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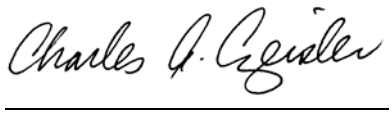

**Charles A. Czeisler, Ph.D., M.D.**

# BEFORE TRANSPORTATION COMMITTEE OF THE MASSACHUSETTS STATE SENATE REGARDING SENATE BILL 2124

## "AN ACT RELATIVE TO DROWSY DRIVING"

**September 29, 2005**

**Introduction**

Thank you for offering me the opportunity to speak here today. My name is Dr. Charles Czeisler. I am a resident of Massachusetts, a member of the Massachusetts Medical Society, and a neuroscientist with over 30 years experience studying the effects of sleep deprivation on human performance. I am the Baldino Professor of Sleep Medicine at Harvard; Director of the Division of Sleep Medicine at the Harvard Medical School; Chief of the Division of Sleep Medicine in the Department of Medicine at the Brigham and Women's Hospital in Boston; Team Leader of the Human Performance Factors, Sleep and Chronobiology Team at NASA's National Space Biomedical Research Institute in Houston; President of the Sleep Research Society, and Chair of its Task Force on Sleep and Public Policy.

**History**

In December 2004, Senator Richard Moore asked Dr. Christopher Landrigan and me provide him with an evaluation—based on the best available medical science—of the Drowsy Driving Act of 2005, also known as "Rob's Law" in memory of Army Major Robert Raneri, who was killed by an admitted drowsy driver on his way to work at Fort Devens. In order to provide Senator Moore with an evaluation of Rob's Law based on a consensus of sleep scientists, I brought the issue to the attention of the Executive Committee of the Sleep Research Society, an organization founded in 1961 that now represents more than a thousand sleep scientists throughout the United States. In response to Senator Moore's request, the Sleep Research Society formed a Presidential Task Force on Sleep and Public Policy, whose membership has included the President of the Sleep Research Society, the President of the American Academy of Sleep Medicine, the President of the National Sleep Foundation, the President of the World Federation of Sleep Research and Sleep Medicine Societies and the Director of Sleep and Patient Safety at the Brigham and Women's Hospital, all of whom met here in the Boston Statehouse to work on this task on April 26, 2005—the day that Rob's Law was introduced into the Massachusetts Senate by Senator Moore.

**Sleep Research Society endorsement of amended legislation**

After carefully reviewing the medical science on the impact of fatigue on the risk of motor vehicle crashes, which included multiple meetings and six months of work on this project, the Sleep Research Society Task Force on Sleep and Public Policy presented its recommendations regarding the proposed legislation to the Board of Directors of the Sleep Research Society, which has endorsed the proposed legislation, as amended. Senator Moore has asked me to come here today to explain why—as a specialist in sleep medicine—I believe that it is so important for the Massachusetts Senate to pass this legislation.

**Scope of the Problem**

Nationwide, 57 percent of drivers admit to having driven while drowsy in the past year, with one out of four drivers admitting that they actually fell asleep at the wheel. Yet the public recognizes the hazards of drowsy driving. According to a 2002 report of the National Highway Transportation Safety Administration, "Virtually all drivers believe that other drivers who drive while sleepy or drowsy are a threat to their own personal safety and that of their family. Ninety-five percent (95%) believe this behavior by others to be a major threat, while 5% see it as a minor threat." The public is right about the importance of this threat. Data collected by the National Highway Transportation Safety Administration indicate that at least 15 million drivers nationwide, including 375,000 licensed drivers here in Massachusetts, have nodded off or fallen asleep while driving in the past six months. That equates to more than two thousand drivers here in Massachusetts falling asleep at the wheel every day—or more than one per minute—endangering themselves, their families, and their fellow citizens. The outcome of those fall-asleep episodes is sobering. More than half (52%) of those drowsy drivers wandered into another lane, drifted onto the shoulder, or drove across the centerline during the incident. In another 10 percent of these incidents, the driver ran off the road. In fact, an estimated 1,350,000 drivers nationwide, including more than 30,000 here in Massachusetts, were involved in a drowsy-driving-related crash in the past five years.

