NATIONAL TRANSPORTATION SAFETY BOARD
Public Meeting of March 9, 2004

Report of Railroad Accident Derailment
of
Canadian Pacific Railway Freight Train 292-16
And Subsequent Release of Anhydrous Ammonia
Near Minot, North Dakota, January 18, 2002NTSB/RAR-04-01
(Information subject to editing)

This is a synopsis from the Safety Board's report and does not include the Board's rationale for the conclusions, probable cause, and safety recommendations. Safety Board staff is currently making final revisions to the report from which the attached conclusions and safety recommendations have been extracted. The final report and pertinent safety recommendation letters will be distributed to recommendation recipients as soon as possible. The attached information is subject to further review and editing.

EXECUTIVE SUMMARY At approximately 1:37 a.m. on January 18, 2002, eastbound Canadian Pacific Railway freight train 292-16, traveling about 41 mph, derailed 31 of its 112 cars about ½ mile west of the city limits of Minot, North Dakota. Five tank cars carrying anhydrous ammonia, a liquefied compressed gas, catastrophically ruptured, and a vapor plume covered the derailment site and surrounding area. The conductor and engineer were taken to the hospital for observation after they complained of breathing difficulties. About 11,600 people occupied the area affected by the vapor plume. One resident was fatally injured, and 60 to 65 residents of the neighborhood nearest the derailment site were rescued. As a result of the accident, 11 people sustained serious injuries, and 322 people, including the 2 train crew members, sustained minor injuries. Damages exceeded $2 million, and more than $8 million has been spent for environmental remediation. The National Transportation Safety Board determines that the probable cause of the derailment of Canadian Pacific Railway train 292-16 was an ineffective Canadian Pacific Railway inspection and maintenance program that did not identify and replace cracked joint bars before they completely fractured and led to the breaking of the rail at the joint. Contributing to the severity of the accident was the catastrophic failure of five tank cars and the instantaneous release of about 146,700 gallons of anhydrous ammonia. The major safety issues identified in this accident were as follows: Canadian Pacific Railway's programs and practices for the inspection and maintenance of joint bars in its continuous welded rail; The Federal Railroad Administration's oversight of continuous welded rail maintenance programs; Tank car crash worthiness, specifically the adequacy of non-normalized steels to resist tank fracture propagation. The analysis also addresses the appropriateness of using shelter-in-place to protect the public from the release of hazardous material. As a result of its investigation of this accident, the Safety Board makes safety recommendations to the Federal Railroad Administration and the Canadian Pacific Railway.

CONCLUSIONS: 1. Train crew qualifications and train operations were not factors in this accident, and there was no evidence found that crew fatigue or alcohol or drug use were causal or contributory to the accident. 2. The derailment was not caused by a mechanical or component

failure of any of the train''s rolling stock. 3. The joint bars at the east end of the plug rail fractured under the previous train or as the accident train passed over the joint, and after the joint bars fractured, the rail itself also fractured and broke away, causing train 292-16 to derail. 4. Canadian Pacific Railway inspection procedures before the accident were inadequate to properly inspect and maintain joints within continuous welded rail, and those inadequate procedures allowed undetected cracking in the joint bars at the accident location to grow to a critical size. 5. Federal Railroad Administration requirements regarding rail joint bars in continuous welded rail are ineffective because they do not require on-the-ground visual inspections or nondestructive testing adequate to identify cracks before they grow to critical size and result in joint bar failure. 6. Canadian Pacific Railway's track procedure manual was confusing and thus did not provide employees with clear guidance on the practices to be followed in installing and maintaining continuous welded rail. 7. The Federal Railroad Administration's oversight of the Canadian Pacific Railway''s continuous welded rail program was ineffective because the agency neither reviewed the program nor ensured that its track inspectors had copies of the program to determine if the railroad was in compliance with it. 8. The catastrophic fracture of five tank cars increased the severity of the accident by exposing residents to high concentrations of toxic vapors from the instantaneous release of 146,700 gallons of ammonia and to the rocketing of portions of tank cars. 9. The low fracture toughness of the non-normalized steels used for the tank shells of the five tank cars that catastrophically failed in this accident contributed to the cars'' complete fracture and separation. 10. Using tank cars built before 1989 and fabricated from non-normalized steel to transport U.S. Department of Transportation class 2 hazardous materials under current operating practices poses an un-quantified but real risk to the public. 11. The research program proposed by the Federal Railroad Administration to model the dynamic forces and evaluate the crash worthiness of tank cars in accident conditions is incomplete without a plan to validate the predictive model. 12. A materials standard to define the minimum level of dynamic fracture toughness for the material in all tank cars that transport class 2 hazardous materials over the entire range of operating temperatures would provide greater assurance that the tank car materials will perform in a safe manner in accident conditions. 13. Before the accident, the Minot emergency responders, the city of Minot and the Canadian Pacific Railway had conducted a disaster preparedness exercise that enhanced the effectiveness of the emergency response to the anhydrous ammonia release on January 18, 2002. 14. The Ward County 911 dispatchers provided accurate and timely information to the residents of Minot even though the Ward County 911 system received more than 2,800 calls immediately following the accident. 15. The decision by the chief of the Minot Rural Fire Department to shelter the residents of Minot in their homes during the anhydrous ammonia release represented an effective response to the emergency.

