risk tasks such as driving a commercial motor vehicle because many drivers will still get inadequate sleep.

◇ Research literature consistently shows that increased exposure time will correspondingly produce more performance lapses (failures), especially if workers get inadequate sleep.

APPENDIX A

Gregory Belenky, The Effects of Restricted Sleep On Performance and Subsequent Recovery: Implications for Managing Sleep to Sustain Performance, *Fourth International Conference On Fatigue In Transportation*, Freemantle, Australia, Mary 19-22, 2000.

- ◇ Reviews studies conducted by the U.S. Army and Walter Reed Hospital showing that anything less than eight to nine hours of sleep per night leads to degraded work performance over time.
- ◇ The longer a person suffers from restricted sleep, the longer it takes them to recover even when given optimal conditions for sleep.

T. Balkin *et al.*, *Effects of Sleep Schedules on Commercial Motor Vehicle Driver Performance*, Walter Reed Army Institute of Research, Report No. DOT-MC-00-133, Federal Motor Carrier Administration, U.S. Department of Transportation, May 2000.

- ◇ Study comprised two separate research efforts, one a field study using wrist actigraphy to determine sleep duration and timing in long- and short-haul commercial drivers over 20 consecutive days, the other a sleep dose/response laboratory study on commercial drivers to determine the effects on performance of differing times spent in bed each night (3, 5, 7, 9 hours) over 7 consecutive days.
- ◇ Overall purpose of the study was the attempt to quantify the relationship between different amounts of sleep and subsequent performance during wakefulness.
- ◇ Field portion of the study showed that daily sleep duration was strongly correlated with the amount of off-duty time.
- ◇ In the field portion, long- and short-haul drivers averaged about 7.5 hours of sleep.
- ◇ Long-haul drivers obtained almost half of their daily sleep during work shift hours principally in sleeper berths which suggests that they spend a significant portion of the work shift in a state of partial sleep deprivation.
- ◇ Even for small reductions in average nighttime sleep duration to about 6.3 hours in the 7-hours of sleep group, there was measurable performance decrements on several tests, including the psychomotor vigilance test.
- ◇ The performance deterioration for even small amounts of sleep restriction was maintained over the entire 7 consecutive days of sleep restriction suggesting that there is no compensatory or adaptive response to even mild amounts of sleep loss.
- ◇ For more severe sleep restriction, it was found that recovery of performance is not complete even after three consecutive nights of attempted recovery sleep based on 8 consecutive hours of time in bed each night, showing that expunging substantial sleep debt takes extended periods of recovery sleep over several days.
- ◇ These findings also suggest that the extant level of daytime alertness and performance capability is a function not only of an individual's circadian rhythm, amount of time since his/her last sleep period, and the duration of that sleep period, but is also a product of that person's long-term sleep history extending back several days.
- ◇ Temporal concordance between electroencephalograph defined lapses in alertness and performance on simulated driving was low, indicating that sleepiness-induced performance reductions most often occur in the absence of visually observed electrophysiological evidence of impaired alertness.

APPENDIX A

N. Haworth, T. Triggs, and E. Grey, *Driver Fatigue: Concepts, Measurement and Crash Countermeasures*, Australia Transport and Communications, Federal Office of Road Safety, Report CR72, June 1988.

- ◇ Massive, detailed evaluation of prior research and speculation on nature, origin, effects, and measurement of fatigue.
- ◇ Precise estimation of contribution of fatigue to road crashes in Australia cannot be made, but there are strong indications that the effects are far greater than hitherto believed, with 5 - 10 percent in all crashes, 20 - 30 percent in casualty crashes, 25 - 35 percent in fatal crashes, and perhaps up to 50 percent in single-vehicle tractor-semi-trailer fatal crashes.
- ◇ Authors' review of prior research shows that drivers' relative risk of crashes increase with increasing work duration and is compounded by drivers taking more risks as fatigue increases.
- ◇ In-depth studies of fatigue effects, even as rigorous as the Jones and Stein (1987) study, may still underestimate the contribution of fatigue to crash causation.
- ◇ Probable that most fatigue-related crashes are unidentified because they do not result in serious injuries or deaths, therefore are unreported and/or disregarded for investigation (see, *e.g.*, Hampson, *Contributing Factors In Road Crashes*, Working Document No. WD78, Federal Office of Road Safety, Australia).
- ◇ Cites studies showing the poor relationship between breaks or naps and recovery of alertness, *e.g.*, Lisper, Laurell, and van Loon (1986) (drivers fell asleep again soon after a five-minute walk break); Lisper and Eriksson (1980) (no difference in recovery of alertness after one, two, or five rest pauses as compared with control who had no pause); Lisper et al. (1979) (no difference between breaks of 15 and of 60 minutes for restoration of alertness).
- ◇ Discusses repeated findings that commercial drivers, including U.S. truck drivers, widely use amphetamines to increase alertness and performance to offset the fatiguing effects of long driving hours, which use, however, also measurably increases risktaking behavior (*e.g.*, Guinn (1983); Baumler (1975) in Seppala et al. (1979)) and increases crash rates (*e.g.*, Smart, Schmidt, and Bateman (1969)).
- ◇ Prolonged hours of service, including both driving and non-driving duty time, is an important cause of fatigued commercial drivers and reduction of excessive driving hours is an effective countermeasure.

J. Stutts, J. Wilkins, and B. Vaughn, *Why Do People Have Drowsy Driving Crashes?: Input From Drivers Who Just Did*, AAA Foundation for Traffic Safety, Wash., DC, Nov. 1999.

- ◇ Case-control study of drowsy driving crashes, large sample size of over 1,400 cases and controls.
- ◇ Cases were drivers involved in police-reported crashes in North Carolina whose condition following the crash was explicitly characterized as asleep or fatigued, two control cohorts of non-sleepy crash-involved drivers and non-crash-involved drivers.
- ◇ Both cases and controls interviewed by telephone (interviewers blinded to case or control status of each interviewed driver) with survey results analyzed descriptively and through multiple logistic regression models.
- ◇ Very high percentages of both cases and controls interviewed regard drowsiness in driving to be

APPENDIX A

a major cause of motor vehicle crashes, second in importance only to alcohol consumption.

