

R-643A

## NATIONAL TRANSPORTATION SAFETY BOARD

Washington, D.C. 20594



### Safety Recommendation

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**Date:** July 29, 1993

**In Reply Refer To:** R-93-11 and -12

Mr. S. Mark Lindsey  
Acting Administrator  
Federal Railroad Administration  
ROA-1  
400 7th Street, S.W.  
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On August 30, 1991, the eastbound Burlington Northern Railroad (BN) freight train 602 departed Shelby, Montana, heading south. Westbound BN freight train 603 departed Great Falls, Montana, proceeding north. Both trains were routed over BN unsignaled single track line between Shelby and Great Falls. A branch line dispatcher in Seattle, Washington, controlled the trains' movements by issuing track warrants (TWs) through a computerized track warrant control system.

At 5:50 p.m. mountain daylight time at milepost 85.55 north of Ledger, Montana, the two trains collided head on at a closing speed of 87 mph. After impact, fire ensued from spilled locomotive diesel fuel, burning locomotive units, two freight cars, and grass. Nine locomotive units and 22 cars were destroyed; 9 cars were damaged. Track damage, equipment replacement, and clean-up costs were estimated at \$19 million. Three crewmen were killed, and four were severely injured.<sup>1</sup>

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<sup>1</sup>For more detailed information, read Railroad Accident Report—*Head-on Collision Between Burlington Northern Railroad Freight Trains 602 and 603 Near Ledger, Montana, on August 30, 1991* (NTSB/RAR-93/01).

Proper radio procedure is vital to clear, concise communication and is particularly important in regulating train movement. Consequently, 49 Code of Federal Regulations Part 220 is very specific about radio train order transmission, and the Federal Railroad Administration (FRA) monitors railroad radio procedure. The radio procedure of the first-shift dispatcher and the train 603 crew was poor. The BN dispatcher training manager had counted 15 radio procedure errors in the transcript of the TW 8851 radio transmission. After listening to taped dispatcher/crew radio conversations, investigators found that procedural errors were typical of TW transmissions. Had the dispatcher given an "over" or a "wait out" at the start of the 9-second destination pause, the conductor may have recognized that the destination had not yet been given, and the collision may have been avoided.

The BN Seattle chief dispatcher was asked if he believed proper radio procedure was being followed and replied, "I know that in the past, we, as a company, have addressed that issue and it's getting better than it was. I believe there's room for improvement." However, BN neither offered any examples nor presented any testimony that the poor radio procedure practice was corrected. Although the poor procedure was acknowledged by BN management, no plans were made to change it. In a formal radio procedure to control train movement, such as a TW, 15 errors appear to be excessive. After reviewing other TWs, the National Transportation Safety Board investigators found that such procedural errors were common. Even after the FRA *National Train Dispatcher Safety Assessment 1987-88*, BN management failed to take any steps through a formal or informal plan to improve radio procedure. Although no evidence indicated that BN encouraged poor procedure, such procedure was tolerated by being ignored.

The FRA dispatcher assessment states:

During the assessment, FRA inspectors noted that the radio procedures used by dispatchers were generally average while those of employees conversing on the radio with the dispatcher were generally poor. Notable by their absence were the insistence by dispatchers that employees initiating a transmission properly identify themselves (occupation and station) before continuing with a transmission and the use of the applicable words "over" or "out" when ending a transmission.

The FRA recommended:

The BN should immediately implement a program to teach and enforce radio procedures by the dispatchers so that they will comply with all applicable federal and carrier radio rules.

Although the FRA recognized that BN had radio procedure problems 3 years before the accident and had so notified BN, it appears that neither the FRA nor BN did anything to significantly improve the situation through stricter regulation enforcement or education. Neither the FRA nor BN could produce any follow-up correspondence or documentation to indicate that corrective action or improvements were made or intended. The Safety Board concludes that the

poor radio procedure practices of the first-shift dispatcher and the train 603 crew were not isolated events. Such practices were known to exist by BN management and fostered an environment in which the misunderstanding of the TW 8851 authority limit occurred. Therefore, the Safety Board believes that BN should implement a program to teach and enforce proper radio procedures for dispatchers and train crews so that compliance with applicable Federal and railroad rules will be accomplished.

The Safety Board understands that when the FRA conducts a special railroad evaluation, the carrier and the FRA reach a mutual agreement. The carrier remains open and willing to facilitate an accurate FRA evaluation in lieu of being cited for any carrier violations uncovered during the assessment process. While such an informal agreement may facilitate the FRA assessment, it does not foster public or railroad safety if the findings are not pursued to closure. The Safety Board concludes that had either the FRA or BN adequately followed up the concerns and recommendations about radio procedures from the dispatcher safety assessment, this accident may not have occurred. Therefore, the Safety Board believes that the FRA should follow up on the concerns and recommendations made to railroads in FRA safety assessments and request a response to provide closure on the safety problems uncovered.