Unfortunately, such drowsy driving crashes are often very serious, just like the crash that killed Army Major Robert Raneri. Fatalities are nearly three times more likely to occur in a sleep-related crash than in other, non-alcohol-related crashes, leading to the conclusion that more of the most serious crashes are sleepiness related. Moreover, young drivers like the one who killed Major Raneri are disproportionately represented in drowsy-driver crashes; in fact, 64% of all drivers involved in a drowsy driving-related crash are between 16-29 years old at the time of the crash. A consensus panel of experts from around the world, convened at the Karolinska Institute in Stockholm, concluded that fatigue-related crashes were the "largest identifiable and preventable cause of accidents in transport operations, surpassing that of alcohol or drug-related incidents in all modes of transportation." In fact, the cost to society of sleep-related accidents—on the road, in the workplace, and at home—has been estimated at $46 billion per year.

**Sleep loss impairs performance**

Given the importance of this issue, and the lack of any explicit language in Massachusetts law addressing this issue, it is important to recognize that sleep-related impairment of driving performance can be caused by a number of different factors related to the sleep-wake history of the individual. These include acute sleep loss (an inadequate amount of sleep in the past 24 hours); chronic sleep loss (an inadequate amount of sleep per day over the past week); the time of day (since the brain's sleep drive increases at night); recent awakening (the brain takes time to awaken fully); use of sedating agents, including alcohol, drugs and medications; and untreated or unrecognized sleep disorders.

Remaining awake for 22 of the prior 24 hours impairs cognitive performance to a degree that is comparable to the impairment induced by a blood alcohol concentration of 0.10 percent. In fact, when people are kept awake for even 19 consecutive hours, their impairment on a psychomotor performance test is comparable to that of a rested person with a blood alcohol concentration of 0.05 percent; at 24 hours of sustained wakefulness, performance is comparable to a blood alcohol concentration of 0.10 percent. Furthermore, drowsiness and alcohol interact, so that small amounts of alcohol ingestion exacerbate the impairment associated with drowsy driving and make the risk of falling asleep at the wheel much higher. When we keep people awake for 24 hours in the lab, average reaction times triple. The slowest reaction times are more than ten times higher than they are when a person is well rested. Even when sleepy drivers do not fall asleep at the wheel, the risk of crashes rises dramatically. For example, we found that the risk of a non-fall-asleep automobile crash for an intern driving home after working a 24 hour shift was increased by 167 percent, and their risk of a near-miss crash was increased by 468 percent–when compared to their risk of such incidents while driving home from a shorter work shift.

And these are impairments in the drowsy driver who wins the struggle to stay awake. These are mild consequences compared to the total loss of functioning that occurs when the drowsy driver loses the battle against fatigue and succumb to a sleep attack (when the sleepy brain seizes control completely and the individual falls asleep at the wheel) or an episode of sleep drunkenness (when part of the brain falls asleep while another part struggles to remain awake). In the state of sleep drunkenness, routine tasks such as automobile driving can be continued in a rudimentary manner without appropriate cortical integration or sensory input from the environment. For example, the operator of a motor vehicle in this sleep-like condition—which probably represents a transitional state in which part of the brain is asleep while part of the brain remains awake—may maintain full pressure on the accelerator pedal and proceed for a considerable distance, even negotiating gradual turns, but fail to heed stop signals or respond appropriately to traffic conditions in a timely manner. In fact, such impaired drivers will often seek out stimuli—such as the flashing hazard signals of a car in the breakdown lane—and drive toward the stimuli with catastrophic consequences, instead of heeding the warning to stay away. Obtaining less than four hours of sleep per night for a week impairs neurobehavioral performance by a comparable amount. Driving with such levels of impairment is unsafe.

The effects of acute loss of sleep are not overcome with a single night's sleep, but can carry over several days. Sleep deprivation leads to an increased probability of experiencing lapses of attention and falling asleep while driving. In fact, because driving is a routine, highly over-learned task, it is one of the most vulnerable to the effects of sleep loss—and the most unforgiving.

The occurrences of lapses of attention, microsleep episodes and/or sleep drunkenness can lead to catastrophic consequences in sleep-deprived drivers.

