U.S. House of Representatives
Committee on Transportation and Infrastructure
Washington, DC 20515

James L. Oberstar
Chairman

David Heymsfeld, Chief of Staff
Ward W. McCarragher, Chief Counsel

John L. Mica
Ranking Republican Member

James W. Coon II, Republican Chief of Staff

February 8, 2007

SUMMARY OF SUBJECT MATTER

TO: Members of the Subcommittee on Railroads, Pipelines, and Hazardous Materials

FROM: Subcommittee on Railroads, Pipelines, and Hazardous Materials Staff

RE: Hearing on Fatigue in the Rail Industry

PURPOSE OF HEARING

The Subcommittee on Railroads, Pipelines, and Hazardous Materials is scheduled to meet on Tuesday, February 13, 2007 at 2:00 p.m. to receive testimony on fatigue in the rail industry.

BACKGROUND

According to the Federal Railroad Administration (FRA), the total number of train accidents, including collisions and derailments, has increased from 2,504 in 1994 (when the FRA was last reauthorized) to 3,325 in 2005. The accident rate – which takes into account the corresponding increase in train miles traveled from about 655 million miles in 1994 to about 790 million miles in 2005 – has also increased since 1994. Meanwhile, fatalities and injuries have increased from 12 fatalities and 262 injuries in 1994 to 33 fatalities and 734 injuries in 2005.

Although generally accepted as a factor in train accidents, the exact number of accidents due to fatigue is difficult to determine and likely to be underestimated, according to the National Transportation Safety Board (NTSB). The difficulty in determining the incidence of fatigue-related accidents is due, at least in part, to the difficulty in identifying fatigue as a causal or contributing factor in accidents. There is no comparable chemical test for identifying the presence of fatigue as there is for identifying the presence of drugs or alcohol; hence, it is often difficult to conclude unequivocally that fatigue was a causal or contributing factor in an accident. In most instances, one or more indirect or circumstantial pieces of evidence are used to make the case that fatigue was a factor in the accidents. This evidence includes witness statements, hours worked and slept in the days prior to the accident, the time at which the accident occurred, the regularity or irregularity of the operator's schedule, or the operator's admission that he fell asleep or was impaired by fatigue.

Despite the difficulty in identifying fatigue as a causal factor, estimates of the number of accidents involving fatigue have been made for the different modes of transportation. With respect to railroads, the FRA reports that human factors are responsible for nearly 40 percent of all train accidents, and that fatigue plays a role in approximately one out of four of those accidents.

The NTSB's in-depth investigations have also demonstrated that fatigue is a major factor in transportation accidents. In fact, fatigue has been on the NTSB's Most Wanted list of safety improvements since its inception in 1990. In the late 1980s, following a series of fatigue-related accidents, the NTSB issued three recommendations to the U.S. Department of Transportation (DOT) addressing needed research, education, and revisions to hours-of-service regulations. Between 1989 and 1999, the NTSB issued more than 70 additional recommendations to the DOT, States, industry, and industry associations to reduce the incidence of fatigue-related accidents.

In 1999, the NTSB published a report evaluating the efforts of the DOT to address operator fatigue. According to the NTSB, in response to the three recommendations issued in 1989, the DOT and the modal administrations "acted and responded positively to those addressing research and education; little action, however, has occurred with respect to revising the hours-of-service regulations."

Hours-of-service regulations specify the length of on-duty and off-duty time for operators in transportation. The current hours-of-service regulations vary from mode to mode. The NTSB reports that the maximum number of hours an employee of each mode is permitted to work in the course of a 30-day period is 100 hours for commercial pilots, 260 hours for truck drivers, and 360 hours for licensed individuals on an oceangoing vessel or coastwise vessel (when at sea). Meanwhile, locomotive engineers may operate a train up to 432 hours per month.

