



National Transportation Safety Board

Washington, D. C. 20594

Safety Recommendation

109B-614B

Date: March 30, 1989

In reply refer to: R-89-21 through -23

Mr. W. H. Dempsey
President and Chief Executive Officer
Association of American Railroads
American Railroad Building
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Washington, D.C. 20001

About 7:54 a.m., e.s.t., on January 14, 1988, westbound Consolidated Rail Corporation (Conrail) "trailer van" freight train TV-61 collided with eastbound Conrail freight train UBT-506 near Control Point (CP) Thompson, at Thompsontown, Pennsylvania. The engineers and brakemen on both trains were fatally injured. The conductors on both trains received minor injuries. Damage to the trains was estimated at \$6,015,000.¹

During the 90 days preceding the accident, the engineer of UBT-506 took a week of vacation, was off on the usual holidays, and worked 57 tours of duty. Other than the vacation, he worked every tour of duty that was available to him. An individual working a straight 5-day, 40-hour week who took a week of vacation and was off on holidays, would also have worked 57 tours during the same period. Excluding several short "deadhead" tours when the engineer performed no duties and was simply transported from one place to another, his average tour of duty was slightly longer than 9 hours. That, too, would be about average for the typical 40-hour, day worker. Additionally, the engineer spent an hour or so each working trip commuting from or to his home, but that was scarcely out of the ordinary for people holding jobs anywhere. The brakeman's work regimen was similar to that of the engineer, except that he spent a little less time commuting. He, too, rarely lost an opportunity to work.

Beyond the overall amount of time the engineer and brakeman had to devote to their jobs, there was no similarity between their work/rest cycles and those of a typical day worker. Most striking was the utter lack of regularity and predictability in their work shifts and rest periods. Whereas a day worker who regularly is on the job between 8 a.m. and 5 p.m., Monday through Friday, and is off every weekday for 15 hours and every weekend for 63 hours, the engineer was off anywhere from 12 1/2 to 112 hours at a time and averaged more than 48 hours between work shifts when at

¹For more detailed information, read Railroad Accident Report--*Head-end Collision of Consolidated Rail Corporation Freight Trains UBT-506 and TV-61, near Thompsontown, Pennsylvania, January 14, 1988 (NTSB/RAR-89/02)*.

home. Away from home, the average rest period was much shorter, almost the same as that of the day worker. However, the amount of time off was never uniform; the spread was from 8 to 30 hours.

When at home, the engineer and brakeman never could be certain when they would have to return to work. In 29 tours of duty beginning at Conemaugh, Pennsylvania, the engineer had 26 different reporting times--8 between 8 a.m. and 4 p.m.; 14 between 4 p.m. and midnight; and 7 between midnight and 8 a.m. Away from home, the engineer's reporting times were just as unpredictable. At Harrisburg, Pennsylvania, he was called at 26 different times of the day for 28 trips. He worked every day of the week, most frequently on Mondays, Wednesdays, and Fridays, but he did work six Saturdays and four Sundays during the 90-day period.

Based on the testimony of Dr. Donald Tepas, an expert on shiftwork stress and sleep research, the engineer and brakeman could never adapt to this nonsystematic pattern of work times, and they were probably highly susceptible to variations in alertness and consciousness associated with their body clocks; adverse environmental conditions that tend to promote sleep, such as rhythmical motion and sound; and repetitive and monotonous job duties. Also, they probably were susceptible to sleep disorders and chronic sleep deprivation resulting in fatigue, frequent microsleeps or lapses, and napping. According to Dr. Tepas, they were unlikely to have recognized the sleep disorder and never made up their lost sleep.

The wives of the UBT-506 crewmembers all worked daytime jobs with regular hours, and it was around these jobs and the daily regimen of the children, in the case of the engineer, that the family routines revolved. The investigation established that upon returning from work, the crewmembers would immediately fall into their family routines.