- ◇ Study importantly recognizes distinction between sleepiness and fatigue: the former is the inclination to sleep, the latter a disinclination or inability to continue performing a task.
- ◇ Drivers in sleep- and fatigue-related crashes were behind the wheel significantly longer prior to the crash, were awake for longer the day of their crashes, and had slept fewer hours the night before (both asleep and fatigued crash-involved drivers averaged about 6.5 hours of sleep per day).
- ◇ Twenty-seven (27) percent of the asleep crash-involved drivers and 20.6 percent of the fatigued crash-involved drivers work more than 60 hours each week; 43.4 percent asleep drivers and 37.3 percent fatigued drivers 50 or more hours per week; and 88 percent asleep drivers and 83.3 percent fatigued drivers 40 or more hours per week.
- ◇ Working more than 60 hours a week increased the odds of having a crash by 40 percent.
- ◇ More than half of all asleep crash-involved drivers and almost half of all fatigued crash-involved drivers have regular daytime work schedules.
- ◇ Half of the fatigued and asleep drivers reported feeling only slightly drowsy or not at all drowsy prior to their crashes.
- ◇ There was evidence that fatigue-related crashes are underreported, as well as drivers unable or unwilling to recognize the influence of drowsiness or fatigue in their crashes.

The National Highway Traffic Safety Administration and National Center On Sleep Disorders Research Program to Combat Drowsy Driving: Report to the House and Senate Appropriations Committees Describing Collaboration Between the National Highway Traffic Safety Administration and the National Center on Sleep Disorders Research, National Heart, Lung and Blood Institute, National Institutes of Health, March 15, 1999; and, Drowsy Driving and Automobile Crashes, NCSDR/NHTSA Expert Panel Report on Driver Fatigue and Sleepiness, DOT HS 808 707, April 1998.

- ◇ Report jointly authored by NHTSA and NCSDR to comply with the mandates of the Fiscal Year 1996 and Fiscal Year 1997 Senate Appropriations Committee Conference Reports which stated that police statistics on fatigue-related crashes represent underreporting of the prevalence of these crashes, as well as a failure to identify driver inattention problems leading to crashes.
- ◇ The FY96 Report asserted that NHTSA has not devoted sufficient resources to understanding and addressing driver fatigue, sleep disorders, and driver inattention.
- ◇ The FY97 conference agreement supplied \$1,000,000.00 to NHTSA to analyze the role of driver fatigue, sleep disorders, and inattention in cooperation with NCSDR.
- ◇ One of the risk factors identified by the Expert Panel was shift workers accruing long daily working hours, including drivers driving long hours each day.
- ◇ The Panel emphasized that periods of work longer than 8 hours have been shown to impair performance and increase crashes (e.g., performance is worse on 12 hours per day work schedules than 8 hours per day (Ivan Brown (1994))).
- ◇ The Panel explicitly distinguished from fatigue, recognizing that fatigue is a disinclination to continue performing a task at hand whereas sleepiness is a neurobiological drive or need to sleep.
- ◇ The Panel found that sleepiness can contribute to fatigue- and inattention-related crashes, but

APPENDIX A

that fatigue-related crashes do not necessarily involve sleepiness [See Stutts, Wilkins, Vaughn (1999)].

T. Dingus, et al., *Impact of Sleeper Berth Usage on Driver Fatigue: Final Project Report*, Virginia Tech Transportation Institute, Federal Motor Carrier Safety Administration Contract DTFH61-96-C-00068, USDOT, July 2002.

- ◇ Prospective study of 56 commercial drivers in 13 team cabs and 30 solo drivers working for 4 for-hire, over-the-road trucking firms, using Class 8 tractors with semi-trailers.

- ◇ Multiple data acquisition systems including PERCLOS (videoed driver face drowsiness interpretation as percentage of eye closure), steering movements, lane maintenance and departures, braking, automated piezo-electric sleep-monitoring system, subjective driver sleep self-ratings, Karolinska Sleepiness Scale (trained observer interpretative use), sleeper berth data noise/vibration/temperature.

- ◇ Study preceded by 10 focus group interview sessions in 1997-1998 comprising 74 drivers.

- ◇ Several drivers in focus groups admitted to illegal conduct related to their commercial driving.

- ◇ The focus group driver admissions of violations were confirmed later in the study participants: there were a significant number of cases where study drivers, even though they knew they were being observed, violated hours of service regulations by driving in excess of 10 consecutive hours without taking the required minimum 8 hours off-duty rest period.

- ◇ Excessive (illegal) consecutive hours of driving ranged from 11 hours to 15 hours, and most violations were committed by solo drivers.

- ◇ However, the 5 percent of the shifts that illegally exceeded 10 consecutive hours of driving had very few recorded critical incidents, and although there were 22 cases where a driver drove over 14 hours in a single shift, there were no occurrences of a critical incident or driver error in any of these cases, according to the authors.

- ◇ Study authors could only verify whether violations of driving hours were committed because logbooks and truck data collection systems cannot verify on-duty not-driving time.

- ◇ Drivers in the focus groups are required to stay awake while waiting in line for long periods of time to load/unload and would like to sleep, but don't for fear of losing their place in the loading/unloading queue.

- ◇ Drivers in the focus groups mentioned that they often cannot load/unload within schedules, and if schedules are not adhered to, they would like to be able to sleep.

- ◇ Drivers in every focus group claimed that carrier dispatchers coerce them to continue driving even when the drivers feel they need to rest.

- ◇ Drivers in the focus groups complained that trucking companies do not give them enough anticipation of a driving tour of duty to enable the drivers to get sufficient sleep before going on the road.

- ◇ Drivers in the focus groups emphasized that they were paid by the mile, were not paid for any time when their trucks were immobile (e.g., during waiting to load/unload), and that this practice impelled them to violate hours of service requirements and to speed.

- ◇ Authors suggest that this industry practice leads drivers to falsify their logbook entries to conceal violations.

- ◇ Low study participant (driver) interaction with data collection systems, but drivers had to don Nightcap sleep monitoring system and attach piezoelectric film to one eyelid.