The principle of safely and successfully operating more than one train on a given railroad segment is predicated on the establishment of a system that will keep trains separated. A system to ensure positive train separation has for many years been a Safety Board concern and has always been on its "Most Wanted List." With either an Advanced Railroad Electronics System (ARES) or an Advanced Train Control System (ATCS) in effect, the TW would have appeared on a cab mounted screen, and a fully implemented system would have automatically limited train 603 from advancing beyond Ledger. Therefore, the Safety Board concludes that had an ATCS been installed and working in the accident area, the accident probably would have been prevented.

After its investigation of a train accident at Sugar Valley, Georgia,<sup>2</sup> the Safety Board issued recommendations to the FRA (R-91-25), to the Association of American Railroads (AAR) (R-91-31), and to the Railway Progress Institute (RPI) (R-91-32). It recommended that in conjunction with each other, they expand the effort being made to develop and install ATCS for the purpose of positive train separation.

In December 1991, the AAR president stated that the AAR and its member railroads actively support the ATCS design and development and that in the past year, significant progress had been made refining the system logic and control flow specifications, which would improve the ATCS capability to perform the intended train control application. He added that the AAR and the RPI are working closely with the FRA to ensure that all concerns are addressed as the

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<sup>2</sup>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).

system logic is further developed and refined. Safety Recommendations R-91-25, -31, and -32 have been classified "Open--Acceptable Response."

AAR member railroads have been testing components of ATCS since 1991. The National Railroad Passenger Corporation (Amtrak), for example, has installed transponders at selected locations on the Northeast Corridor that have the ability to slow trains (using the current cab signal system) for permanent speed restrictions. Amtrak plans to update the signal system on the Northeast Corridor to include nine speed commands up to 150 mph. The application of onboard computers to Northeast Corridor locomotives may eventually provide true positive train separation. The AAR, however, has yet to demonstrate a fully implemented ATCS that provides positive train separation. Although the activities of Amtrak and other AAR member railroads in developing and testing ATCS components are laudable, the Safety Board concludes that the development of a practical positive train separation system has not progressed as quickly as it should have.

Until 1992, BN had ARES, a working positive train separation system. The Safety Board was greatly disappointed when BN abandoned ARES. The ARES approach for wayside, locomotive, and dispatcher control was very similar to the AAR-proposed ATCS; however, ARES used continuous Global Positioning Satellite system signals instead of in-track transponders. Through these signals, an onboard computer calculated the specific location of the train, which was transmitted by very high frequency 160 megahertz data radio to a central office. Based on Rockwell International receivers, train locations could be determined within a 150-foot accuracy.

Whether ARES or ATCS, a fully implemented positive train separation system will supply *information to the dispatcher's computer monitor to indicate whether the engineer has train control*. If the engineer fails to adhere to a speed restriction or to obey a signal, the locomotive computer can stop the train.

The Safety Board is greatly interested in systems such as ARES and ATCS and knows that system technology exists because its staff had the opportunity to see the ARES demonstration program. However, the only active program, the ATCS project, is limited to work order reporting, track warrants, and installation of ultrahigh frequency radio systems. These activities have no bearing on positive train separation or its benefits. More emphasis should be placed on positive train separation, particularly since FRA records indicate that from 1987 through 1991, 1,483 head-end, rear-end, and side collisions have occurred.

ARES made a lasting impression on many carriers in the railroad industry. Amtrak requested that ARES be installed on BN track where Amtrak passenger trains operate. Amtrak also requested that ARES be installed on its own track between Porter, Indiana, and Kalamazoo, Michigan. BN indicated that the area in the Ledger accident, the 4th Subdivision, would have been included if ARES had been adopted. The advanced, field tested and demonstrated ARES technology has been abandoned in favor of ATCS, which has not been field proven.

The Safety Board believes that the FRA, in conjunction with the AAR and the RPI, should establish a firm timetable that includes, at a minimum, dates for final development of required ATCS hardware, dates for implementation of a fully developed ATCS, and a commitment to a date for having the ATCS ready for installation on the general railroad system.


Therefore, the National Transportation Safety Board recommends that the Federal Railroad Administration:

Follow up on the concerns and recommendations made to railroads in your safety assessments and request a response to provide closure on the safety problems uncovered. (Class II, Priority Action) (R-93-11)

In conjunction with the Association of American Railroads and the Railway Progress Institute, establish a firm timetable that includes, at a minimum, dates for final development of required Advanced Train Control System hardware, dates for implementation of a fully developed Advanced Train Control System, and a commitment to a date for having the Advanced Train Control System ready for installation on the general railroad system. (Class II, Priority Action) (R-93-12)

Also, the Safety Board issued Safety Recommendations R-93-5 through -10 to the Burlington Northern Railroad, R-93-13 and -14 to the Association of American Railroads, and R-93-15 to the Railway Progress Institute. 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