National Transportation Safety Board

Washington, D.C. 20594

Safety Recommendation log B-630

Date: February 12, 1990

In reply refer to: R-89-68
through R-89-77

Mr. William H. Brodsky
President
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About 4:30 a.m. mountain standard time on February 2, 1989, freight cars from Montana Rail Link Inc. (MRL) westbound train 1-121-28 (train 121) rolled eastward down a mountain grade and struck a stopped helper locomotive consist, Helper 1, in Helena, Montana. The locomotive consist of train 121 included three helper units (Helper 2) and three road units positioned at the head end of a 49-car train. The crewmembers of train 121 had uncoupled the locomotive units from the train to rearrange the locomotive consist while stopped on a mountain grade. In the collision and derailment, 15 cars from train 121 derailed, including 3 tank cars containing hydrogen peroxide, isopropyl alcohol, and acetone. Hazardous material released in the accident later resulted in a fire and explosions. About 3,500 residents of Helena were evacuated. Two crewmembers of Helper 1 were only slightly injured. The estimated damage (including clean-up and lading) as a result of this accident exceeded $6 million.[1]

The National Transportation Safety Board determined that the probable cause of this accident was the failure of the crew of train 1-121-28 to properly secure their train by placing the train brakes in emergency and applying hand brakes when it was left standing unattended on a mountain grade. Contributing to the accident was the decision of the engineer of Helper 2 to rearrange the locomotive consist and leave the train unattended on the mountain grade, and the effects of the extreme cold weather on the airbrake system of the train and the crewmembers. Also contributing was the failure of the operating management of the Montana Rail Link to adequately

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[1] For more detailed information, read Railroad Accident Report--"Collision and Derailment of Montana Rail Link Freight Train with Locomotive Units, and Hazardous Materials Release at Helena, Montana, February 2, 1989." (NTSB/RAR-89/05)

assess the qualifications and training of employees placed in train service. Contributing to the severity of the accident was the release and ignition of hazardous materials.

Train 1-121-28 had the required initial terminal road train airbrake test before departing Laurel to determine train line leakage. The MRL Train Activity/Delay Report dated February 1, 1989, showed that the failure of the 64-car train to pass the air test was "due to cold." To pass the required airbrake test, a block of 16 cars was removed from the train as interchanged from the BN. The engineer stated that the train line leakage after a second air test (following the removal of the 16 cars) was 4 psi/min (49 CFR 232.12 requires 5 psi/min or less train line leakage). However, the relief engineer stated that he had taken exception to the train line pressure between Townsend and Helena, and told the Helper 2 engineer and Helena yard office "...the fact that the air flow indicator was at 14...." Although the helper engineer was made aware of the train line pressure concerns of the relief crew engineer, he did not take any action nor were there any instructions that required him to do so.

In accordance with MRL operating practices for mountain grade territory, the Helper 2 engineer increased the feed valve setting increasing train line pressure from 80 psi to 90 psi prior to departing Helena. This had the effect of increasing the air flow and thus the leakage rate. However, leakage tests were not required and none were performed. At intermediate terminals such as Helena, when the train consist is not changed, Federal regulations[2] only require that the train line be charged to within 15 psi of the feed valve setting on the locomotive. After making a 20-psi automatic brake reduction and release, it must be determined that the brakes on the rear car apply and release. Crews of trains with an EOT telemetry device must make the same 20-psi automatic brake reduction and release, but they only need to determine that the train line pressure reduces and then is being restored; they do not need to check the rear car to determine that its brakes have applied and released. Neither the Federal regulations nor the MRL operating practices require additional airbrake testing or provide specific procedures such as more stringent leakage requirements, increased frequency of airbrake testing, or diagnostic devices for airflow, when extreme cold weather conditions exist, even in mountain grade territory or when the feed valve setting has been increased. The Safety Board believes that had there been requirements to perform leakage tests in extreme cold weather, the outbound crew would have done so while train 1-121-28 was at Helena and the high air flow reported by the inbound engineer might have been verified providing an opportunity for a decision to either correct the cause of the high air flow or not operate train 1-121-28.