APPENDIX A

- ◇ One study participating driver subverted the data collection systems by placing opaque tape over the cab-mounted video camera.
- ◇ Critical incident recordation protocol (video and computer storage) governing indications of fatigue, performance lapses, safety-related events, potentially hazardous driving behavior.
- ◇ Solo drivers were found to be greatly affected by drowsiness which compromises their ability to safely operate large trucks.
- ◇ Solo drivers were greatly affected by their level of drowsiness which translated into dangerous driving behavior.
- ◇ Solo drivers had many more critical incidents at all levels of severity as compared with team drivers and the differences were large at all trigger severity levels.
- ◇ The ratio of critical incidents to timed triggers in the extremely drowsy category for solo drivers was far greater than expected and hypothesized.
- ◇ Solo drivers were found to be extremely drowsy in almost 2.5 times as many incidents as hypothesized.
- ◇ Solo drivers were involved in 4 times the instances of very/extremely drowsy observer ratings than were team drivers (20 occurrences solo drivers, 3 occurrences team drivers).
- ◇ Six (6) of the extreme fatigue occurrences took place when drivers had <5 hours sleep in previous 24 hours.
- ◇ Authors note that only 9 of the extreme drowsiness drivers had more than 7 hours of sleep in the previous 24 hours.
- ◇ However, only 3 of the extremely drowsy drivers had rated themselves subjectively for prior quality of sleep as worse than Level 4 (slept fairly well) [Note GAD: a finding that accords with several studies over the years showing that drivers cannot accurately judge or predict how drowsy they are or will be while driving].
- ◇ Solo drivers were more alert in the morning and gradually became fatigued as the day progressed.
- ◇ Solo drivers experienced high rate of extreme drowsiness after the second or third bout (authors use the term shift) of driving after the first day of several days of consecutive driving.
- ◇ The authors believe that this high rate of extreme drowsiness is the combination of long consecutive driving hours and multiple days of consecutive driving, and several measures indicate that this extreme drowsiness is the product of cumulative fatigue.
- ◇ The impact of drowsiness on single drivers increased as the days of a duty tour accumulated.
- ◇ Solo drivers in the extremely drowsy category were involved in over 20 times as many abrupt steering incidents than hypothesized, a result that was much larger than expected by the authors.
- ◇ The authors believe the combination of long driving shifts over multiple days creates a high potential for significant drowsiness for commercial drivers, especially in the final days of several consecutive days of driving.
- ◇ Quality and depth of sleep during a tour of duty were worse than home sleep, especially for team drivers who had difficulty especially sleeping in sleeper berths while trucks were moving.
- ◇ Team drivers got more sleep during the study than solo drivers, but the sleep was overall of poorer quality.

APPENDIX A

- ◇ Both solo and team drivers reported having a harder time falling asleep in sleeper berths than at home.
- ◇ Both solo and team drivers slept more deeply during a tour of duty as the days of consecutive driving elapsed due perhaps to the presence of a growing, cumulative sleep debt.
- ◇ Solo drivers, unlike team drivers, continued to push their driving when very tired and judged to be extremely drowsy.
- ◇ Solo drivers on average reported one hour less sleep per day than team drivers during a tour of duty.

B. Wright and E. Fogel, *On-Board Recorders: Literature and Technology Review*, Cambridge Systematics, Inc., FMCSA Contract No. DTFH61-99-Z-00083, July 2002.

- ◇ Literature review of 4 studies:
 - Deborah Freund, *Agency Working Paper: On-Board Automated Recording for Commercial Vehicle Driver's Hours-of-service Compliance: The European Experience*.
 - Federal Highway Administration Global Positioning System Pilot Program 1998 (unpublished materials reviewed by authors), derived from GPS Technology Notice of Interpretation with Request for Participation in Pilot Demonstration Program, 65 FR 16697 (April 6, 1998).
 - K. Campbell and S. Lang, *Electronic Recorder Study: Final Report*, University of Michigan Transportation Research Institute, Federal Highway Administration, June 1998.
 - *Field-Testing of On-Board Recorder, Smart Card, and Digital Signature Technology: Phase I*, Public Works and Government Services Canada Western Quebec Region and TECSULT, September 2001.
- ◇ Technologies include digital tachographs, engine control modules (widely used and installed by engine manufacturers, GPS, and wireless communication system.
- ◇ Technologies need to record number of hours driver has rested, number of hours driver has been awake and the time s/he awoke, number of hours driver on duty but not driving.
- ◇ About 4.2 million commercial drivers subject to logbooks.
- ◇ Authors note early on concerns regarding sufficiency of relying exclusively on GPS data for determining RODS and hours-of-service compliance.
- ◇ Authors recommend that RODS and compliance need to be governed by effective combinations of technologies, not just one type.
- ◇ 49 CFR Pt. 395.15, adopted in 1988, cannot be fulfilled by GPS because reg specifically requires any non-logbook technology to be integrally synchronized with specific vehicle operations, therefore must record engine use, road speed, miles driven, date, and time of day.
- ◇ Special pilot program necessary in 1998 because GPS does not use engine data to create RODS reports.
- ◇ Clear from GPS pilot program that technologies chosen must protect the regulatory interests of the federal government.

◇ **Deborah Freund agency working paper review:** European Union has made advances in

Testimony of Joan Claybrook: House Committee on Transportation & Infrastructure, Subcommittee on Highways and Transit
June 18, 2013

APPENDIX A

promoting use of on-board recordation technologies along with defining their requirements for monitoring compliance with hours-of-service requirements.

◇ EU specifies that buses carrying more than 9 passengers and trucks weighing more than 7,700 lbs. must have automatic recording devices for distance traveled, speed, driving times, non-driving work time, and rest time.

◇ EU reg. Annex 1 prescribes requirements for development, testing, installation, and periodic inspection of the recording devices (includes design specs even for cable types and insulation).

◇ Digital tachographs poised to replace tamper-prone mechanical tachographs in near future.

◇ Digital tach uses electronic recording on a smart card, and permits printouts of daily, weekly, monthly info of date, time, names of drivers and inspectors, driving times, breaks, rest periods, standby times, start-finish times of all transportation-related activities.

