Log R-630A

National Transportation Safety Board

Washington, D. C. 20594

Safety Recommendation

Date: September 16, 1991

In Reply Refer To: R-91-27 through -30

Mr. Arnold B. McKinnon
President and Chief Executive Officer
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About 3:13 a.m. eastern daylight time, on August 9, 1990, northbound Norfolk Southern (NS) freight train 188 collided with southbound NS local freight train G-38 at control point DAVIS near Sugar Valley, Georgia. The conductor on train 188 and the conductor and engineer on train G-38 were fatally injured. The trainmen on both trains and the engineer on train 188 received minor injuries. Damage was estimated at $1,268,680.[1]

The National Transportation Safety Board determines that the probable cause of this accident was the failure of the engineer of train 188 to stop at the stop signal because he was asleep, distracted, or inattentive. Contributing to the accident were the failure of the conductor to monitor the engineer's performance and the failure of the brakeman and flagman to carry out their responsibilities to notify the engineer to stop the train

Work and Rest Cycle.--The engineer of train 188 normally worked at night. He usually reported for duty between 9:00 and 11:00 p.m., took a train to Chattanooga, took his required rest during the day at a motel, and then returned by train to Atlanta, where he usually arrived between 2:00 and 7:00 a.m.. On the average, he worked about 8 hours per shift and had 12 to 15 hours rest time after he returned home.

The train engineer's schedule had been reasonably consistent since July 7, and he had regularly worked 6 days a week. His habit, he said, was to go to bed after he got home, sleep through the remainder of the morning, do chores and shop in the afternoon, and try to nap before the time he expected to be called. A change had taken place in his routine, however, just before the accident. On Sunday, August 5,

[1]For more detailed information, read Railroad Accident Report--"Collision and Derailment of Norfolk Southern Train 188 with Norfolk Southern Train G-38 at Sugar Valley, Georgia, August 9, 1990" (NTSB/RAR-91/02).

he went off duty about 5:10 a.m. and he took Monday, as well as his usual day, Tuesday, off. Thus, he had reverted to a day and night routine for 3 nights after having been on his normal night-work and day-rest routine for over 3 weeks.

Sleep research has shown that shift workers never fully adapt to an irregular night shift routine.[2] Other research[3] has shown that people in general are particularly vulnerable to falling asleep between 2 and 7 a.m. and between 2 and 5 p.m. People who have slept briefly during these times are likely to suffer from diminished capacity in their functioning, and people who have not had enough sleep are likely to be particularly vulnerable to episodes of microsleep during those same periods.

Microsleep is defined as a period of sleep lasting from a few seconds to minutes from which a person awakens spontaneously. During a public hearing on a similar railroad accident, Dr. Donald Tepas, an expert on sleep loss, testified[4] before the Safety Board that the frequency and duration of such events increase with the increase in sleep deprivation. He said that the individual often is unaware of either the onset or the end of a microsleep and even may be entirely unaware that any lapse of consciousness has occurred. He may perform quite well just before and after the lapse; during the lapse, however, he will respond only to external stimuli that are very intense, very unusual, or particularly meaningful.

The decision of the engineer of train 188 to interrupt his work and rest cycle made him more susceptible to falling asleep. On the previous 3 nights, he had slept a full 8 hours or more. He had not tried to obtain additional rest before he went on duty on Wednesday night; and thus at the time of the accident, he had been awake for more than 17 hours. The need for sleep would recur again after about 15 or 16 hours of wakefulness. Furthermore, this pressure for sleep probably was increased because he had entered into the early zone (2 to 7 a.m.) of increased sleep vulnerability.

The Safety Board believes that despite the engineer's testimony to the contrary, he was already experiencing some alertness problems when the train entered the siding at CP SUGAR VALLEY. The event recorder data recovered from the leading unit shows that the engineer's performance had deteriorated; that is, he did not control his train so as to arrive at the turnout at CP SUGAR VALLEY at the proper speed. He subsequently allowed the speed to drop well below the 25 mph limit for the siding and needed to go to full throttle (position 8) to regain speed. Since a willful disregard for track speed and train handling technique was out of character for him, the Safety Board believes that he was having trouble staying awake even before he entered the siding.

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[2]Dinges, David F., "The Nature of Sleepiness: Causes, Context and Consequences"; in Baum, A., Stunkard, A. eds., Perspectives in Behavioral Medicine, New Jersey: Erlbaum, 1988.

[3]Mitler, Merrill M., et.al. "Catastrophes, Sleep, and Public Policy: Consensus Report"; in Sleep, 11(1): 100-109, Raven Press Ltd, New York, 1988.