Because train 121 was operating between Helena Jct. and Phosphate en route to Missoula over BN trackage, the BN rules applied. Although both BN and MRL use the same operating and airbrake rules, during testimony it was

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[2] Road Train and Intermediate Terminal Train Air Brake Tests, 49 CFR 232.13.

clear that BN and MRL operating officers differed in their interpretation of these rules as they applied to an unattended train and the need for hand brakes by MRL crewmembers at Austin. The Safety Board recognizes that it is an accepted practice in the railroad industry for each railroad to interpret the rules on their property; however, when the interpretations are not the same, management must take steps to make certain that train crews operate in accordance with the interpretation of the rules as they apply for that property -- in this case the BN's interpretation.

An FRA regulation (49 CFR 232.13(f)) provides the basis for some of the pertinent operating rules used by both BN and MRL for the use of airbrakes and hand brakes on trains left standing on a grade. This regulation does not make an exception for a locomotive being attached or detached from the cars or train. As such, the MRL's interpretation of "unattended" and the requirement for applying hand brakes, as specified by rules 100 and 103 (L) of the General Code of Operating Rules and rule 470 of the BN Air Brake, Mechanical, and Train Handling Rules, is incorrect and may have resulted in train 121's crewmembers believing that they were complying with the rules. The Safety Board believes that the MRL should revise its interpretation and provide training on the rules requiring the use of hand brakes and assure that all operating employees know the proper interpretation and application of the rules.

The MRL's operating agreement provides for an engineer, assistant engineer, and utility operating employee (UOE) to be responsible for the duties traditionally associated with an engineer, brakeman, and conductor. Generally, in the traditional arrangement, the conductor is responsible for the general direction and government of the train. The MRL's operating agreement, however, does not delineate specific responsibilities to crewmembers.

The Safety Board believes that had a discussion taken place prior to rearranging the locomotive the accident may have been avoided. The helper engineer could have made known the information he received from the relief engineer regarding the concern for train line pressure, and the crew could have discussed other available options such as rotating engineers in the unheated cab to continue on to Elliston, or moving only one of the road units to the head end of the train. The crew could have also discussed the consequences of leaving the train standing on a 2.2 percent mountain grade in extreme cold weather conditions and the effect of exposure to the weather conditions on the crewmembers having to set hand brakes.

No written policy exists to define which engineer has the decisionmaking responsibility when helper units are positioned on the head end of a train. The MRL superintendent indicated that the road engineer was in charge; however, he believed that in practice decisions are made by mutual agreement. The superintendent believed that if a confrontation developed and it became necessary to determine who was in charge, the engineers would contact a supervisor for an interpretation; however, the engineers of train 121 did not contact a supervisor. The conduct of the crewmembers on train

121 on February 2, 1989, demonstrated that with multiple engineers it can be unclear where the authority and responsibility lies. The Safety Board believes that to improve crew coordination and to provide for resolution of conflict, MRL needs to develop and implement instructions clearly designating crewmembers' responsibilities and defining the role of engineers when helper locomotives are positioned on the head end of a train.

MRL does not equip its helper locomotives with receivers for EOT devices; therefore, the Helper 2 engineer, although at the head end of train 121 and in control of the train, had to rely on receiving EOT telemetry information by radio from the road engineer. This arrangement is not practical as it requires the road engineer to constantly monitor the EOT telemetry receiver and to radio the helper engineer of any changes displayed. However, once the road engineer had radioed the helper engineer that their train had cleared the Benton Avenue crossover, he provided no further information from the EOT telemetry display to the helper engineer. The road engineer did not inform the helper engineer that the EOT display had not changed when the automatic airbrake application was made at Austin. Had this information been radioed to the helper engineer, he might have suspected that there had either been a radio break or that there was a train line blockage and that all of the brakes may not have applied. Knowing this, the helper engineer could have decided that it was a dangerous risk to disconnect the locomotives from the train and rearrange the locomotive consist. The Safety Board believes that MRL should equip all helper locomotives operating at the head end of a train with an EOT telemetry receiver.

The weather conditions that existed in the 48-hour period prior to the accident were extreme. On January 31, 1989, a severe cold front passed through Helena resulting in a 72^{0} F temperature drop, from a high of 45^{0} F early that morning to -27^{0} F on February 2, about 0430, the time of the accident. Similar temperature drops were experienced in Missoula, the home terminal of the road crew of train 121, and in Laurel, the interchange point where MRL received train 121 from the BN. The temperatures were unusually cold for the area as the normal temperatures for that time of the year are usually 35 to 40 degrees higher.