The crewmembers ate at the usual times, slept at night, engaged in family activity in the evening, and otherwise lived "normally." If the crewmembers were not called to work for a protracted time, which was almost always the case, they would get one, two, or more nights of sleep. If their next call to duty came late in the day, they probably got little or no rest until after they arrived at Harrisburg. In the engineer's case, he reported for duty between 4:30 p.m. and 7:30 a.m. on 21 of the 29 occasions he worked out of his home terminal during the 90 days preceding the accident. Considering that he was called 3 hours before his reporting time, he probably went to work deprived of sleep to at least some degree in each of those 21 instances. In some, he probably had no meaningful sleep for 24 hours or longer by the time he had completed his trip to Harrisburg.

The testimony of the UBT-506 conductor was probably instructive as to how train crewmembers typically deal with the unpredictable nature of their work. He said he normally went to bed between 11 p.m. and 11:30 p.m., and slept 8 hours. He also said that he needed a minimum of 4 to 5 hours sleep to feel rested, but could get by one night without sleep. Even though he knew well in advance that he would probably have to work some time during the night preceding the accident, he made no effort to get adequate sleep by retiring early. The Safety Board believes that, under the circumstances, it would not be surprising if, at 6 a.m. or so on the morning of the accident, the conductor was seriously fatigued, particularly since his body clock was still at low ebb. Alone on the trailing unit without any compelling duties to keep him busy, it would be easy for him to submit to his fatigue by taking a nap.

The engineer and brakeman also probably understood they might be called out on the night before the accident, yet neither departed from their custom of going to bed in the evening. The brakeman was long conditioned to going to work at any time of the day or night, but from the standpoint of fatigue, he may have been worse off than the other crewmembers. During the 40 hours preceding the accident, he probably had little more than the 1 1/2 to 2 hours bed rest he got before being called to work. The night before, he probably managed to get some sleep while sitting with his terminally ill mother.

The engineer had about 1 1/2 hours of bed rest and a 1-hour nap in the 24 hours or so before the accident, although it is questionable that he actually obtained 2 1/2 hours of meaningful sleep in the process. The Safety Board believes that this sort of behavior may have been typical, not only of this crew, but of other crews on the Allegheny Division and elsewhere on Conrail and other railroads. As Dr. Tepas observed, it is probably not so surprising that the crew of UBT-506 fell asleep and allowed their train to overrun the interlocking at CP Thompson as it is that similarly caused accidents are not more commonplace.

As pointed out in the Safety Board's 1985 report of the Burlington Northern (BN) collisions in Colorado and Wyoming,² railroad train crews are confronted by the most uniquely unpredictable work/rest cycles in the transportation industry. Moreover, there is probably little that is even remotely comparable in other industries. To some degree, unpredictability in work schedules has been generally characteristic of the railroad industry since its inception. However, in the past when there were many scheduled passenger and freight trains, as well as large numbers of yard and local freight runs, that had regularly assigned crews, most of the irregular and unpredictable work fell to local extra boards staffed by younger employees with low seniority. The past 20 to 30 years have brought sweeping changes to the industry, not the least of which have been wholesale elimination of passenger trains, yard operations, scheduled freight trains, and a proliferation of crew pools and division-wide extra boards.

Additionally, larger American railroad systems, such as Conrail and BN, are the result of the mergers of many smaller systems within the past 30 years. As a result of these mergers and competitive forces, many duplicate operations have been eliminated. Because of management-labor agreements protecting employee seniority, this has resulted in widespread relocation of work assignments. Also, railroads have eliminated many operating divisions resulting in changed reporting points and longer freight runs. All of these changes have brought economic advantages to the railroads, and quite often, to the employees as well. But, the Safety Board believes that neither railroad management nor the railroad unions have adequately considered the adverse impact that many of the changes have wrought on the working regimens of freight train crewmembers. Under present conditions, many train crewmembers may well work their entire careers without ever having a job with regularly assigned working hours and off-duty periods.

The traditional "it goes with the territory" attitude of railroad management toward the unpredictable nature of train crew work was revealed succinctly by

²Railroad Accident Reports--*Head-on Collision of Burlington Northern Railroad Freight Trains Extra 6714 and Extra 7820 East, Wiggins, Colorado, April 13, 1984 and Rear-end Collision of Burlington Northern Railroad Freight Trains Extra 7843 East and ATSF 8112 Near East Newcastle, Wyoming, April 22, 1984 (NTSB/RAR-85/04).*

Conrail's senior vice president-operations at the Safety Board's public hearing on this accident. The Safety Board understands that freight train operations are subject to fluctuations in traffic, delays in transit, and work rules, and that attempting to return to a higher level of regularly assigned work shifts would be a major undertaking. Nevertheless, as recognized by BN, the situation demands far more than a simplistic "we lived with it, they can live with it or get out" analogy.

