

- rohibited by existing Motor Carrier Safety Regulations.
8. Existing Motor Carrier Safety Regulations (Section 393.65 - Fuel Systems) do not cover the vulnerability of fuel crossover lines.
 9. The truckdriver made the correct decision when he elected to warn people away from the burning truck rather than to fight the fire. His postcrash activities undoubtedly reduced the number of injuries and fatalities.
 10. Three contributing factors to the severity of injuries were the inquisitive nature of the bystanders, their partial disregard or lack of understanding of the truckdriver's warnings and a lack of knowledge as to the proper action to take.
 11. The warning placards were not large enough to be seen from a safe distance and the truckdriver was unable to warn everyone within the danger zone. Therefore, the range of visual and audible warnings fell far short of the range of hazard. It is a public danger to transport explosives on highways without a warning system capable of reaching everyone who may be within range of a possible explosion.
 12. The fire ignited some of the tractor's rear tires.
 13. The explosive energy and the cap fragments of the blasting caps were contained in the dromedary.
 14. The detonation of the explosives was initiated by heat from the burning diesel fuel and tires.
 15. The initial detonation, in turn, caused an almost simultaneous, sympathetic detonation of all the other explosives in the load.
 16. No definite conclusion can be made as to whether the firemen and wrecker driver knew that the burning truck contained dynamite.
 17. The trailer was typical of the kind used for transporting explosives and other hazardous materials. It was not designed and constructed to shield the cargo from accidental exposure to heat or fire.

18. Criteria have been published for identifying alternative courses of action in dealing with explosives under emergency conditions. These criteria apparently are not fully understood and used by all emergency service personnel, as indicated by this accident.
19. The current warning system for fires which involve explosives or other hazardous materials is inadequate. The system needs careful study and revision.
20. If the police had been notified and dispatched immediately, they would have provided more effective crowd-control measures which probably could have reduced the number of fatalities and injuries.

V. PROBABLE CAUSE

The National Transportation Safety Board determines that the probable cause of the collision was that the automobile crossed over into the opposing lane of traffic and collided with the oncoming tractor-semitrailer, which was carrying a cargo of explosives. Fire broke out due to fuel loss from the automobile fuel tank and leakage from the truck's diesel fuel tanks.

The cause of the explosion was localized heat on the nitroglycerin-based dynamite. The explosion caused extensive property damage.

Contributing causes to the fatalities and injuries were: 1) a warning system that did not advise everyone within the danger range of the nature of the hazards; 2) the decision of the firemen to try and contain the hazardous fire; 3) the failure to notify emergency service personnel promptly and accurately of the hazards involved so that authoritative crowd-control measures could be taken; and 4) the inquisitive nature of bystanders and their partial disregard or lack of understanding of the truckdriver's warnings.

VI. RECOMMENDATIONS

The National Transportation Safety Board recommends that:

1. The Bureau of Motor Carrier Safety in the Federal Highway Administration of

- the Department of Transportation, and the Office of Hazardous Materials in the Department of Transportation initiate appropriate action to develop standards for mandatory installation of fire barriers in trucks or trailers used to transport Class "A" explosives or other hazardous, heat-sensitive materials. Such standards should apply to future vehicles and, by retrofit, to present vehicles. (Recommendation H-72-31)
2. The Bureau of Motor Carrier Safety modify Section 393.65 of the Motor Carrier Safety Regulations (as revised 2-4-72) to eliminate the fuel crossover line and other lines and fittings which are subject to damage, as a result of their exposed location on the bottom of tanks close to the road. (Recommendation H-72-32)
 3. The National Highway Traffic Safety Administration include in all future Federal Motor Vehicle Safety Standards that are applicable, requirements to eliminate fuel crossover lines and any other lines and fittings which may be subject to damage, as a result of their exposed location on the bottoms of fuel tanks close to the road. (Recommendation H-72-33)
 4. The Bureau of Motor Carrier Safety and the National Highway Traffic Safety Administration develop regulations and standards to establish road clearance specifications for fuel systems to protect them from road damage as a result of tire failures or normal driving operations. (Recommendation H-72-34)
 5. The National Fire Protection Association (NFPA) develop new guidelines dealing with explosives in emergencies and bring them to the attention of emergency service personnel at all levels. These guidelines should be based on the NFPA Document entitled *Fire Protection for Chemicals* and published separately with special emphasis placed on:
 1. Assessing the situation upon arrival at the scene of an emergency.
 2. Determining alternative courses of action.
 3. Evaluating the risks associated with each alternative.
 4. Selecting the alternative which presents the minimum amount of risk to people, facilities, and firefighting crews and their equipment.

Guidelines should include not only explosives, but all heat-sensitive hazardous materials which are on fire or exposed to elevated temperatures as a result of a fire.

This new publication should be as widely distributed as possible through channels which will make the guidelines available to all levels of firefighting operations. (Recommendation H-72-35)
 6. The Office of Hazardous Materials (OHM) study warning-system deficiencies demonstrated in this accident. The proposal for a Hazard Information System issued by OHM on June 16, 1972 should be carefully reviewed to insure that warnings of impending danger and advice are given in an understandable manner to the general public as well as to emergency personnel. The capability of the system to warn those at a distance should be equal to the range of the hazard and should not rely on the physical condition of the driver. The system should function under all weather conditions and the range of warning should be specified by regulations. (Recommendation H-72-36)
 7. The Office of Hazardous Materials in cooperation with the American Association of Motor Vehicle Administrators, the American Driver and Traffic Safety

Education Association, the American Automobile Association, the North American Professional Drivers Association, and the National Safety Council provide information on precautions the public should take when confronted with hazardous materials in highway accidents. These agencies should have this information incorporated into driver-education curricula and driver-licensing examinations and they should

disseminate the information periodically as a public service. (Recommendation H-72-37)

8. The National Highway Traffic Safety Administration modify Driver Education Standard N-4 to include the same precautionary information. (Standard N-4 of Proposed rule making, Highway Safety Program Standards - Docket No. 72-13, August 3, 1972). (Recommendation H-72-38)

BY THE NATIONAL TRANSPORTATION SAFETY BOARD:

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