Geog I-88H

National Transportation Safety Board

Washington, D.C. 20594

Safety Recommendation

Date: May 11, 1987

In reply refer to: I-87-4 and -5

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About 3:30 a.m., c.d.t., on August 4, 1985, a tractor-semitrailer operated by Explosives Transports, Inc., and loaded with 10 MK 84 2,000-pound general purpose bombs, collided with an automobile on Interstate 40 near Checotah, Oklahoma. The automobile fuel tank ruptured and spilled gasoline which quickly ignited. Both vehicles were engulfed in flames. Subsequent explosions from the bombs destroyed the vehicles and left a crater 27 feet deep and 35 feet wide in the roadway. Three hundred and seventy-one residences were damaged. Other buildings, including a school located 734 feet from the accident site, suffered substantial damage. Total damages were estimated at $5 million. Forty-nine persons reported to a hospital emergency room for treatment of injuries, most after breathing smoke and gases from burning tritonal. No one was fatally injured. 1/

Public exposure to munitions shipments has doubled in the past 7 years, increasing from 23,456 shipments in 1980 to 47,593 in 1986. During the same period, Department of Defense (DOD) Class A and Class B explosive shipments have been involved in 49 highway accidents in 25 States.

During its investigation, the Safety Board found that Class A and Class B explosive shipments transported by Explosives Transports, Inc., for the DOD regularly experienced unnecessarily long transit times. Not only were munitions often transported over indirect routes for hundreds of unnecessary miles, but shipments regularly were held at carrier terminals for several days while in-transit. The accumulation of multiple in-transit shipments of Class A and Class B explosives at the carrier's terminal in Oklahoma City also unnecessarily exposed the public in that area to significantly increased risks.

Title 49 CFR 177.853 requires all shipments of hazardous materials to be "transported without unnecessary delay, from and including the time of commencement of the loading of the cargo until its final discharge at destination." However, the regulation does not define unnecessary delay nor does it specifically prohibit carriers from transporting explosives shipments over indirect routes that may increase highway mileage but provide no increased safety benefits, such as travel through less populated areas or over lower accident risk highways. In its investigation of an accident involving the

1/ For more detailed information, read Hazardous Materials Special Investigation Report--"Collision Between a Tractor-Semitrailer Transporting Bombs and an Automobile, Resulting in Fire and Explosions, Checotah, Oklahoma, August 4, 1985" (NTSB/SIR-87/01).

overturn of a tractor-semitrailer transporting torpedoes in Denver, Colorado, 2/ the Safety Board concluded that the Federal Motor Carrier Safety Regulations describe motor carrier routing requirements in ambiguous terms. Also, it was unclear whether the carrier involved in that accident violated any Federal regulations by routing the vehicle through an interchange near downtown Denver instead of over a bypass that would have directed the vehicle away from the central business district. As a result, the Safety Board recommended that the Bureau of Motor Carrier Safety (BMCS) of the Federal Highway Administration (FHWA):

H-85-34

Amend Federal Motor Carrier Safety Regulation 49 CFR 397.9 to eliminate ambiguities in the routing requirements for vehicles transporting hazardous materials.

On November 26, 1986, the FHWA advised the Safety Board that because Section 206 of the Motor Carrier Safety Act of 1984 prohibits the modification or elimination of any regulation relative to the transportation of hazardous materials unless and until an equivalent or more stringent regulation has been promulgated under the Hazardous Materials Act, the Secretary of Transportation delegated the responsibility for the development and promulgation of the regulations to the Research and Special Programs Administration (RSPA). No further action has been taken on the recommendation which remains in an "Open--Acceptable Action" status. Because of the severe consequences that can result when accidents involving explosives are involved in accidents, the Safety Board urges the FHWA and the RSPA to move expeditiously on this recommendation.