In citing his own relatively brief experience as a young brakeman, the Conrail senior vice president failed to consider that many of his employees will have to cope with unpredictable work/rest cycles for their entire working lives, even into their 50s and 60s. The Safety Board believes that Conrail and the rest of the railroad industry need to make an in-depth assessment of what can be done to restructure their cultural approach to train operations and work/rest cycles. In the meantime, they can expand their training and counseling programs to provide sound advice to employees and their families on what constitutes good health and diet regimen, good behavior, and acceptable performance. Such programs will need the endorsement and cooperation of the operating unions, particularly the Brotherhood of Locomotive Engineers and United Transportation Union. In structuring the counseling programs, Conrail and the other railroads ought to take note of what is currently being done on the BN, the nation's largest railroad system.

The Safety Board is particularly encouraged by the initiative BN has demonstrated in providing education and counseling to its employees and their families. Particularly noteworthy, in the Safety Board's opinion, are BN's recognition of the scope of the problem, its efforts to change the traditional thinking of managers and to improve its operational format, and its willingness to undertake the pilot sleep-deprivation workshop. The Safety Board is also encouraged by the Brotherhood of Locomotive Engineers' cosponsorship and cooperation in the BN programs. Hopefully, the United Transportation Union will also support these and/or similar efforts.

The lead unit of UBT-506 was equipped with a deadman pedal that the engineer was supposed to keep depressed with his foot. If he failed to do this, a penalty brake application would be automatically initiated that would stop the train. However, the deadman pedal is an inadequate substitute for a state-of-the-art alerter that requires a recurring and relatively cognitive response from the engineer and provides an audible warning if he fails to respond. Moreover, the deadman device can easily be defeated by placing a heavy object on the pedal, a practice the Federal Railroad Administration (FRA) 1987 Conrail safety assessment reported as being widespread and not uniformly discouraged. Indeed, the engineer of UBT-506 had been cautioned against defeating the deadman device when his superior concluded that the engineer intended to do so.

After viewing a demonstration of the alerter and the automatic cab signal/automatic train stop acknowledging pedal, Dr. Tepas concluded that it was possible for the engineer to respond to the audible alerter by depressing and releasing the pedal in his sleep. Conrail, and the rail industry in general, need to modify the pedal or replace it with a sophisticated alertness device so that the action required on the part of the engineer is more cognitive than a simple reflex motor response.

Therefore, the National Transportation Safety Board recommends that the Association of American Railroads:

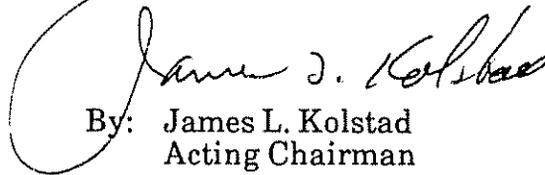
Encourage its member railroads to improve their current methods of using train crews to reduce the irregularity and unpredictability of their work/rest cycles. (Class II, Priority Action) (R-89-21)

Encourage member railroads to provide education and counseling to employees on proper health regimens and avoidance of sleep deprivation. (Class II, Priority Action) (R-89-22)

Recommend to those member railroads with locomotive cab signal systems to evaluate their cab signal acknowledging devices and redesign those that could be operated through a simple motor response by a sleeping engineer. (Class II, Priority Action) (R-89-23)

Also, as a result of its investigation, the Safety Board issued Safety Recommendations R-89-8 through -18 to the Consolidated Rail Corporation and Safety Recommendations R-89-19 and -20 to the Brotherhood of Locomotive Engineers and the United Transportation Union.

KOLSTAD, Acting Chairman, and BURNETT, LAUBER, NALL, and DICKINSON, Members, concurred in these recommendations.



By: James L. Kolstad
Acting Chairman