◇ Authors concluded that few available on-board technologies in the market designed specifically to capture Record of Duty Status (RODS) because they cannot record activity of driver while not in a driving mode, cannot distinguish between on-duty/not-driving and off-duty activities.

◇ Some European interest groups opposed to use (International Road Transport Union).

◇ **GPS pilot program** conducted 1995-1998, 2000 drivers, written logbooks used alongside GPS.

◇ System calculates driving time by determining time and distance between truck location updates not direct recordation of driving time.

◇ GPS operates on several algorithmic default assumptions B if vehicle idle >2 hours, system codes sleeper berth; if vehicle idle for <2 hours, driver status coded off-duty; no driving time recorded if truck and trailer travels <15 miles or tractor alone travels <25 miles; if driver fails to record how long on-duty not-driving, GPS automatically records default of 15 minutes for loading/unloading.

◇ Inspection and enforcement personnel can examine either display or printed hard copy of RODS.

◇ No FMCSA claims either supporting or opposing company claims about value or accuracy of RODS with GPS; however, Cambridge Systematics interviewed several FMCSA personnel about GPS pilot program.

◇ FMCSA personnel said that technology needed because commercial driver so not always accurately log on-duty times per regs and provide other economic/administrative benefits.

◇ FMCSA do not believe that there has been any documented improvements in compliance or safety due to GPS use in the pilot program.

◇ FMCSA personnel observed that 40% of HOS OOS citations were for no log or log not up to date, not falsified entries.

◇ FMCSA personnel cautioned that default assumptions governing GPS in pilot program could lead to an inaccurate picture of a driver's working time and total distance traveled.

◇ FMCSA staff questions accuracy of sleeper berth default judgment (2 hours motionless vehicle).

◇ FMCSA personnel think GPS not enough, need use with other engine-related EOBRs.

◇ Some GPS pilot program drivers found ways to tamper with data, compromise safety.

◇ FMCSA personnel admitted that some carriers don't want EOBRs because they regularly violated HOS limits, want to avoid enforcement.

APPENDIX A

◇ FMCSA personnel do not believe an EOBR mandate is imminent because, among other things, current Administration is pro-business.

◇ **UMTRI electronic recorder study** conducted 1998 on benefits/costs of EOBRs by interviewing major trucking organizations and independent owner-operators.

◇ Low response rate (1,200 responses of 10,000 distributed survey forms).

◇ Of respondents, only 175 use EOBRs.

◇ Multiple purposes of EOBR use, not just regulatory.

◇ Larger firms = more common use.

◇ Private fleets use more than for-hire.

◇ 57 percent have HOS function for EOBRs.

◇ Only 37 fleets of 1,200 use EOBRs for HOS compliance and RODS tracking.

◇ But no for-hire and owner-operators used EOBRs for HOS compliance.

◇ EOBR buy/install \$2,000 or less, <\$200 annual operating costs.

◇ Fleets cite driver paperwork timesaving, better fleet management.

◇ Most carriers don't want them, won't get them.

◇ UMTRI authors concluded no economic benefits to EOBR use.

◇ **Transport Canada October 2001 Study EOBRs, Smart Cards, Digital Signatures** Phase 1 conducted with several national and provincial transportation agencies and one motor carrier.

◇ 16 companies providing EOBRs, smart cards, and digsigns evaluated.

◇ No company could prove that its technology could meet regulatory requirements.

◇ But part of problem is the lack of clear legal framework to tailor technical specs.

◇ Study (Phases 2-4) will proceed to other phases of actual in-service testing, specification of actual processes for recordation.

APPENDIX B

**TRUCK DRIVER HOURS OF SERVICE (HOS) RULE
OVERTURNED TWICE BY UNANIMOUS DECISIONS**

**U.S. COURT OF APPEALS HAS VACATED KEY ASPECTS OF HOS RULE
IN TWO PREVIOUS DECISIONS AND
HELD THIRD CASE IN ABEYANCE PENDING OUTCOME OF NEW RULEMAKING**

The U.S. Court of Appeals for the District of Columbia Circuit (Washington, D.C.) has twice ruled that prior versions of the Hours of Service (HOS) rule issued by the Federal Motor Carrier Safety Administration (FMCSA) were adopted in violation of federal law.

In the first case, a unanimous 3-judge panel of the appellate Court held in a 2004 decision that the FMCSA failed to consider the effect of longer driving and work hours permitted by the HOS rule on the health of truck drivers. Federal law required the agency to examine the impact of regulations on driver health. The Court went on to analyze and criticize every other aspect of the HOS rule including:

- increasing in the limit on consecutive driving hours from 10 to 11 hours of driving, even though data shows that crash risk increases geometrically after 8 hours of driving;
- allowing drivers to restart their maximum weekly driving hours after only 34-hours off duty, even though the agency found that drivers need two nights of sleep in order to be fresh and alert for driving;
- permitting a continuation of split sleeper berth off-duty time, where drivers can take two five hour breaks instead of one 10-hour off duty period, even though data shows that drivers cannot get a full night sleep or adequate rest in shorter off duty periods;
- failing to address the need to require automatic on-board recorders (EOBR) that accurately collect information on truck engine operation and driver on and off duty compliance.

The Court stated that the FMCSA had not provided reasoned explanations for the increases in maximum driving and on-duty time, casting doubt on the safety of the 11-hour daily driving limit and the 34-hour restart requirements. The Court remanded the rule to the FMCSA which began a separate rulemaking process for the EOBR issue.

In 2005, the FMCSA reissued nearly the identical rule except that the revised rule required drivers using sleeper berths to take at least 8 hours off-duty in a single rest period, allowing an 8/2 split of the 10 hour off duty period but no shorter split sleeper berth rest periods.

In the second lawsuit, another unanimous 3-judge panel of the Court, in a 2007 decision, ruled that the 11 hour limit on consecutive driving hours and the 34-hour restart provision must be sent back to FMCSA because the agency had acted illegally in failing to disclose during the public comment period critical information in its cost-benefit analysis and by failing to explain the assumptions and methodology used by FMCSA in arriving at the statistical models on which the HOS rule cost-benefit analysis relied. The HOS rule was, once again, returned to the agency for further action and, once again, FMCSA issued the same, exact rule in 2008.

