R-1044A

NATIONAL TRANSPORTATION SAFETY BOARD

Washington, D.C. 20594

Safety Recommendation

Date: August 17, 1993

In Reply Refer To: R-93-17

Mr. W. Graham Claytor, Jr.
Chairman and President
National Railroad Passenger Corporation
60 Massachusetts Avenue, N.E.
Washington, DC 20002

On December 17, 1991, National Railroad Passenger Corporation (Amtrak) train 87, Silver Meteor, operating on CSX Transportation Inc. track, derailed at milepost A697.6 in Palatka, Florida. Train 87 consisted of a locomotive and eight cars; the locomotive and first six cars derailed. The derailed equipment struck two homes and blocked the street north of the Palatka station. Eleven passengers sustained serious injuries and 41 received minor injuries. Five operating crewmembers and four on-board service personnel had minor injuries.[1]

In compliance with Federal Railroad Administration (FRA) regulations, postaccident blood and urine specimens were collected from the engineer, the fireman, and the three other operating crewmembers at 4:10 p.m. on December 17 (4 hours 45 minutes after the accident). A U.S. Department of Transportation-authorized laboratory analyzed the specimens for the FRA. The laboratory found no drugs in the blood and urine specimens of the fireman and three operating crewmembers. The engineer's blood specimen was negative, but codeine was reported in his urine specimen.

[1]For more detailed information, read Railroad Accident/Incident Summary Report--*Derailment of Amtrak Train 87, Silver Meteor, In Palatka, Florida, on December 17, 1991* (NTSB/RAR-93/02/SUM).

Following the FRA tests, the National Transportation Safety Board requested that the Center for Human Toxicology (CHT) also analyze portions of the specimens. Results of the CHT analysis agreed with those of the FRA analysis; the CHT also tested for additional substances in the engineer's specimen based on his reported use of various medications. The CHT analysis of the engineer's urine specimen showed the presence of codeine and its metabolite, morphine, as well as the antihistamines doxylamine, chlorpheniramine, and diphenhydramine. None of these drugs were found in the blood specimen at instrumental detection limits.[2] However, the drugs have a relatively short half-life, that is, they are eliminated rapidly from the system. The urine and blood specimens were collected about 4 hours 45 minutes after the accident, and that delay in specimen collection provided adequate time for them to fall below their measurement sensitivities.

The engineer reported that in the 4 days before the accident, he took medications for bronchitis, a chronic back condition, and sleep inducement. Each medication had the potential to cause drowsiness. The night before the accident, he took three prescribed medications: an antibiotic, an inhalant for bronchitis, and Tussi-Organidin[3] (codeine) for his cough. He also took Unisom (doxylamine), an over-the-counter nighttime sleep aid. On the morning of the accident, the engineer reported taking Tussi-Organidin and ibuprofen, as well as the antibiotic and the inhalant. He did not provide any information about the sources of the chlorpheniramine and the diphenhydramine, which are frequently found in over-the-counter cold medications.

The engineer stated in his Amtrak medical records that he had been prescribed Halcion (triazolam), a hypnotic drug used for treating insomnia. According to his medical forms, it was prescribed for a chronic back condition, and the engineer stated that he took the drug to be able to sleep when his back bothered him. He could not remember whether he had used this medication the night before the accident; if he had, he would have taken half a tablet, which is 0.125 milligram (mg). Because triazolam was not found in his blood or urine specimen, pharmacokinetic[4] calculations were done to compare the calculated values with the toxicology laboratory cut-off values, based on triazolam's instrumental detection limit of 20 nanograms/milliliters (ng/ml). Assuming the engineer took 0.125 mg of triazolam the night before the accident, his blood concentration at the accident would have been 0.057 ng/ml, and the concentration when the blood was sampled would have been 0.017 ng/ml. These values are well below the detection limit of 20 ng/ml. Similar calculations were not done for the chlorpheniramine and the diphenhydramine, since their source, dosage, and ingestion time is

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[2]The codeine and morphine detection limits were 20 nanograms/milliliters (ng/ml); the antihistamine detection limits were 50 ng/ml.

[3]A liquid prescribed for the symptomatic relief of cough associated with conditions such as chronic bronchitis or the common cold.

[4]Pharmacokinetics is the branch of pharmacology that relates to the body's absorption, distribution, and elimination of drugs.

unknown. The presence of these drugs in the engineer's urine suggests that he was also taking over-the-counter cold medications.

For the drugs reported in the toxicology tests, pharmacokinetic data were used to calculate the concentrations expected at the time of the accident and at the time of the specimen collection. These calculations assumed that the engineer metabolized the drugs at the average rate stated in the drug literature. The prescription strength, the engineer's weight, and the standard dosage were used to calculate the drug amount. Because the exact time of drug ingestion was not reported, the time was estimated. The calculations indicate that at the time of the accident, the blood concentration for codeine and for doxylamine would have been 30 and 35 ng/ml, respectively, and that at the time of the blood collection, the concentration for codeine and for doxylamine would have been 10 and 26 ng/ml, respectively. These calculated postaccident specimen concentrations for codeine and for doxylamine were below the instrumental detection limits of 20 and 50 ng/ml, respectively, which explains why they were not found in the blood specimen. The calculations suggest that if the specimen had been collected immediately after the accident, the codeine would have been detectable in the blood. In addition, the codeine concentration would have been higher when he reported for work about 9:30 a.m.