The NTSB recommended that the FRA establish within two years scientifically based hours-of-service regulations that set limits on hours-of-service, provide predictable work and rest schedules, and consider circadian rhythms and human sleep and rest requirements. However, the FRA is the only modal administration within the DOT whose hours-of-service standards are mandated by Congressional statute and, therefore, may not be adjusted or modified by administrative procedures.

HOURS-OF-SERVICE

The Hours of Service Act was first enacted in 1907; it was substantially revised in 1969, and amended again in 1976 and 1988. The Act governs maximum time on-duty for all persons engaged in or connected with the movement of a train, including locomotive engineers, conductors, signalmen, and dispatchers. Maintenance-of-way workers (who maintain and repair tracks and other structures), carmen (who repair and inspect railroad cars), other shop crafts, and contractors who perform signal duties are not covered by the Act and thus have no limits on hours-of-service.

Under current law, train operating crews and railroad signalmen can work 12 consecutive hours with 10 hours of rest. However, if they work less than 12 hours by even one minute, then they are only required to get 8 hours of rest. Duty tours may be extended by interim periods of release, 4 or more hours for train service and 1 or more hours for signal service.

This means that an individual can begin a shift on Monday at 8:00 a.m., and be called for a shift on Tuesday at 4:00 a.m. and a shift on Wednesday at midnight. According to the FRA, this kind of "backward-rotating shift" may continue for weeks, and can wreak havoc on an employee's circadian rhythm, the biological cycle that governs sleeping patterns.

Train dispatchers are under a different hours-of-service regime. Under current law, dispatchers can work a total of nine hours in a 24-hour period in a tower, office, or station that has two or more shifts in a 24-hour period, or a total of 12 hours in a 24-hour period where employed in a one-shift office.

There are two exceptions to these work periods. During emergencies, all of these employees may be required to work up to an additional four hours, for a total of 16 hours for train operating crews and railroads signalmen, and a total of 13 to 16 hours for train dispatchers (limited to three days per week for dispatchers). In addition, signalmen may be called for one or more "trouble calls" to deal with wayside signal problems or malfunctioning warning devices at grade crossings. Trouble calls can add up to four hours on top of the 12-hour on-duty limit.

Then there is "limbo time," a term used to describe the period of time when a train operating crew's hours-of-service has expired, but the crew has not yet arrived at their point of final release; meaning, the off-duty location or terminal point where they can go home or obtain food and lodging at an away from home terminal. Limbo time also accrues for train operating crews whose trains are stopped on a line of track, frequently due to the expiration of their 12-hour on-duty time limit, before they reach their destination terminal (point of final release). Limbo time accrues from the time the train is stopped until the crew arrives at the final release point, and includes time spent in transportation to their final release point, as well as time spent waiting for transportation to pick them up from their train.

During limbo time, crewmembers are required to stay awake, alert, and able to respond to any situation and follow the railroad's operating rules. Although time spent in limbo is classified under current law as neither on-duty nor off-duty time, it may be paid time for the crew, and any required minimum rest period does not begin until the limbo period ends, limbo time can and has kept railroad operating crews effectively on-duty for well over 12 hours and, in the case of the Union Pacific engineer involved in the 2004 Macdona, Texas accident, 22 hours (12 hours on-duty and 10 hours of limbo time).

When it comes to time available for rest, train crewmembers are generally called for service approximately two to three hours before their report for duty time. So, if a train crewmember is called to return to duty at the completion of his or her statutory off-duty period, then the duration of uninterrupted off-duty time available for sleep could be as little as five or six hours. However, since the required eight or 10 hours of off-duty time includes commuting, leisure, and personal time, the duration of any period available for sleep could be even less than that.