The third lawsuit was filed in March, 2009, but just as the briefs were due in Court the parties and the government reached a settlement agreement in which FMCSA agreed to issue a new revised HOS rule by the end of July, 2011. The third lawsuit is pending but held in abeyance until the FMCSA issues the new HOS rule. If the HOS rule is essentially the same as the HOS rule issued in 2008 then the Court can reinstate the lawsuit and the briefing would proceed.

APPENDIX B

Six federal judges of the appellate court that is directly below the U.S. Supreme Court have found the prior iterations of the HOS rule illegal. Beyond the specific legal holding in each case, the Court in both decisions criticized other shortcomings of a number of critical aspects of the FMCSA HOS rule. The attached side-by-side includes quotations from each Court opinion about the various issues considered by the Court panels in the two cases.

ISSUE	ANALYSIS of July <u>2004</u> COURT OF APPEALS DECISION	ANALYSIS of July <u>2007</u> COURT OF APPEALS DECISION
Driver Health	<p>“The FMCSA points to nothing in the agency’s extensive deliberations establishing that it considered the statutorily mandated factor of drivers’ health in the slightest”</p> <p>“[The FMCSA’s] failure to [explain its reasons for not considering the effect of the rule on driver health], standing alone, requires us to vacate the entire rule as arbitrary and capricious, as the agency’s failure to consider this factor, to borrow a phrase from the agency’s brief, ‘permeated the entire rulemaking process.’ ”</p>	N/A
Cost-Benefit Analysis (Operator-Fatigue Model Methodology)	<p>“[T]his analysis assumes, dubiously, that time spent driving is equally fatiguing as time spent resting – that is, that a driver who drives for ten hours has the same risk of crashing as a driver who has been resting for ten hours, then begins to drive. [citation omitted]. In other words, the model disregarded the effects of ‘time on task’ because, the agency said, it did not have sufficient data on the magnitude of such effects.”</p> <p>“The exponential increase in crash risk that comes with driving greater numbers of hours, presumably caused by time-on-task effects, raises eyebrows about the agency’s increase in daily driving time. Yet the agency excluded time-on-task effects from the cost-benefit analysis. That analysis, then, assumes away the exact effect that the agency attempted to use it to justify. The agency’s reliance on the cost-benefit analysis to justify this increase is therefore circular, and the rationality of that explanation is correspondingly doubtful.”</p>	<p>“FMCSA’s decision to plot the data point for Hour 13 and beyond at Hour 17 – instead of at Hour 13 (or some other point) – was entirely unexplained in the RIA [regulatory impact analysis] and final rule. This complete lack of explanation of an important step in the agency’s analysis was arbitrary and capricious.”</p> <p>“Although we apply a deferential standard of review to an agency’s use of a statistical model, we cannot uphold a rule based on such a model when an important aspect of its methodology was wholly unexplained.”</p> <p>“FMCSA gives no explanation for the failure of its operator-fatigue model to account for cumulative fatigue due to the increased weekly driving and working hours permitted by the 34-hour restart provision. . . . [t]he agency’s failure of explanation renders the restart provision arbitrary and capricious.”</p>
Increase in Maximum Driving Time from Ten to Eleven Hours	<p>“The exponential increase in crash risk that comes with driving greater numbers of hours . . . raises eyebrows about the agency’s increase of daily driving time.”</p> <p>“[P]etitioners’ challenge raises very real concerns.”</p>	<p>“First, we expressed ‘very real concerns’ about the increase in the daily driving limit from 10 to 11 hours. [cite omitted]. We noted that the ‘agency freely concedes that ‘studies show [] that performance begins to degrade after the 8th hour on duty and [the</p>

APPENDIX B

Increase in Maximum Driving Time from Ten to Eleven Hours (Continued)	<p>“We have our doubts about whether [the agency’s] two justifications are legally sufficient.”</p> <p>“The agency freely concedes that ‘studies show[] that [driver] performance begins to degrade after the 8th hour on duty and increases geometrically during the 10th and 11th hours’ on duty. Despite this finding, the agency cited absolutely no studies in support of its notion that the decrease in daily driving-eligible tour of duty from fifteen to fourteen hours will compensate for these conceded and documented ill effects from the increase [in consecutive driving hours].”</p> <p>“The agency did refer generally to studies, but that generalized reference is of doubtful legal sufficiency.”</p> <p>“... the effects from the increased weekly driving hours may offset any decrease in fatigue flowing from the fact that drivers have overall [one hour] shorter tours of duty. For these [] reasons, it is unlikely that we would find the agency’s first explanation legally sufficient.”</p> <p>“The agency’s reliance on the cost-benefit analysis to justify this increase [in driving hours] is therefore circular, and the rationality of that explanation is correspondingly doubtful.”</p>	<p>degradation] increases geometrically during the 10th and 11th hours’. ”</p> <p>“Second, we also found suspect the agency’s claim that the increase in daily driving limit to 11 hours could be justified by ‘the cost-benefit analysis it conducted.’ ”</p>
34-Hour Restart Provision	<p>“... this provision has the effect of increasing the number of hours drivers can work [i.e., drive] each week.”</p> <p>“While the agency’s explanation seems sound enough as far as it goes, it does not even acknowledge, much less justify, that the rule ... dramatically increases the maximum permissible hours drivers may work [i.e., drive] each week.”</p> <p>“And the agency’s failure to address it [the increase in the number of weekly driving hours] . . . makes this aspect of the rule’s rationality questionable.”</p>	<p>“[W]e regarded as ‘problematic’ the fact that FMCSA’s justification for the 34-hour restart provision ‘[did] not even acknowledge, much less justify, that the rule ... dramatically increases the maximum permissible hours drivers may work [i.e. drive] each week.’ [citation omitted]. That increase, we said, ‘is likely an important aspect of the problem[,] [a]nd the agency’s failure to address it . . . makes this aspect of the [2003] rule’s rationality questionable.’ ”</p>
Electronic On-Board Recorders (EOBRs)	<p>“The agency’s justification for not requiring EOBRs to monitor driver compliance is another aspect of the final HOS rule of questionable rationality.”</p> <p>“The agency’s explanation in all likelihood does not conform to [its] statutory requirement.”</p> <p>“The agency concedes that it ‘did not test the</p>	<p>N/A</p>