Fatigue is a major cause of crashes involving heavy trucks due to fatigue-related impairment of driving skills (poor judgment, slowed reaction times and decreased awareness). The National Commission on Sleep Disorders Research has estimated that thousands of lives have been lost on the nation's highways as a result of sleep-related crashes. In fact, in May of 1994, two parents in Maine whose son and three of his friends were killed by a truck driver who the parents believe fell asleep at the wheel formed an organization they call "Parents Against Tired Truckers," an organization with the stated goal of reducing heavy truck crashes resulting from truck driver fatigue.

A number of medical conditions and/or the medications used to treat those conditions are associated with increased sleep tendency, increased risk of lapses of attention and increased risk of sleep-related accidents. These include primary sleep disorders, such as narcolepsy and sleep apnea, as well as sleep disturbance secondary to a medical condition or its treatment. Obstructive sleep apnea patients, for example, with an apnea/hypopnea index greater than 10 have a 6-fold increase in risk for having a traffic accident.

Given the multiple factors that can lead to sleep-related crashes, you might wonder what the legislature can do to prevent their occurrence. The good news is that unlike heart attacks, sleep attacks do not occur without warning. In fact, the statistics that I just reported to you from the National Highway Transportation Safety Administration on the prevalence of drowsy driving crashes were reported from the drivers themselves, who recognized that they had been driving drowsy and that they had fallen asleep at the wheel. In a study of sleep-related crashes in North Carolina conducted by the AAA Foundation for Traffic Safety, when asked confidentially, the vast majority of people (3/4) in drowsy driving crashes admit that they were drowsy before the crash. And—as is so common in the case of drunk driving—drowsy driving represents a repeated pattern of behavior. 97.4 percent of such drivers admitted to driving drowsy on another occasion during the year before the fall-asleep crash, 90.6 percent had previously fallen asleep at the wheel and 95.3 percent of these had fallen asleep at the wheel within the prior 2-3 years. Most people who fall asleep at the wheel know that they were drowsy, and had been struggling to stay awake before the crash. Most such drivers have a history of struggling to stay awake, not only at the wheel, but in other inappropriate situations. Yet they keep driving when drowsy. Like alcohol, drowsiness impairs judgment and the sleep-deprived driver often attempts to drive despite this self-awareness. This is why a prescriptive limit and education regarding the hazards of drowsy driving are so important.

**Need for Education**

These grim statistics reveal the urgent need for a mandatory state-wide educational program on the **prevention of drowsy driving crashes** for all drivers in Massachusetts. The hazards of drowsy driving must be included in all driver education programs and should be an essential component of the driver licensing examination in Massachusetts. Rumble strips, which have been installed on many highways in Massachusetts, should be required on all

highways in which the speed limit exceeds 45 miles per hour. Today, there are a woefully inadequate number of safe rest stops on the nation's highways; Massachusetts should take the lead in providing drivers in the Commonwealth a safe alternative to driving whenever they recognize the signs of drowsiness. Finally, the Massachusetts State Police and local police should be trained on the role of drowsy driving in crashes and the recognition and investigation of drowsy driving crashes, because drowsy driving crash incidents are underreported, police reporting practices throughout the Commonwealth are inconsistent, and self-reporting is often unreliable because of legal and financial liability concerns on the part of the driver. Thus, a major initiative will be required to gather data on drowsy driving crashes systematically in order to track our progress in combating this silent killer.

Therefore, it is critical that the Massachusetts legislature enact Rob's Law to:

1) raise awareness among Massachusetts drivers of the tremendous risks of drowsy driving and that drowsy driving is wrong;
2) establish the principle that as a society we will no longer tolerate the wreckless endangerment to ourselves and our children that results from drivers making the irresponsible choice to get behind the wheel of a car when they are impaired by drowsiness. The Massachusetts Legislature made the decision decades ago to establish this same principle with respect to the irresponsible decision to drive when impaired by alcohol; its time to so the same for drowsy driving by passing Senate Bill 2124.

Please let me take this opportunity to thank Senator Moore for his pioneering and courageous effort to lead this initiative, which could set the standards for states nationwide on this very important legislation. Thank you again for having offered me the opportunity to speak here today. With your permission, I will provide the Committee with written testimony, including an extensive bibliography referencing the medical science on which this testimony is based, within the next few weeks.