The antihistamine doxylamine reportedly has hypnotic properties and is more effective than the barbiturate secobarbital,[5] a common sedative. This hypnotic property is apparently the reason that doxylamine is used as a sleep-inducing medication. The effects of doxylamine in combination with the narcotic codeine and the antihistamines chlorpheniramine and diphenhydramine, which can also cause drowsiness, as well as the engineer's acute bronchitis, raise questions about his fitness for duty on the day of the accident. This combination of multiple drugs, although admittedly at a low level, may result in decreased alertness. While the degree is difficult to quantify, some impairment may have occurred from his drug usage and his medical condition.

The engineer may have tried to compensate for the effects of his illness and his medications by drinking coffee. Between 7:30 and 11:25 a.m. on the day of the accident, he drank four of the five to eight cups of coffee that he routinely drank each day. From his interviews and his medication usage, the engineer appears to have had a sleep disorder, which he attributed to his years of irregular work schedules. He used sedatives at night to sleep and then used caffeine during the day to remain alert. As a result of this routine, the engineer may have suffered from a lack of quality sleep that may also have adversely affected his level of alertness and attentiveness. The Safety Board concludes that a combination of prescription and over-the-counter medications, illness, and poor quality sleep perhaps reduced the engineer's attention level.

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[5]Seth K. Sharpless, "Hypnotics and Sedatives," *The Pharmacological Basis of Therapeutics*, eds. Louis S. Goodman and Alfred Gilman, 4th ed. (New York: Macmillan, 1970), p. 132.

The Safety Board is concerned about the effects of medications, used for long-term ailments or acute illnesses, on safe operating practices. Amtrak has addressed the use of medications under its personnel order 19 and operating rule G. Both rules require that an employee not report for duty under the influence of any substance, including a prescribed medication, that will adversely affect alertness, coordination, reaction, response, or safety. On December 16, 1991, the engineer had been placed on a medication that contained codeine. After the accident, the prescribing physician was asked whether she had given him instructions about his activities when he took the codeine medication. In a December 23, 1991, letter to the Amtrak medical director, the physician reported that she told the engineer not to operate any heavy machinery while taking this medication. The engineer reported that he was never given such an instruction and that the medication container, which was lost in the accident, had no warnings on it. In addition, he had not informed the medical director about his use of the prescribed codeine medication. After reviewing the FRA drug test results and consulting with the prescribing physician, the medical director stated that the engineer had used the medication in a manner not directed by his physician. The engineer's use of medications indicates that not all employees understand the potential dangers of many medications and may use them inappropriately.

Since this accident, Amtrak has provided all service personnel with a plastic wallet-sized card. A notice of employee responsibility is on one side; a notice to physicians about the use of medications that may affect employees is on the reverse side. When the card is issued, Amtrak supervisors brief employees on the importance of following its instructions. To prevent a violation of rule G, employees are to verify any questionable use of a prescription or over-the-counter medication with their personal physicians. The employees' physicians may also contact the Amtrak medical director, whose telephone number is on the card, for additional guidance. An employee is to notify his supervisor if a potentially impairing medication is taken; the medical director is then notified to determine the employee's work status. If temporarily disqualified for medical reasons due to the use of an impairing medication, the employee is not paid. Title 49 Code of Federal Regulations (CFR) 219.103 states that the medical director or physician must be informed and make a good faith judgment that the substance used by the employee is at the prescribed or authorized dosage levels.

This card directs employees to contact their physicians about any questionable use of prescription or over-the-counter medications; however, to follow this direction requires a clear understanding of what is questionable. The Safety Board concludes that Amtrak's reliance on its employees to contact a physician about questionable medication use may be beyond its employees' knowledge of what questionable means. Therefore, the Safety Board believes that Amtrak should develop and implement an educational program for employees that describes and illustrates potential consequences of medication use to enable employees to make an informed decision about the relationship between their use of prescribed and over-the-counter medications and their fitness for duty.

Therefore, the National Transportation Safety Board recommends that the National Railroad Passenger Corporation:

> Develop and implement an educational program for employees that describes and illustrates potential consequences of medication use to enable employees to make an informed decision about the relationship between their use of prescribed and over-the-counter medications and their fitness for duty. (Class II, Priority Action) (R-93-17)

Also, the Safety Board issued Safety Recommendation R-93-16 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 recommendations in this letter. Please refer to Safety Recommendation R-93-17 in your reply. If you need additional information, you may call (202) 382-6840.

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

By: Carl W. Vogt
Chairman