THE MACDONA ACCIDENT

On June 28, 2004, a westbound Union Pacific (UP) freight train traveling on the same main line track as an eastbound BNSF freight train struck the midpoint of the 123-car BNSF train as it was leaving the main line to enter a parallel siding. The accident occurred at the west end of the rail

siding at Macdona, Texas, on the UP's San Antonio Service Unit. The collision derailed the four locomotive units and the first 19 cars of the UP train as well as 17 cars of the BNSF train. As a result of the derailment, the 16th car of the UP train, a pressure tank car loaded with liquefied chlorine, was ruptured. Chlorine escaping from the punctured car immediately vaporized into a cloud of chlorine gas that engulfed the accident area to a radius of at least 700 feet. Three persons, including the conductor of the UP train and two local residents, died as a result of chlorine gas inhalation. The UP train engineer, 23 civilians, and six emergency responders were treated for respiratory distress and other injuries. Damages to the rolling stock, track, and signal equipment were estimated at $5.7 million, with environmental cleanup costs estimated at $150,000.

The NTSB determined that the probable cause of the collision was UP train crew fatigue that resulted in the failure of the engineer and conductor to appropriately respond to wayside signals governing the movement of their train. An NTSB review of the UP engineer's work schedule revealed that his time on-duty in the days leading up to the accident ranged from nine hours to more than 18 hours. Eleven of his work days were longer than 14 hours, with one day totaling 16 hours and eight minutes on-duty, another day totaling 18 hours and 34 minutes on-duty, and another day totaling 22 hours on-duty (12 hours on-duty and 10 hours of limbo time).

Contributing to the crewmembers' fatigue was their failure to obtain sufficient restorative rest prior to reporting for duty because of their ineffective use of off-duty time and UP's train crew scheduling practices, which inverted the crewmembers' work/rest periods. A review of the UP conductor's work schedule showed that in the 10 days prior to the accident he had four days off followed by six consecutive work days leading up to the day of the accident. His duty times for the six work days would have allowed him to continue the nighttime sleep pattern that he had adhered to during the preceding four days off, but the conductor's call for the accident trip shortly after midnight inverted the work/sleep cycle he had developed over the previous 10 days. According to the NTSB, "such a disruption would be expected to produce severe effects for sleepiness and performance."

The NTSB concluded, "The minimum rest periods prescribed by Federal regulations do not take into account either rotating work schedules or the accumulated hours spent working and in limbo time, both of which can affect the ability of an employee to obtain full rest and recuperation between job assignments." The NTSB recommended, among other things, that the FRA require railroads to use scientifically based principles when assigning work schedules for train crewmembers, which consider factors that impact sleep needs, to reduce the effects of fatigue and establish requirements that limit train crewmember limbo time to address fatigue.

In response to the recommendation, FRA Administrator Joseph Boardman stated in an October 24, 2006 letter that the FRA currently lacks rulemaking authority over duty hours, which precludes the FRA from making use of almost a century of scientific learning on the issue of sleep-wake cycles and fatigue-induced performance failures. Administrator Boardman also stated that the FRA lacks the statutory authority to deal with limbo time because the hours-of-service law specifically states that time spent in deadhead transportation from a duty assignment to the place of final release is neither time on duty nor time off duty. In addition, because the United States Supreme Court has held that time spent awaiting deadhead transportation to the place of final release is of the same character as the time spent in the deadhead transportation itself, and is therefore neither time on duty nor time off duty, the FRA lacks authority to adopt regulatory

requirements related to these periods. *See Brotherhood of Locomotive Engineers v. Atchison, Topeka and Santa Fe R.R. Co., 516 U.S. 152, 116 S. Ct. 595 (1996).*

"The FRA supports efforts to address the fatigue experienced by railroad operating employees, and acknowledges that the existing hours-of-service law is not designed to address the causes of fatigue. Also, any requirements that FRA might implement to address fatigue would result in conflict with the provisions of the hours-of-service law, therefore exceeding FRA's existing statutory authority," said Boardman.

The DOT has on four occasions formally submitted legislation to Congress to reform the hours-of-service law, supplement it with fatigue management requirements, or authorize the FRA to prescribe regulations on fatigue in light of current scientific knowledge. To date, however, no action has been taken.

