Log I-100

National Transportation Safety Board

Washington, D. C. 20594

Safety Recommendation

Date: October 28, 1992

In Reply Refer To: I-92-1 and -2

Mr. Douglas B. Ham
Acting Administrator
Research and Special Programs Administration
400 Seventh Street, S.W.
Washington, D.C. 20590

About 9:10 a.m. on December 11, 1990, a tractor-semitrailer in the southbound lanes of I-75 near Calhoun, Tennessee, struck the rear of another tractor-semitrailer that had slowed because of fog. The uninjured truckdrivers exited their vehicles and attempted to check for damage. After the initial collision, an automobile struck the rear of the second truck and was in turn struck in the rear by another tractor-semitrailer. Fire ensued and consumed two trucks and the automobile. Meanwhile, in the northbound lanes of I-75, an automobile struck the rear of another automobile that had slowed because of fog. Then, a pickup truck and two other automobiles became involved in the chain-reaction rear end collision. No fatalities, injuries, or fires occurred. Subsequently, 99 vehicles in the northbound and southbound lanes were involved in multiple-vehicle chain-reaction collisions that killed 12 people and injured 42 others.[1]

Postaccident examination of the tractor-semitrailer involved in the first southbound collision and subsequent fire revealed that 3 of its 10 portable dicumyl peroxide tanks were punctured. The similarities between the soot patterns on the tank walls at the punctures and the soot patterns on the outside walls of the tank indicated that the punctures occurred during the accident sequence before the fire. In addition, the size and shape of the punctures in the tank walls corresponded to the size and shape of the steel fork lift channels, indicating that the punctures were caused by the fork lift channels attached to other tanks. Therefore, the National Transportation Safety Board concludes that the punctures on the three U.S. Department of Transportation (DOT) specification 57 portable tanks transporting dicumyl peroxide were caused by the fork lift channels attached to other tanks.

[1]For more detailed information, read Highway Accident Report--*Multiple-Vehicle Collisions and Fire during Limited Visibility (Fog) on Interstate 75 near Calhoun, Tennessee, on December 11, 1990* (NTSB/HAR-92/02).

In 1988 the Safety Board investigated an accident in Collier County, Florida,[2] in which a cylinder containing poison gas was punctured by a steel plate attached to another cylinder. As a result of that investigation, the Safety Board issued the following safety recommendation to the Research and Special Programs Administration (RSPA) on March 23, 1990:

> I-90-7
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> Require that attachments to cylinders be designed to reduce to a minimum the risk of puncturing other cylinders during transportation.

On September 24, 1990, RSPA responded to the Safety Board, stating that it intended to issue a notice of proposed rulemaking (NPRM) concerning standards that "will require cylinders to be designed in such a manner that punctures during transportation are kept to a minimum." Safety Recommendation I-90-7 was classified "Open--Acceptable Response" pending the issuance of a final rule; however, RSPA had not issued the NPRM as of September 3, 1992.

The accident near Calhoun demonstrates that the potential for punctures from appurtenances extends to all types of hazardous material containers. Therefore, the Safety Board believes that RSPA should expand its proposed rulemaking to require that attachments to all DOT-authorized hazardous material packagings be designed to minimize the risk of puncturing other packagings during an accident situation. As a result of the revised safety recommendation issued with this letter, Safety Recommendation I-90-7 is classified as "Closed Acceptable Action/Superseded."

During the fire in the Calhoun accident, the 22 1/2-inch-diameter lids on 8 of the 10 portable tanks apparently functioned as intended, adequately relieving the rapid pressure buildup in the tanks during the decomposition of the dicumyl peroxide and preventing a violent overpressure rupture of any tank. The lids on the two remaining tanks probably did not pop off because the pressure inside those tanks did not increase significantly. A puncture hole in one tank's wall allowed its liquefied dicumyl peroxide to flow out. After the other tank fell on its side, its liquefied dicumyl peroxide flowed out through an opening where the 3 1/4-inch fusible plastic closure had been.

No plastic fusible closures were found during the postaccident examination of the tanks, and the Safety Board believes that the closures were consumed in the fire. While pressure may have popped off some 22 1/2-inch-diameter lids before the plastic fusible closures functioned, the closures probably melted first from the heat generated by the vehicle fire. The Safety Board is concerned that without the 22 1/2-inch-diameter pressure-relief lids, the internal overpressure during the rapid decomposition of the dicumyl peroxide would have ruptured the portable tanks.

During preaccident testing, Hercules, Incorporated, found that in tanks with 22 1/2-inch-diameter pressure-relief openings, the internal pressure exceeded 140 psi but did not reach the calculated burst pressure of 247 psi. Hercules calculated that

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[2]Hazardous Materials Accident Report--*Puncture of a Cylinder Containing a Mixture of Methyl Bromide and Chloropicrin Following the Overturn of a Tractor-semitrailer, Collier County, Florida, November 30, 1988* (NTSB/HZM-90/01).

the 3 1/4-inch pressure-relief opening, which was double the size opening required by DOT regulations, would not prevent tank overpressure rupture because internal pressure would exceed 247 psi. Therefore, Hercules installed the plastic closures to meet the regulations but relied on the 22 1/2-inch-diameter pressure-relief openings to prevent overpressure ruptures.

The Safety Board believes that the DOT requirements are not adequate to ensure the safe venting of pressure buildup from the rapid decomposition of dicumyl peroxide within DOT specification 57 portable tanks. In addition, the Safety Board is concerned that other products that may be subject to rapid decomposition reaction are permitted to be transported in portable tanks for which current venting requirements may not be adequate. Because of the significant product volume transported in portable tanks and the potential hazards from a violent pressure rupture of tanks, the Safety Board believes RSPA should revise the requirements for pressure-relief venting on DOT specification 57 portable tanks to ensure that the pressure-relief systems prevent overpressure rupture of tanks from a product rapid decomposition reaction.

Therefore, the National Transportation Safety Board recommends that the Research and Special Programs Administration:

> Require that attachments to all U.S. Department of Transportation-authorized hazardous materials packagings be designed to minimize the risk of puncturing other hazardous materials packagings during an accident situation. (Class II, Priority Action) (I-92-1)
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> Revise requirements for pressure-relief venting on U.S. Department of Transportation specification 57 portable tanks used to transport dicumyl peroxide and other products with similar rapid decomposition characteristics to ensure that the pressure-relief systems prevent overpressure rupture of tanks from a rapid product decomposition reaction. (Class II, Priority Action) (I-92-2)

Also, the Safety Board issued Safety Recommendations H-92-86 to the U.S. Department of Transportation; H-92-87 and -88 to the Federal Highway Administration; H-92-89 and -90 to the National Highway Traffic Safety Administration; H-92-91 to the Tennessee Department of Transportation; H-92-92 to the Tennessee Highway Patrol; H-92-93 through -95 to the American Association of Motor Vehicle Administrators; I-92-3 to Hercules, Incorporated; I-92-4 to the Charleston Volunteer Fire Department; H-92-96 to the American Automobile Association; and H-92-97 to the American Driver and Traffic Safety Education Association.

VOGT, Chairman, COUGHLIN, Vice Chairman, and LAUBER, and HAMMERSCHMIDT, Members, concurred in these recommendations. HART, Member, concurred in Safety Recommendation I-92-1, but did not concur in Safety Recommendation I-92-2.

By: Carl W. Vogt
Chairman