APPENDIX B

	<p>(very few) EOBRs currently available.’ The agency offers no excuse for not doing so, and we can think of none that would suffice to fulfill the agency’s duty to ‘deal [] with’ the issue of EOBRs.”</p> <p>“We cannot fathom, therefore, why the agency has not even taken the seemingly obvious step of testing existing EOBRs on the road, or why the agency has not attempted to estimate their benefits on imperfect empirical assumptions.”</p> <p>“The agency has given no good reason for treating this problem with such passivity.”</p>	
Sleeper Berth Exception	<p>“Despite the premise [that each driver should have an opportunity for eight consecutive hours of uninterrupted sleep every day], the agency offered several justifications for nevertheless permitting drivers to obtain the required continuous period of rest in two chunks, all of which are quite weak.”</p> <p>“In sum, we have grave doubts about whether the agency’s explanation for retaining the sleeper-berth exception would survive arbitrary and capricious review.”</p>	N/A



Hours of Service Laws, Fact & Chronology

Key Laws Affecting Motor Carriers

1937: Current Hours-of-Service rules issued by Interstate Commerce Commission (ICC):

- ICC Commissioners expressed misgivings that rules might not be conducive to safety.

1938: Fair Labor Standards Act exemption:

- trucking industry exempted from overtime compensation;
- creates incentive to drive long hours putting drivers and the public at risk;
- no major profession in the U.S. accrues more work hours under a formal regulatory regime than truck and motor coach (bus) drivers.

1984: Motor Carrier Safety Act requires DOT standards that must ensure:

- commercial vehicles (trucks and buses) are operated safely;
- driver responsibilities do not impair ability to operate vehicles safely;
- physical condition of drivers is adequate to operate their vehicles safely;
- operation of trucks does not have a deleterious effect on the physical condition of drivers.

1995: Interstate Commerce Commission Termination Act:

- directs FHWA (predecessor agency to FMCSA) to deal with a variety of fatigue-related issues pertaining to commercial motor vehicle safety;
- specifically mentions need to address amount of sleep after driving time, loading/unloading, automated recording devices, rest/recovery cycles, fatigue and stress in longer combination vehicles, fitness for duty, other measures to reduce fatigue-related crashes and increase driver alertness.

1999: Motor Carrier Safety Improvement Act of 1999:

- requires creation of a new safety agency, the Federal Motor Carrier Safety administration (FMCSA);
- emphasizes need to focus on and improve commercial motor vehicle safety;
- establishes safety as the highest priority of new agency.

2004: Congress enacts temporary extension of surface transportation authorization legislation:

Following July, 2004, U.S. Court of Appeals decision finding FMCSA HOS final rule of April, 2003, to be in violation of law and probably arbitrary and capricious, Congress supersedes court decision and allows agency to continue to enforce final rule until completion of new rulemaking or September 30, 2005, whichever comes first.

The Hours of Service Rule Chronology

1937: Interstate Commerce Commission adopts hours of service for interstate commercial drivers:

- drivers are required to work on 24-hour cycle, drive maximum 10 hours, rest minimum 8 hours;
- drivers can accrue up to 60 hours of driving over 7 consecutive days, 70 hours of driving over 8 consecutive days.

1962: Interstate Commerce Commission Eliminates Requirement for work/rest on a 24 hour cycle:

- commercial drivers can now constantly alternate maximum 10 hours of driving with minimum 8 hours of rest – an 18-hour, non-circadian cycle that increases sleep deprivation and fatigue;
- commercial drivers can exhaust available 60 hours of driving over 7 consecutive days, in less than 5 days and 70 hours of driving over 8 consecutive days, in slightly more than 5 days;
- when drivers are “out of driving hours,” they must lay over until the beginning of a new 7- or 8-day tour of duty that allows them another 60 or 70 total hours of driving.

1978: Federal Highway Administration (FHWA) issues Advanced Notice of Proposed Rulemaking (ANPRM) to provide drivers with more rest time:

- proposal to improve driver rest and recovery without increasing driver duty and driving hours;
- stressed elevated health risks to drivers including chronic problems of diet, sleep deprivation leading to hazardous driving, mental and physical stress, emotional/psychological deficits resulting from long periods away from home and family, and exposure to excessive heat and carbon monoxide.
- proposed rule issued by the Carter Administration withdrawn by the Reagan Administration in 1981.

1992: FHWA issues Notice of Proposed Rule Making (NPRM) to increase on-duty hours and shorten weekly off-duty layover period:

- over 70,000 comments filed, with the overwhelming majority opposed to longer hours;
- leading Congressional members opposed longer hours;
- major health, safety, union, insurer, law enforcement, consumer, victims and some industry groups opposed longer driver hours;
- FHWA stated supporters of rule provided no substantive research to justify increasing duty hours and reducing off-duty time;
- proposed rule issued by Bush Administration (1992) withdrawn by Clinton Administration (1993).

1997: FHWA issues ANPRM request for research on driver fatigue:

- FHWA failed to cite numerous studies on fatigue and performance;
- FHWA spent \$4.5 million on deeply flawed Driver Fatigue and Alertness Study (DFAS) which was partly directed by the trucking industry;
- FHWA tries to avoid inclusion and public review of DFAS in the ANPRM;
- FHWA withholds expert panel report severely critical of DFAS until required to release report under Freedom of Information Act.

2000: FMCSA issues NPRM that proposes to increase the maximum consecutive driving hours and divide trucking industry into segments (May 2, 2000):

- HOS Proposed Rule: requires that work and rest alternate only within a 24 hour period; mandates electronic onboard recorders for long-haul and regional drivers; increases maximum consecutive driving hours from 10 to 12 hours; increases off-duty rest time from 8 to 9-12 hours, depending on the type of driver; provides no distinction between driving and non-driving on-duty time;
- There is no research that shows increasing off-duty time counteracts the decreased performance and elevated risk produced by more driving hours.