The MRL operates locomotives with either electric or warm water heaters. Both were considered by mechanical personnel to be adequate for heating locomotive cab compartments in cold weather if they operate optimally. MRL mechanical personnel have tried to minimize the inoperative or insufficient heater capacity problems by arranging the locomotive consist such that there are at least two units with operable heaters, the leading and last unit. MRL has also started a program to replace the warm water heaters with electric heaters much like the replacement performed on the lead unit of Helper 2, MRL 208, and to install auxiliary electric side wall heaters.

During MRL's first two winters of operation, the Helena mechanical supervisor received increasing complaints about cab heaters and he had some difficulty providing adequate functional cab heaters in all helper locomotives. This was primarily a result of malfunctions occurring in older

locomotives and insufficient heater capacity. Also, a colder winter may have contributed to the increase in complaints.

Air leakage into the cab compartment of a moving locomotive counteracts the output of each heater. Crewmembers will attempt to stop the leakage with towels or rags. Often when train crews complain about malfunctioning cab heaters, maintenance personnel will check the cab heaters while the locomotive is stationary and determine that the cab heater is functional. Investigators determined that the second and third units of Helper 2 may have fit that category. Nevertheless, the cab heater in the lead unit of Helper 2 did fail to operate as a result of an electrical malfunction.

An electrical overload caused by the operation of the cab heaters in MRL 208 resulted in the shutdown of the power for the lead helper unit. This occurred because the 10 KW auxiliary generator supplied power to the electric heaters from the load side of the generator fuse. The electrical requirements for the two electric heaters, 45 amp with a 50-amp circuit breaker, should have been adequate, but a negative low voltage ground caused the circuit to "open" resulting in the control circuit breaker, fuel pump circuit breaker, and the 15-amp turbo lube pump circuit breaker to "open" causing the unit's motive power to shutdown. The electrical requirements of two 3,000 watt main electric heaters combined with the electrical requirements for normal support circuits, lights, excitation, electrical control, and electric side wall heaters place the 10 KW auxiliary generator at its supply limit.

The extreme cold weather required the helper crew to operate the cab heaters at their maximum rating to maintain comfort in the operating cab. Because of the inadequacy of the heaters, and the resultant electrical problem, the lead helper unit's motive power shut down and the helper engineer, who had been complaining about inadequate cab heater operations, made the decision to rearrange the locomotive units. Had these events not occurred, there would not have been an accident.

The Safety Board believes that the replacement of warm water heaters with electric heaters and the installation of side wall heaters in locomotive units with only 10 KW auxiliary generators should be given extra consideration to make certain that the auxiliary generator has the capacity to meet the electrical requirements. Furthermore, MRL should expedite its program to upgrade existing cab heaters and seal the cab compartment to reduce air leakage.

The extreme cold weather conditions had the greatest effect on the road crew of train 121. The crewmembers had left Missoula, their home terminal, on January 31, 1989, before the temperatures dropped significantly due to the severe cold weather front. When they left Missoula, the temperature was about 25^{o}F and the crewmembers had dressed in accordance with the temperatures at the time. When the crewmembers departed Helena on February 2, the temperature was -27^{o} F with a wind chill of -70^{o} F. Such extreme

conditions can place humans in danger from the possibility of freezing exposed flesh and thus have an effect on the decisions they make in performing their duties. The MRL does not provide its employees with winter apparel even when conditions become extreme as they were in this accident. Some railroads have addressed the cold weather operating conditions by offering to participate with special programs that make suitable winter apparel available at the employees option.

There are few general guidelines in the MRL safety rule book that address proper clothing and none deal with appropriate cold weather attire. The Safety Board believes that MRL should provide information to all employees on the potential dangers of cold weather and on the proper selection of appropriate clothing.

Both BN and MRL operating officers conducted efficiency tests of MRL train crews operating between Helen Jct. and Phosphate. MRL records showed that no efficiency tests were performed on either the engineer or the UOE of Helper 2 during the 6-month testing period prior to the accident; however, the engineer had been a trainmaster during the first 3 months of the testing period and was not subject to efficiency testing. The engineer, assistant engineer, and UOE of the road power had each been individually tested on at least three occasions during this period, but only the engineer had been tested on the airbrake rules from the group "B" category for rules 219 through 224. Further, the road power UOE was working as an engineer when the efficiency tests were made on him, but he had not been tested on any airbrake rules.

