Log R-659

National Transportation Safety Board
Washington, D.C. 20594

Safety Recommendation

Date: DEC 15 1995

In Reply Refer To: R-95-41 through 43

Mr. Edwin L. Harper
President and Chief Executive Officer
Association of American Railroads
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About 5:21 a.m., Pacific standard time, on December 14, 1994, a westbound Atchison, Topeka and Santa Fe Railway Company (Santa Fe) intermodal train, PBHLA1-10, collided with the rear end of a standing westbound Union Pacific Railroad Company (UP) unit coal train, CUWLA-10, at milepost 61.55, near Cajon, California, on the Cajon Subdivision of the Santa Fe's San Bernardino Division. The two crewmembers from the Santa Fe train were injured when they jumped from the moving train before the collision. Two helper crewmembers on the rear of the UP train detrained before the collision because they had heard radio conversations among the Santa Fe crewmembers, the train dispatcher, and UP crewmembers. As a result of the collision, a fire broke out that burned the two UP helper locomotive units. Four Santa Fe locomotive units and three articulated five-pack double-stack container cars were also destroyed. Total estimated damages were $4,012,900.[1]

The National Transportation Safety Board determines that the probable cause of the collision was insufficient available train braking force for the Santa Fe train due to a restriction or blockage in the trainline between the third and fourth cars. The Safety Board concludes that there would have been no accident had the Santa Fe train had a two-way end-of-train (EOT) device, which offers a key advantage that a one-way EOT device does not. The two-way device allows the locomotive crew to telemetrically initiate an emergency brake application at

[1] For more information, read Railroad Accident Report--*Rear-End Collision of Atchison, Topeka and Santa Fe Railway Freight Train PBHLA1-10 and Union Pacific Railroad Freight Train CUWLA-10 near Cajon, California, December 14, 1994* (NTSB/RAR-95/04).

the end of the train. Thus the whole train can be braked, even if the trainline is blocked, as it was in this accident.

The Safety Board has a long history of advocating the use of two-way EOT devices. As a result of a runaway train near Helena, Montana, on February 2, 1989, the Safety Board recommended that the Federal Railroad Administration (FRA):

> Require the use of two-way EOT telemetry devices on all cabooseless trains for the safety of railroad operations. (R-89-82)

The FRA, which has not yet implemented the recommendation, has recognized the importance of requiring two-way EOT devices in its proposed changes to the "Power Brake Regulations." [2] The comment period for the proposed changes was extended to April 1, 1995, and the FRA has been evaluating the responses. The Safety Board believes that until a rule requiring two-way EOT devices is in effect, runaway train accidents like Cajon will continue to happen.

The amount of brake-shoe force affects the ability of the brake system to stop the car. Postaccident testing was done to determine the brake-shoe force against the wheel and to determine the consistency of force throughout the range of brake applications. When investigators barred back the brake shoes, they found that although many brake shoes were making contact with the wheel tread, they could easily be barred away. To ensure some level of braking effectiveness and adequacy, there should be a minimum standard for brake-shoe force if the braking system is to properly and efficiently perform the critical job of stopping a train. The AAR has been aware of this need for some time and has empirically developed a 100-pound minimum freight-car tread-brake-shoe force. This force serves as a benchmark from which to measure force at the brake shoe to ensure some level of braking effectiveness. The Safety Board believes the AAR should issue a national standard for minimum brake-shoe forces before 1996.

Safety Board investigators also examined whether the Santa Fe engineer's use of the regulating valve in feed-valve braking caused or contributed to the accident. (Train brake applications are normally made using the automatic brake-valve handle rather than the regulating valve.) Postaccident interviews of Santa Fe operating personnel by Safety Board investigators established that feed-valve braking became a practice in Santa Fe mountain territory in order to compensate for a brake system leakage problem. A frequently occurring leak in the control stand between the equalizing reservoir and associated piping, such as the equalizing gage, can cause brakes to gradually and continually apply beyond the set brake application. Under such circumstances, brake-pipe reductions continue past a set reduction by the automatic brake handle until dropping brake-pipe pressure causes the train to bog down and stop, rather than just slow down.

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[2] *Federal Register*, Vol. 59, No. 179, Friday, September 16, 1994, "Proposed Rules," page 47678.

This phenomenon is more likely in mountainous areas where brakes are likely to be applied for an hour or more. Other railroads and the AAR agree that the problem is more frequent on railroads with a greater number of extended grades. To cope with the problem, Santa Fe engineers in mountain-grade territory adopted feed-valve braking, or the use of the regulating valve, as standard operating procedure.