2003: FMCSA issues a final rule that increases maximum driving hours (April 28, 2003):

- Key anti-safety elements in HOS Final Rule: allows work and rest to alternate on a 21 hour rotation; does not require electronic onboard recorders; reduces time for rest in each shift to 10 hours; re-establishes split rest time periods in sleeper berths; increases former consecutive driving time in each shift from 10 to 11 hours; allows drivers to take off a minimum of 34 consecutive hours, after which they can again start driving another 70 or 80 hours; 34-hour layover forces drivers to drive during what formerly was layover time between tours of duty; increases maximum driving hours from 60 to 77 hours over 7 consecutive days, and increases maximum driving hours from 70 to 88 hours over 8 consecutive days;
- FMCSA provides no support for these changes in the final rule or in the accompanying regulatory evaluation and benefit-cost analysis.

Public Citizen and other safety groups, with Advocates as *amicus curiae*, file suit against the FMCSA challenging validity of HOS final rule (June 12, 2003):

Lawsuit challenges HOS rule as arbitrary, capricious, and not in accordance with law; shows that the agency failed to fulfill a statutory requirement to address the need for electronic onboard recorders; emphasizes that none of the changes in the final rule are adequately supported in the administrative record; shows agency ignored earlier admissions of the dangers of increasing consecutive driving time; demonstrates that the benefit cost analysis on which the final rule relies is fundamentally flawed.

2004: U.S. Circuit Court of Appeals decision, issued July 16, 2004, overturns and vacates entire final rule and remands to the agency:

- opinion holds that the agency violates the Motor Carrier Safety Act of 1984 by failing to ensure that the regulation protects the health of commercial drivers;
- remainder of opinion vacates the entire rule and indicates that each of the major features of the final rule is inadequately supported in the existing rulemaking record;
- remainder of opinion states that agency failed to satisfy all of the requirements of Sec. 408 of the Interstate Commerce Commission Termination Act of 1995;
- FMCSA begins work to attempt to justify the April 2003 final rule by forming an expert intra-agency task force to study how to defend or modify the regulation;
- Congress approves special provision that retains HOS rules for one year giving FMCSA until September 30, 2005 to complete new HOS rulemaking in response to court decision.

2005: New FMCSA HOS rule - retains dramatic increases of maximum driving hours:

- FMCSA publishes proposed HOS rule on January 24, 2005 that merely restates the 2003 rule;
- On August 16, 2005, FMCSA issues new HOS final rule that is identical to the 2003 HOS rule in most respects, keeping the longer 11-hour limit on consecutive driving hours, the minimal 34-hour off duty “restart”, and allowing more cumulative work and driving hours than the pre-2003 rule;

2005: Continued:

- Only changes in new HOS from 2003 rule is to allow short-haul drivers to work even longer hours twice each week, and to require, and to require at least one 8-hour rest period in sleeper berths;
- Petition for Reconsideration filed by Public Citizen, Advocates, CRASH, P.A.T.T., Trauma Foundation and the International Brotherhood of Teamsters on September 23, 2005.

2006: Groups File Lawsuit Opposing 2005 HOS Rule:

- Petition for reconsideration filed by Owner-Operator Independent Drivers Association (OOIDA) is denied on December 5, 2005; OOIDA files suit over the sleeper berth issue on Jan. 23, 2006.
- After waiting 5 months with no response from FMCSA to the petition for reconsideration, Advocates, Public Citizen, CRASH, PATT, and the International Brotherhood of Teamsters withdraw petition from agency and file petition for review in federal court of appeals on Feb. 27, 2006. The case was argued in court on Dec. 4, 2006.

2007: FMCSA Issues Weak EOBRs Proposed Rule and Court Again Strikes Down FMCSA HOS Rule:

FMCSA announces weak proposed rule on Electronic On Board Recorders (EOBRs) that will require few, if any, motor carriers to install currently available technology to monitor driver hours of service compliance and other aspects of commercial vehicle operation. Notice of proposed rulemaking, Jan. 11, 2007, 71 FR 2340 (Jan. 18, 2007).

U.S. Circuit Court of Appeals decision, issued July 24, 2007, again overturns and vacates major portions of 2005 final rule:

- Court's opinion reiterates flaws in reasoning on major issues identified in first case;
- Opinion vacates the increase to 11 consecutive driving hours and 34-hour restart provision;
- Court holds that agency revised model used to explain reasoning is flawed and fails to properly represent data on truck crashes during and after the 11th hour of driving;
- Court also rules that FMCSA failed to afford public notice and an opportunity to comment on the agency model before it was issued as part of the final rule;
- Court grants 90-day stay of the issuance of the order to vacate the two provisions, giving FMCSA to Dec. 27, 2007, to provide the trucking industry and law enforcement with guidance regarding the changes in hours of service rules that will take effect after the mandate is issued.

FMCSA Issues Interim Final Rule reinstating rules vacated by Court of Appeals:

- FMCSA, citing no legal authority, reinstates both the 11th hour of driving and 34-hour restart provisions that the Court held were promulgated in violation of law;
- FMCSA claims that disruption of trucking industry and inability to get states to change enforcement policies necessitated this action, even though the Court of Appeals already rejected these arguments when FMCSA presented them seeking a one-year stay of the Court's order;
- Interim Final Rule continues the 2005 HOS rule intact while agency collects data and information to support eventual reissuing the same rule sometime in 2008;
- Interim Final Rule reinstates provisions vacated by Court of Appeals without giving public prior notice or opportunity for public comment, one of the reasons the Court cited in its July, 2007 opinion for vacating the two rules; provides public with after-the-fact comment period of 60 days.

2007: Continued:**Senate Holds Public Hearing on Hours of Service Regulations:**

December 19, 2007, before the Surface Transportation and Merchant Marine Infrastructure, Safety, and Security Subcommittee of the Commerce, Science and Transportation Committee.

Safety Groups and Labor Union Seek to Set-Aside Interim Final Rule:

Groups file motion in on Dec. 19, 2007, requesting that Court of Appeals enforce its decision to vacate features of the 2005 HOS rule and set-aside agency interim final rule. Court denies request.