In its Denver report, the Safety Board also said that "the safest through routing for the transportation of hazardous materials can best be developed at the State level of government where concerns and problems of local jurisdictions can be coordinated to ensure that the routes selected minimize the population at risk and that due regard is taken relative to the level of preparedness of local jurisdictions to handle emergency situations." On November 15, 1985, the Safety Board recommended that the FHWA:

H-85-38

Encourage States to establish through routes for shipments of hazardous materials, and coordinate the compatibility of the designated routes regionally and nationally.

On October 8, 1986, the FHWA advised the Safety Board that it also had forwarded this recommendation to the RSPA because of the responsibilities recently delegated to that Administration by the Secretary of Transportation. There has been no further response to the recommendation, which remains in an "Open" status. Therefore, the Safety Board urges the FHWA and RSPA to also move expeditiously on Safety Recommendation H-85-38.

As demonstrated in the Checotah accident, the principal threats to the safe transportation of general purpose bombs and other Class A and Class B explosive munitions are fire and heat. During fast cook-off tests conducted on general purpose

2/ Hazardous Materials Accident Report--"Overturn of a Tractor-Semitrailer Transporting Torpedoes, Denver, Colorado, August 1, 1984" (NTSB/HZM-85/02).

bombs similar to those involved in the Checotah accident, the bombs deflagrated in about 4 minutes. Fast cook-off tests conducted on other munitions, including rockets, air-launched missiles, mines, and torpedoes, have demonstrated that major hazards also exist when those munitions are subjected to fire conditions for very short periods of time.

The Safety Board has investigated two other recent munitions accidents where the release of vehicle fuel increased risks of cook-off reactions.

- On August 1, 1984, a tractor-semitrailer transporting Navy torpedoes overturned at the intersection of two major interstate highways near downtown Denver, Colorado. After arriving at the accident scene, the fire department stopped a leak in the vehicle's fuel tank. In its report, the Safety Board found that while no fire resulted during the accident a sufficient volume of diesel fuel was present to have produced temperatures necessary for deflagration of the warheads.

- On May 10, 1985, a truck-trailer transporting munitions struck a parked vehicle on Interstate 65 near Bonnieville, Kentucky, resulting in a fiery accident. A fuel tank on the truck was torn open and an estimated 30 gallons of gasoline poured onto the ground and ignited. Class A explosives (C-4 plastic explosives) transported in a dromedary on the truck ignited and burned intensely. Although the trailer contained additional Class A and Class B explosive munitions, the fire department chose to deluge it with water rather than withdraw. Fortunately for the fire department, the explosives on the trailer did not explode.

On June 4, 1971, an automobile collided with a tractor-semitrailer transporting non-military explosives near Waco, Georgia. Gasoline and diesel fuel leaked from vehicle fuel tanks, a fire quickly engulfed both vehicles, and the cargo exploded. Two firemen, a wrecker operator, and 2 bystanders were killed as a result of the explosion; 33 persons were injured. As a result of its investigation, the Safety Board recommended that the BMCS and the Office of Hazardous Materials in the Department of Transportation (DOT):

H-72-31

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.

The Assistant Secretary for Safety and Consumer Affairs for the DOT responded that there were an estimated 3,000 to 5,000 vehicles owned by large carriers which could be used to transport such materials and that the installation of fire barriers in all vehicles was economically unsound and that the dedication of vehicles could not be justified. The Safety Board reconsidered its recommendation, and no further action was taken at that time. However, as a result of accidents which have occurred since 1972 and the danger that vehicle fuel fires pose to explosives shipments, the Safety Board believes that the DOT should require that Class A explosive shipments by highway be provided thermal protection while in transportation to provide reasonable time for the evacuation of persons in nearby threatened areas.

Additionally, although the accident in Checotah was reported to the fire departme as a fuel truck fire, the chief quickly identified a Class A explosives placard on the rear of the semitrailer and withdrew his men to safer locations. The shipping papers, which contained important information about the cargo and provided emergency DOD telephone numbers, were not available to emergency response personnel. Further, it is questionable whether anything could have been done to prevent the bombs from exploding by the time the fire department had time to act, and by the time the chief recognized the need to immediately evacuate the area. It is therefore important that safe minimum evacuation distances be provided to emergency response personnel in the DOT Emergency Response Guidebook.