PROBABLE CAUSE: The National Transportation Safety Board determines that the probable cause of the derailment of Canadian Pacific Railway train 292-16 was an ineffective Canadian Pacific Railway inspection and maintenance program that did not identify and replace cracked joint bars before they completely fractured and led to the breaking of the rail at the joint. Contributing to the severity of the accident was the catastrophic failure of five tank cars and the instantaneous release of about 146,700 gallons of anhydrous ammonia.

SAFETY RECOMMENDATIONS: As a result of its investigation of the January 18, 2002, freight train derailment near Minot, North Dakota, the National Transportation Safety Board

makes the following safety recommendations: To the Federal Railroad Administration: 1. Require all railroads with continuous welded rail track to include procedures (in the programs that are filed with the Federal Railroad Administration) that prescribe on-the-ground visual inspections and nondestructive testing techniques for identifying cracks in rail joint bars before they grow to critical size. 2. Instruct Federal Railroad Administration track inspectors to obtain copies of the most recent continuous welded rail programs of the railroads that fall within the inspectors'' areas of responsibility and require that inspectors use those programs when conducting track inspections. 3. Establish a program to periodically review continuous welded rail joint bar inspection data from railroads and Federal Railroad Administration track inspectors and, when determined necessary, require railroads to increase the frequency or improve the methods of inspection of joint bars in continuous welded rail. 4. Conduct a comprehensive analysis to determine the impact resistance of the steels in the shells of pressure tank cars constructed before 1989. At a minimum, the safety analysis should include the results of dynamic fracture toughness tests and/or the results of nondestructive testing techniques that provide information on material ductility and fracture toughness. The data should come from samples of steel from the tank shells from original manufacturing or from a statistically representative sampling of the shells of the pre-1989 pressure tank car fleet. 5. Based on the results of the Federal Railroad Administration''s comprehensive analysis to determine the impact resistance of the steels in the shells of pressure tank cars constructed before 1989, as addressed in Safety Recommendation R-04-XX, establish a program to rank those cars according to their risk of catastrophic fracture and separation and implement measures to eliminate or mitigate this risk. This ranking should take into consideration operating temperatures, pressures, and maximum train speeds. 6. Validate the predictive model the Federal Railroad Administration is developing to quantify the maximum dynamic forces acting on railroad tank cars under accident conditions. 7. Develop and implement tank car design-specific fracture toughness standards, such as a minimum average Charpy value, for steels and other materials of construction for pressure tank cars used for the transportation of U. S. Department of Transportation class 2 hazardous materials, including those in "low-temperature" service. The performance criteria must apply to the material orientation with the minimum impact resistance and take into account the entire range of operating temperatures of the tank car. To the Canadian Pacific Railway: 1. Finalize and submit to the Federal Railroad Administration your revised continuous welded rail maintenance program and ensure that all maintenance employees are trained in the requirements of the new program.

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Full text of this NTSB synopsis may also be accessed directly at ***www.ntsb.gov*** .