Since the beginning of MRL's operation in 1987, BN operating officers conducted only 13 efficiency tests of MRL train crews operating between Helena Jct. and Phosphate over BN trackage, or less than one test per month. Such infrequent testing cannot result in any meaningful evaluation of rules compliance by operating personnel. The Safety Board believes that the BN and MRL need to establish and implement procedures to improve their testing for rules compliance when MRL train crews are operating over BN trackage.

Neither of the engineers of train 121 initially received any training from MRL for train operations when they entered train service, except for an engineer instructional up-date class in 1988. However, the employment criteria when MRL operations began in 1987 included previous experience on a Class 1 railroad; statements by MRL officers indicated that MRL assumed all engineers had already acquired the necessary operating skills and knowledge. The employment criteria also accepted prior qualification on the General Code of Operating Rules from a former railroad. It was not until March of 1988 that the MRL began testing its operating employees on the General Code of Operating Rules; however, employees, such as the road locomotive UOE who began service after that date, were not tested.

The MRL accepted the UOE's resume for his qualifications on the General Code of Operating Rules in 1987 and for an engineer while with the Washington

Central Railroad and for his experience as an engineer on the Alaska Railroad and Milwaukee Railroad. The MRL did so without verifying his qualifications. There was no record that the UOE received any training from the MRL. The Safety Board is concerned that the MRL hiring criteria was an expedient measure for the start-up of operations and appears to have been used to substitute for a comprehensive operating employee training program.

The Safety Board has similar concerns with the MRL adoption of the BN Air Brake, Mechanical, and Train Handling Rule Book. There is no evidence to suggest that the rules are inappropriate for the present MRL operation, given that BN had operated the same trackage at an earlier time. Because of the adoption of these rules and the hiring of former BN employees as well as employees formerly with other class I carriers, MRL apparently must have concluded that orientation on these rules was unnecessary. However, MRL employees who had previously worked for BN may not have had consistent interpretations of the BN rules. Likewise, employees that worked for other Class I railroads may or may not have used the General Code of Operating Rules and would only be familiar with the rules interpretation of their former employer. Rules interpretation and their application may differ from railroad to railroad or even division to division on the same railroad, and only training, operating experience, or both can produce uniformity. The Safety Board believes that the MRL must ensure through requalification and training programs that rules interpretations are disseminated and internalized systemwide so that employees have a clear understanding of the application of rules and procedures.

Under Federal regulations a carrier is not to accept a non-complying shipment (for example a shipment not packaged or labeled in accordance with the regulations) of hazardous material for transportation and is required to check the shipping papers and placards at interchange for accuracy. Because train crews are responsible for the placement and location of hazardous material cars within the train, they must check the product identification number on the DOT placard against that on the waybill to carry out their duties. If this had been done at Laurel, it would have been noted that the waybill for UTLX 820 was not consistent with the placards on the tank car and this conflict could have been corrected.

Because these cars were not of immediate concern, the lack of a waybill for ACDX 816007 and the inaccurate data on the waybill for ATSF 621566 did not become an issue in the emergency. Emergency response actions taken because of the isopropyl alcohol in UTLX 820 were also appropriate for the acetone since both are flammable liquids. Therefore, the fact that the waybill for UTLX 820 did not indicate the tank car contained acetone was not sufficient to lead the fire department to take inappropriate response measures, but may have lead firefighters to falsely believe that the tank car released its entire lading. Since the waybills are also used to generate the consist, any errors in the waybills will be carried over to the consist as was the case in this accident. The accuracy of the consist was further compromised by the failure to list the first car behind the locomotive.

The missing and inaccurate waybills and consist did not directly affect the ability of the fire department to identify those cars and commodities involved in the derailment and fire. However, inaccurate or the lack of sufficient information can be of critical importance, particularly if the faulty information relates to cars directly involved in the accident.

The MRL superintendent stated that as far as he was aware inaccurate waybills received from other carriers are an infrequent occurrence. However, he also stated that the inaccurate waybills for UTLX 820 and ATSF 621566 were discovered only because of the accident. It is apparent that there is no system by which such errors would be detected without an accident. This suggests that MRL has no means to determine the magnitude of the problem. The accuracy of a waybill depends on the accuracy and completeness of the information provided by a shipper and the attention of the originating carrier to properly enter this information on the waybill. Although the MRL officials stated that they had discussed inaccurate waybill information for hazardous materials cars with the AAR and the BN, the problem still persists. Without making a systematic periodic effort to verify the accuracy of waybills received from other carriers or shippers, there is little opportunity to know how prevalent the problem may be. Had this accident not occurred, the MRL would have never known about the inaccurate waybills. Inaccurate waybills or the lack of sufficient information can be of critical importance, particularly if the information relates to cars directly involved in an accident. The Safety Board believes that BN and MRL need to develop and implement procedures to verify the accuracy and completeness of hazardous material shipping documentation for cars received at interchange from other carriers or shippers.