The Safety Board's investigations of accidents involving torpedoes in Denver and bombs in Checotah disclosed varied safety withdrawal distances recommended in munitions accidents. Recommended evacuation distances in Denver varied from 1,200 to 2,000 feet in case of fire; it was later estimated that fragments may have been propelled 4,500 feet had the torpedoes exploded. In Checotah, information accompanying the shipping papers recommended an evacuation distance of 2,500 feet in case of fire, and a subsequent evacuation distance of 4 miles was recommended by the U.S. Army 61st Detachment at Fort Sill, Oklahoma. The DOD had decided, after the Denver accident, to use a recommended evacuation distance of 2,500 feet on documents accompanying shipping papers because that distance was recommended in the DOT Emergency Response Guidebook for Class A explosives.

While the guidebook currently recommends that a minimum evacuation distance of 2,500 feet be used when accidents involving Class A explosives are engulfed in fire, the DOD has concluded that 2,500 feet is not adequate for truckload and carload shipments of bombs and other large munitions. Based on both fragment and overpressure hazards, the DOD recommends that the minimum evacuation distance in the emergency response guidebook be changed to 3/4 mile (4,000 feet) for highway accidents involving Class A explosives and fire and 1 mile for railcar accidents. In addition, the American Society for Testing and Materials (ASTM) recommends that emergency response personnel be evacuated a minimum distance of 5,000 feet when Class A explosives are involved in a fire.

Substantial property damage occurred a mile from the accident site where Checotah's central business district is located. If the accident had occurred during normal business hours, personal injuries probably would have been much greater. The Safety Board does not believe that a minimum evacuation distance of 2,500 feet is adequate for truckload or carload shipments of Class A explosives involved in fire. Therefore, the Safety Board believes that the RSPA, which is currently reviewing the DOD's recommendation to expand the recommended evacuation distances, should increase recommended minimum evacuation distances based on the fragment and overpressure hazards posed by explosives shipments and make the appropriate changes to the emergency response guidebook. In developing recommended safe evacuation distances for explosives that present fragment or overpressure hazards beyond 2,500 feet, the RSPA should strive, wherever possible, to minimize the number of newly introduced evacuation distances. Such action will make it easier for emergency response agencies to train their personnel in recognizing the presence of such materials and in taking appropriate action to protect the public.

Additionally, explosive shipments, which present increased risks because of quantity or special fragment hazards, could be better marked to readily inform emergency response personnel about the need for increased precautions. Such shipments could be

identified through a number of ways, including a requirement that explosive placards for increased risk shipments requiring a greater evacuation distance be displayed against a square white background, similar to a requirement that placards for highway route controlled quantities of radioactive materials be displayed against a square white background.

Therefore, as a result of its investigation, the National Transportation Safety Board recommends that the Research and Special Programs Administration:

> Require thermal protection for those explosives shipments which pose the greatest fragment and overpressure hazards in highway transportation accidents involving fire to allow reasonable time for the evacuation of nearby persons. (Class II, Priority Action) (I-87-4)
>
> Quantify, based on tests, the fragment and/or overpressure hazards of Class A and Class B explosives shipments when involved in fire; establish in the Department of Transportation's Emergency Response Guidebook safe evacuation distance(s) for shipments which present these hazards beyond the 2,500 feet presently recommended for all Class A and Class B explosives shipments; and require that vehicles transporting such shipments be appropriately identified to readily inform emergency response personnel about the increased hazards and the recommended evacuation distance(s). (Class II, Priority Action) (I-87-5)

Also, the Safety Board issued Safety Recommendations H-87-17 and I-87-1 through -3 to the Department of Defense.

BURNETT, Chairman, GOLDMAN, Vice Chairman, and LAUBER and NALL, Members, concurred in these recommendations.

By: Jim Burnett
Chairman