[4]Tepas, Donald I.; in railroad accident report, "Head-end Collision of Consolidated Rail Corporation Freight Trains UBT-506 and TV-61 near Thompsontown, PA, January 14, 1988"; National Transportation Safety Board, NTSB/RAR-89/02, Washington, D.C. 20594, February 14, 1989. Government Assession No. PB89-916302.

The event recorder data showed that he reduced the throttle setting from 8 to 7 and finally to 6 in an apparent effort to maintain a speed of 25 mph as he topped the crest of the grade. An alert and proficient engineer would have brought the throttle back to the idle position at this point so that the train could coast to a stop before it reached the signal. Nevertheless, the Safety Board is not able to say definitely that the engineer fell asleep at this point, and there are other possible reasons for his inattention; however, none were apparent to the Safety Board.

The conductor, who was seated on the right side of the locomotive cab, had also worked a steady 6-day week throughout June and the first half of July, after which he went on a 2-week vacation. The majority of his trips were round trips between Atlanta and Chattanooga, and most were at night. It could not be conclusively established why he did not warn the engineer when the train did not slow down in preparation for a stop at the signal. It seems unlikely that the conductor would have consciously allowed the engineer to pass the stop signal and cause an accident. Therefore, the Safety Board believes that the conductor was either distracted or asleep.

The brakeman and the flagman, who were in the trailing unit, had work and rest cycles that were similar to those of the other two train crewmembers. The Safety Board could not conclusively determine why the trainmen did not see the home signal at CP DAVIS. Their testimony indicates that they were alert and that they were aware that they were responsible for warning the engineer or taking other action to avoid an accident if he did not stop the train in response to the signal at CP DAVIS. The Safety Board realizes that since the trainmen were in the trailing unit, it was not easy for them to see signals because their view was partially blocked by the lead unit and by the long hood of the trailing unit. Nevertheless, these trainmen were equally responsible for ensuring the safety of the train to the best of their ability.

On May 12, 1989, the Safety Board issued Safety Recommendations I-89-1 through 3 to the Secretary of the Department of Transportation (DOT) about human fatigue in transportation. The Secretary responded on August 11, 1989, citing ongoing human-factors research in the various modal administrations of DOT. The Office of the Secretary briefed the Safety Board staff on September 12, 1990. Each modal administration discussed its ongoing studies and how they would relate to the overall DOT policy.

On June 21, 1991, the Chairman of the National Transportation Safety Board addressed Congress and discussed work and rest problems and how the FRA is being hampered by antiquated railroad work laws. The Safety Board is hopeful that the FRA will soon provide guidelines to help the railroad industry reduce or eliminate accidents caused by fatigue

A number of the trains' crewmembers had hypertension, diabetes, and other medical conditions for which they were taking various prescription drugs. Although most of these prescription drugs are relatively harmless, sensitive users could develop side effects, such as headaches and dizziness. Moreover, Disulfiram may cause drowsiness. The surviving crewmembers denied experiencing any of these symptoms. However, while the side effects of individual drugs are well known, very little is known about the possible interaction of drugs when they are taken in combination, such as was done by at least one of the crewmembers.

Although the medicines taken by the crewmembers were reported by them and noted by the contract physician on the medical forms that were forwarded to the carrier after the crewmembers' physical examinations, the Safety Board is concerned that the medical condition of crewmembers and the drugs prescribed for these conditions by their private physicians were not being monitored by the carrier. As was noted previously, the NS does not require an employee to undergo a physical examination other than for vision and hearing until he turns 50. The only exception is the employee who is returning to duty after an extended absence caused by sickness or disciplinary action. Thus, serious illness and prescriptions required for such conditions by safety-sensitive personnel easily could go unnoticed by the carrier for extended periods of time. The engineer, for instance, had not been examined medically since 1985, a violation of company rules, which required a medical examination every 2 years. The Safety Board believes that the carrier's medical department should set up a system for monitoring its personnel in safety-sensitive positions for ailments that require them to take prescription drugs.

The FRA recently adopted Notice No. 1, RIN 2130-- AA 51,"Qualification For Locomotive Engineer."[5] The regulation requires that engineers be licensed and pass an examination of their hearing and visual acuity. Unfortunately, the regulation does not require engineers to have any other medical qualifications, other than that of being drug free. The Safety Board has supported requiring employees in safety-sensitive positions to periodically demonstrate minimum medical qualifications. Although individual carriers may have their own medical policies, there is no evidence that such policies are enforced, at least not at Norfolk Southern. The Safety Board believes the FRA should require standard periodic medical examinations of train crewmembers.

Carrier's Operating Rules 34 and 106.--These rules made all crewmembers, regardless of which unit they were in, responsible for observing signals and, if necessary, for stopping the train. The operating department enforcement officer had no way to determine when crewmembers were fulfilling their obligation under rules 34 and 106.