The initial notice from MRL was made to the HPD dispatcher about 0431 by the yard clerk. Although the clerk did not request assistance at that time, he said he would call back if there was anything else to report. During this period, the HPD dispatcher did not advise the HFD or request the assistance of the HPD or HFD to investigate the accident. Following the explosion the MRL yard clerk could not contact the HPD dispatcher. The yard clerk and the assistant trainmaster then drove to the HPD headquarters; however, they could not get in to see the dispatcher. This delay resulted in the loss of time and hampered the emergency response personnel. About 5 to 15 minutes before the explosion occurred, the HPD dispatcher received two "complaints" of a "small accident" at the railroad's Benton Avenue crossing. Still the HPD dispatcher did not dispatch personnel to investigate the accident. Primarily due to the disruption of the radio and telephone communications in Helena, local safety officials were not advised by MRL of the hazardous materials involvement in the derailment until after 0500, 30 minutes following the derailment, when another yard office clerk called the HPD dispatcher and requested that someone come to the yard office to pick up hazardous materials information.

Although MRL did not initially request assistance, the HPD dispatcher should have dispatched the HPD to investigate the situation to determine if the city needed to be involved. The Safety Board believes that the City of Helena and MRL should cooperate to develop specific instructions and

procedures for responding to reports of railroad accidents. At a minimum, these procedures should address the initial notification, the actions to take when responding to a release of hazardous materials, the identification of key contact personnel, the need for emergency drills, and the identification of resources and actions to be taken by railroad personnel and the city.

Therefore, the National Transportation Safety Board recommends that the Montana Rail Link, Inc.:

Develop and implement additional airbrake testing and specific operating procedures for train crews when they are operating trains during extreme cold weather conditions. (Class II, Priority Action) (R-89-68)

Provide training on rules requiring the use of hand brakes to all operating employees. (Class II, Priority Action) (R-89-69)

Develop and implement instructions clearly identifying the engineer in charge when helper locomotives are positioned on the head end of a train and the role of other crewmembers in the decisionmaking process. (Class II, Priority Action) (R-89-70)

Equip all helper locomotives operating at the head end of a train with an end-of-train receiving device. (Class II, Priority Action) (R-89-71)

Expedite the program to upgrade existing cab heaters with an adequate power supply and seal the locomotive cab compartment to reduce air leakage. (Class II, Priority Action) (R-89-72)

Provide information on the potential dangers of cold weather and the proper selection of appropriate clothing to all employees. (Class II, Priority Action) (R-89-73)

Improve the efficiency testing procedures and provide training on Burington Northern (BN) operating rules for Montana Rail Link train crews when operating over BN trackage. (Class II, Priority Action) (R-89-74)

Establish and implement a program to requalify and train all operating employees on the operating rules, airbrake, and train handling procedures. (Class II, Priority Action) (R-89-75)

Develop and implement procedures to verify the accuracy and completeness of hazardous material shipping documentation for cars received at interchange from other carriers or shippers. (Class II, Priority Action) (R-89-76)

Cooperate with the City of Helena in developing specific instructions and procedures for responding to reports of rail accidents. (Class II, Priority Action) (R-89-77)

Also as a result of its investigation of this accident, the Safety Board issued Safety Recommendations R-89-78 and R-89-79 to Burlington Northern Railroad Company, R-89-80 to the Secretary of the U.S. Department of Transportation, R-89-81 and R-89-82 to the Federal Railroad Administration, R-89-83 to the Research and Special Programs Administration, R-89-84 through R-89-87 to the City of Helena, R-89-88 to the State of Montana, R-89-89 to the Lewis and Clark County Disaster and Emergency Services, and R-89-90 through R-89-92 to the Association of American Railroads.

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 actions taken as a result of its safety recommendations and 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-89-68 through R-89-77 in your reply.

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

By: James L. Kolstad
Acting Chairman