THE SCIENCE OF FATIGUE

Several FRA data collection and research activities provide a quantitative picture of the role of fatigue in railroad accidents. In 1996, the FRA commissioned a work/rest survey of 200 locomotive engineers, which found that while the average locomotive engineer obtained only 20 minutes less sleep than the average person, locomotive engineers who started work between 10:00 p.m. and 3:00 a.m. averaged only about five hours of sleep. Researchers determined that there is considerable variation in the amount of sleep that locomotive engineers obtain, depending on the time of day when work starts, because human physiology enables sleep at night but makes sleeping during the day difficult.

In 1997, the FRA commissioned a simulator study, which found that locomotive engineers working strictly within the hours-of-service standards accumulated a progressive sleep debt over a period of days. Engineers working a 10-hour shift with 12 hours off-duty averaged 6.1 hours of sleep, while engineers with 9.3 hours off-duty averaged only 4.6 hours of sleep. The engineers reported a progressive decrease in subjective alertness across the duration of the study, and performance of safety-sensitive tasks degraded during the same time period. Researchers concluded that the hours-of-service law allows work schedules that degrade job performance and reduce the safety of railroad operations.

Most recently, the FRA released its Fatigue Avoidance Scheduling Tool, a biomathematical model that can be used to reduce the risk of fatigue in work schedules. FRA researchers used two and one-half years of accident data from five Class I freight railroads and the 30-day work schedule histories of locomotive crews preceding about 1,400 train accidents to determine the relationship between accident risk and crew effectiveness. Data from the research showed a strong statistical correlation between the crew's estimated level of alertness and the likelihood that they would be involved in an accident caused by human factors. The level of fatigue associated with some work schedules was found to be equivalent to a 0.08 blood alcohol level or being awake for 21 hours following an 8-hour sleep period the previous night. At this level, train accidents consistent with fatigue, such as failing to stop for red signals, are more likely to occur.

Other FRA analyses of accidents agree substantially with the results of the Fatigue Avoidance Scheduling Tool project. For example, the FRA's Switch Operations Fatality Analysis

(SOFA) working group indicated that fatigue was responsible for more than 22 percent of the risk of SOFA severe incidents from 1997 through 2003. Additionally, the FRA's Collision Avoidance Working Group (CAWG) examined 65 main-track train collisions from 1997 through 2002 in which human factors contributed to trains exceeding their authority by passing a stop signal, failing to comply with a restricted speed signal, or entering territory without authority. The CAWG found that 19 of the 65 accidents involved impaired alertness; nearly all of the 19 collisions occurred between midnight and 8:00 a.m., which indicates a strong circadian effect.

In addition to research focused on fatigue, the FRA has also conducted research and development of new technologies that can help prevent human factors-caused accidents. Positive Train Control (PTC), for example, is an advanced train control technology that can prevent collisions with automatic brake applications. It also provides capabilities such as automatic compliance with speed restrictions and enhanced protection of maintenance-of-way workers. PTC could have prevented the accident in Macdona, Texas, and remains on the NTSB's Most Wanted list of safety improvements.

EXPECTED WITNESSES

The Honorable Joseph H. Boardman
Administrator
Federal Railroad Administration

The Honorable Mark V. Rosenker
Chairman
National Transportation Safety Board

Mr. Edward R. Hamberger
President
The Association of American Railroads

Mr. David Dealy
Vice President, Transportation
BNSF Railway

Mr. Thomas A. Pontolillo
Director of Regulatory Affairs
Brotherhood of Locomotive Engineers and Trainmen
On behalf of the Rail Conference Division, International Brotherhood of Teamsters

Mr. James Brunkenhoefer
National Legislative Director
United Transportation Union

Mr. Leonard Parker
Legislative Director
Brotherhood of Railroad Signalmen

Dr. Steven R. Hursh
President
Institutes for Behavior Resources

Mr. Pat Sherry
Professor
University of Denver