Bulletin 0-108 stated that crewmembers were instructed to transmit via radio to the engineer, the indication of each controlled signal as it came into view. The bulletin was issued in October 1990 by the Superintendent of the Georgia Division and governed only that division of the carrier. The Safety Board believes that the bulletin should be included in the carrier's operating rule book, particularly under rules 34 and 106. Its inclusion there would provide oversight for the operating department because each radio transmission on the road channel[6] could be recorded on the dispatcher's audio tapes. Safety would improve because each crewmember would be responsible for reporting controlled signal aspects to the engineer and for receiving a response from him verifying the conversation. Any crewmember who did not receive a response would be responsible for halting the

[5]Federal Register, Vol. 56, No. 118, June 18, 1991; "Qualifications for Locomotive Engineers"; Docket Mp RSOR-9, Notice No. 5, RIN 2130-AA51.

[6]Norfolk Southern uses frequency 160.950 megahertz for its road channel. On the former Southern Railway System, no dispatcher signaling is used. However, on the former Norfolk Western Railroad, dispatcher signaling is used. A modification in the radio system could be made to permit recording of all radio messages on the dispatcher's audio tape even though signaling is required to talk to the dispatcher.

train. Crewmembers in the trailing units would conduct their conversations with the engineer by radio.

Locomotive Diagnostic Computer Checking.--The dynamic braking of train 188's second unit was working intermittently. On three occasions during the trip the brakeman reset the unit's diagnostic display panel because it was reporting the following fault: "No Speed From Braking Grid Blower," meaning that the dynamic braking capability had been eliminated. The last time the display came on, the brakeman did not reset the panel. The lack of dynamic braking capability was not a cause of the accident because the train's primary brake system was working. However, the engineer, in his testimony was concerned about the inconsistency in the braking system.

According to the unit's computer, the dynamic brakes also had not functioned well on the previous trip. At the time of the accident, no one knew about the previous problem because the unit had not yet been returned to its maintenance base where the computer-stored information would have been retrieved. The Safety Board believes that the carrier should make a practice of retrieving a computer's stored information at away-from-home maintenance facilities, as well as at home maintenance facilities, to ensure that any problems the locomotive units are having will be corrected as soon as possible.

Therefore, the National Transportation Safety Board recommends that the Norfolk Southern Corporation:

> In conjunction with the operating unions, conduct an educational and counseling program designed to improve train crewmembers' knowledge of health and diet regimens and of methods of avoiding sleep deficits and sleep deprivation. (Class II, Priority Action) (R-91-27)
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> Revise the company's medical program to ensure that train crewmembers are examined periodically and monitored for ailments and the taking of associated prescription drugs. (Class II, Priority Action) (R-91-28)
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> Check the locomotive diagnostic computer "LOG" at away-from-home terminals to determine and promptly correct faults that occurred during a trip. (Class II, Priority Action) (R-91-29)
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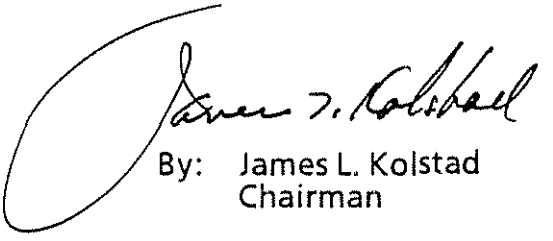
> Revise the Carrier's Operating Rules 34 and 106 to incorporate system wide the language of the Georgia Division Superintendent's Bulletin 0-108, dated October 4, 1990, which requires all crewmembers to acknowledge the indication of each control signal to the engineer. (Class II, Priority Action) (R-91-30)

Also, the Safety Board issued Safety Recommendations R-91-23 through -26 to the Federal Railroad Administration; R-91-31 to the Association of American Railroads; and R-91-32 to the Railway Progress Institute. In addition, the Safety Board reiterated Safety Recommendation R-87-16 to the Federal Railroad Administration.

The National Transportation Safety Board is an independent Federal agency with the statutory responsibility "to promote transportation safety by conducting independent accident investigations and by formulating safety improvement recommendations" (Public Law 93-633). The Safety Board is vitally interested in any action taken as a result of its safety recommendations. Therefore, it would appreciate a response from you regarding action taken or contemplated with respect to the recommendation in this letter. Please refer to Safety Recommendations R-91-27 through -30 in your reply

KOLSTAD, Chairman, COUGHLIN, Vice Chairman, and LAUBER, HART and HAMMERSCHMIDT, Members, concurred in these recommendations.



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Chairman