2008: FMCSA Issues New HOS Final Rule, Petition for Reconsideration Filed with**Agency; FMCSA reissues HOS rule without change:**

- Agency issues final rule on December 17, 2008, that formally adopts the HOS provisions contained in the interim final rule and the prior 2005 HOS regulation.
- Safety groups and labor union file petition for reconsideration of HOS final rule on Dec. 18, 2008.

2009: Petition for Reconsideration Denied , Parties File 3rd Lawsuit, Reach Settlement:

Agency responds by denying petition for reconsideration of safety groups and labor union on Jan. 16, 2009, just three days before leaving office.

Safety groups and labor union file third HOS Lawsuit challenging FMCSA rule:

- Third HOS law suit filed by safety groups and labor union on March 9, 2009, seeking review of the HOS final rule and the denial of the petition for reconsideration in U.S. Court of Appeals, and send contemporaneous letter to Transportation Secretary Ray LaHood requesting new HOS rulemaking.
- Petitioners and FMCSA file a joint motion on October 26, 2009, requesting that the Court hold the Petition for Review in abeyance pending fulfillment of a settlement agreement between the parties in which FMCSA agrees to reopen rulemaking on hours of service by forwarding a draft notice of proposed rulemaking to the Office of Management and Budget within nine months of the date of the settlement agreement (by July 26, 2009), and by issuing a final rule within 21 months of the settlement date (by July 26, 2010).
- The FMCSA federal advisory committee, the Motor Carrier Safety Advisory Committee (MCSAC), meets in early December to discuss HOS rules and compile list of issues and ideas the agency should consider in developing revised HOS rule.

2010: FMCSA Undertakes New HOS Rulemaking:**Agency conducts outreach and listening sessions to prepare draft of new rule:**

- FMCSA holds five public listening sessions around the country to take public comment on HOS rule.
- The FMCSA MCSAC holds a second meeting in early February to complete deliberations and list of issues and ideas the agency should consider in developing revised HOS rule.
- Court of Appeals issues an order on March 3, 2010, granting the October, 2009, joint motion to hold the petition for review in abeyance pending further proceedings before the FMCSA consistent with the joint motion and settlement agreement.
- FMCSA adheres to deadline in litigation settlement agreement by sending proposed HOS rule to Office of Management and Budget (OMB) on July 26, 2010.
- OMB Office of Information and Regulatory Affairs (OIRA) completes review on Dec, 17, 2010.

2010: FMCSA issues new proposed HOS rule (Dec. 20, 2010):

- Notice of proposed rulemaking (75 FR 82170, Dec. 29, 2010) issued, proposed rule includes—
 - consideration of return to imposing maximum of 10 consecutive hours of driving per shift; requiring minimum one-half hour rest breaks after seven hours on duty if further driving is contemplated;
 - requiring 34-hour restart be taken over two night time periods of midnight to 6 a.m. and limiting use of restart to once every seven days;
 - reducing on-duty time during 14 hour daily work window from 14 to 13 hours per day;
 - allowing non-work extension of 14-hour day to 16 hours twice each week;
 - and permitting sleeper berth 2-hour off duty period to be taken in-cab immediately before or immediately following 8-hour off duty period.
- FMCSA holds public listening session and on-line question and answer public availability on Feb. 17, 2011.
- American Trucking Association and trucking interests mount media campaign and effort in Congress to prevent proposed rule from being issued as final rule.

2011: FMCSA reopens docket for new research publications (May 9, 2011):

FMCSA publishes four new studies –

- Hanowski, et al, “The Impact of Driving, Non-Driving Work, and Rest Breaks On Driving Performance in Commercial Vehicle Operations,” FMCSA (April 2011);
- Jovanis, et al, “Hours of Service and Driver Fatigue – Driver Characteristics Research,” FMCSA (April 2011);
- Sando, et al, “Analysis of the Relationship Between Operator Cumulative Driving Hours and Involvement in Preventable Collisions,” TRB 90th Annual Meeting (Nov. 2010); and
- Sando, et al, “Potential Causes of Driver Fatigue: A Study On Transit Bus Operators In Florida,” TRB 90th Annual Meeting (Nov. 2010);
- FMCSA reopened HOS rulemaking docket to accept public comment on the studies;
- FMCSA files third status report on pending litigation stating intent to publish final rule on or before October 28, 2011.
- **FMCSA issues final rule (Dec. 27, 2011):**
 - Retains 11-hour consecutive driving maximum;
 - Limits use of restart to once per week (each 168 hours);
 - Requires 2 night time sleep periods during 34-hour restart;
 - Requires one-half hour rest break after 8-hours of reporting for duty;
 - Sets July 1, 2013 as implementation date.

Electronic On-Board Recorders –

- Motor Carrier Safety Advisory Committee establishes subcommittee on EOBRs;
- OOIDA wins 7th Circuit lawsuit against FMCSA remedial EOBRs rule, agency failed to define what actions constitute illegal use of EOBRs to harass operators.

2012: Safety Organizations, Trucking Industry File Lawsuits Opposing New HOS Rule:

- Advocates, Public Citizen, Truck Safety Coalition and two truck drivers file suit opposing continuation of rule that allows 11-consecutive hours of driving and unhindered use of 34-hour restart by long-haul drivers operating on 70 –hour in 8-day schedules.
- Trucking industry groups file lawsuit opposing limitation on use of 34-hour restart by long-haul drivers operating on 60-hour in 7-day schedules, imposing two night time sleep periods, and requiring one-half hour rest break after 8 hours of reporting for duty.

2012: Continued:

- Briefs Filed in lawsuits opposing HOS rule, case #12-1092 & #12-1113.
- **MAP-21 Legislation Enacted (July 6, 2012)**
Requires FMCSA to conduct field study of benefits of nighttime sleep.

2013: HOS Litigation

- Oral argument in the HOS cases was heard on March 15, 2013 before judges Brown, Griffith and Randolph.
- FMCSA denied petitions from ATA and CVSA seeking delay of July 1, 2013 date for implementation of changes in HOS rule regarding rest breaks and limits on use of 34-hour restart, required by final rule issued Dec. 27, 2011.
- House Committee on Transportation and Infrastructure, Subcommittee on Highways and Transit, holds hearing on *The Impacts of the DOT's Commercial Driver Hours of Service Regulations* on June 18, 2013.