However, the regulating valve is intended to set the operating brake-pipe pressure; it is not intended to be used to apply or release the brakes. That is the function of the automatic brake-valve handle. Feed-valve braking was allowed under Santa Fe train handling rule 537, but only as an implied exception to normal braking procedures under certain circumstances. Rule 537, *Regulating Valve Braking*, reads:

> Use of the regulating valve to brake a train is not permitted if the brake-pipe pressure maintaining feature is operative, or on 26 brake equipment the brake valve will maintain in the IN FRT or PASS position.

Since a leak between the equalizing reservoir and the associated piping prevents the maintaining feature from maintaining pressure, engineers and first-line supervisors felt free under the rule to use the regulating valve to brake the train. The Santa Fe director of operating practices, who was responsible for training crews, and the managers of train operations (road foremen) explained that over a number of years, the exception had become a train handling norm in mountain-grade territory and was condoned and taught by first-line supervisors, although many upper level managers, including superintendents, were unaware of the practice. The "tradition" was passed from older to younger engineers and, thus, to first-line supervisors, who are often promoted engineers.

According to Westinghouse Air Brake Company (WABCO), feed-valve braking is not condoned or warranted and is a misuse of a device designed for other purposes. WABCO inserted the following warning on page 17 of its booklet *26-L Locomotive Air Brake Equipment and Devices*, #5071-6, dated January 1988:

> The regulating-valve adjustment screw MUST NOT BE turned once the brake-pipe pressure has leveled off and the brake-pipe leakage test is completed. Any movement of the regulating-valve adjustment screw immediately before the departure of the train and/or while the train is in motion WILL CAUSE unpredictable variation in brake-pipe air pressure and unpredictable degradation of brake-cylinder pressure. Such erratic changes in brake-pipe pressure and/or brake-cylinder pressure could result in a less effective train retardation with possible damage to equipment and/or injury to personnel or by-standers.

WABCO has also stated:

> WARNING: An initial "minimum reduction" of less than 5 psi will probably result in undesired pressure waves in the brake pipe which could cause the

train brakes to release. Unintentional brake release may result in equipment damage and/or personal injury and therefore such reduction must not be made.

At the time of the accident, 75 percent of Santa Fe locomotives were equipped with cut-off valves having a passenger, "PASS," position, which is designed for graduated release on passenger trains. Such a position allows engineers to bypass the leak problem described above, but when used on freight trains, has its own inherent danger. If, during a brake application with the cut-out valve in the PASS position, the automatic brake-valve handle is moved, bumped, or vibrates back toward release, all the train's brakes will release, whether desired or not. This situation, if not carefully monitored, can result in an inadvertent release of a train's brakes. Therefore, the Santa Fe had prohibited the use of the PASS position before the Cajon accident. However, several western railroads use the PASS position on locomotives so equipped rather than use feed-valve braking to compensate for leaks at the equalizing reservoir.

The Safety Board believes both feed-valve braking and the use of the PASS position on freight trains are inherently dangerous because they can result in the inadvertent release of the brakes. Air brake manufacturers have identified both feed-valve braking and use of the PASS position on freight trains as hazardous and as an abrogation of the safe design of the air brake system. The Safety Board believes the difference between air brake practice and design should be reconciled. The Safety Board also believes that the remedial use of feed-valve braking and the PASS position is not unique to the Santa Fe, but is common on many other railroads. Therefore, the Safety Board urges the AAR, in cooperation with the air brake manufacturers, to assess the current methods of braking in mountainous territory and to identify safe braking methods for handling a train on an extended downhill grade. In addition, the Safety Board believes the AAR should inform its members that feed-valve braking and any other braking method deemed hazardous should not be used to control trains that are descending mountains.

The National Transportation Safety Board therefore issues the following recommendation to the Association of American Railroads:

> Pending the adoption of a formal rule by the Federal Railroad Administration, recommend the use of two-way end-of-train telemetry devices on all cabooseless trains by March 31, 1996. (Class II, Priority Action) (R-95-41)
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> Expedite the issuance of national standards for minimum freight-car tread-brake shoe force before 1996. (Class II, Priority Action) (R-95-42)
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> In cooperation with the air brake manufacturers, assess the current methods of braking in mountain-grade territory and identify safe braking methods for trains descending extended grades, and inform your membership that feed-valve braking and any other braking method found hazardous should not be condoned as an alternative method of controlling a train that is descending an extended grade. (Class II, Priority Action) (R-95-43)

Also, the Safety Board issued Safety Recommendation R-95-44 to the Federal Railroad Administration, Safety Recommendation R-95-47 to the American Short Line Railroad Association, and Safety Recommendation R-95-48 to all Class 1 railroads.

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 Recommendations R-95-41 through 43 in your reply. If you need additional information, you may call (202) 382-6840.

Chairman HALL, Vice Chairman FRANCIS, and Members HAMMERSCHMIDT and GOGLIA concurred in these recommendations.

By: Jim Hall
Chairman