

SP-20  
Log H-453

NATIONAL TRANSPORTATION SAFETY BOARD  
WASHINGTON, D.C.

ISSUED: November 15, 1985

-----  
Forwarded to:

Honorable Ray A. Barnhart  
Administrator  
Federal Highway Administration  
Washington, D.C. 20590

SAFETY RECOMMENDATION(S)

H-85-36 through -40

-----  
About 4:48 a.m., m.d.t., on August 1, 1984, a tractor-semitrailer combination operated by Riss International Corporation (Riss) of Kansas City, Missouri, was traveling south on Interstate 25 (I-25) in Denver, Colorado. The flatbed semitrailer was loaded with six torpedoes, Class A explosives, which were being shipped from a U.S. Navy base in Keyport, Washington, to a Navy facility in Groton, Connecticut. The driver intended to turn east onto Interstate 70 (I-70) and was being guided by signs when she steered the vehicle to the right onto the ramp connecting I-25 to I-70. The driver then made a quick turn to the left and the trailer whipped. She applied the footbrake, saw that she had to make a left turn at the bottom of the ramp, and then released the brake and tried to steer through the curve. The tractor-semitrailer overturned onto its right side and into the center lane of I-70, slid 62 feet on its side, struck a 48-inch-high concrete safety-shape barrier, bounced off the barrier, and after sliding another 45 feet came to rest. The driver had not seen a left-turn sign and 25-mph advisory speed plate located on the right side of the exit ramp. It was cracked, glazed, and partially hidden from the approaching driver's view by tree foliage and a lamppost. 1/

After the torpedoes were loaded onto the trailer and before leaving Keyport, the codriver called the Riss dispatcher in Kansas City, Missouri, and received highway routing instructions. The routing instructions directed the driver to take Interstate 5 south (to Portland, Oregon), Interstate 84 east (to Ogden, Utah), Interstate 80 east (to Laramie, Wyoming), U.S. Route 287 south (to Fort Collins, Colorado), Colorado State Route 14 east to I-25, I-25 south (to Denver), and then I-70 east.

The propriety of routing the vehicle through the Denver area, as well as using I-70 as the route of choice for the shipment of torpedoes is debatable. Both I-80 and Interstate 90 (I-90), the most northerly east-west interstate route, could have served as the designated route. One of the reasons stated by the Riss safety supervisor for selecting I-70 was the locations of safe havens. According to a map of safe havens used by Riss, I-70 and I-80/connecting with Interstate 65 both have seven safe havens between Denver or Cheyenne, Wyoming, and Indianapolis, Indiana, while I-90 shows only one.

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

Therefore, I-80 would have been just as suitable as I-70. However, neither the Riss map nor its list of safe havens included all safe havens available for the Riss safety supervisor to use in selecting routes. Furthermore, the list also included one facility used by the drivers as a safe haven prior to the accident that had not been designated as a safe haven by local or State officials at that time.

The Federal Motor Carrier Safety Regulations (FMCSR) (49 CFR 397.5) of the Bureau of Motor Carrier Safety (BMCS) of the Federal Highway Administration (FHWA) require that "a motor vehicle which contains Class A or B explosives must be attended at all times by its driver or a qualified representative of the motor carrier . . . [unless] the vehicle is located on the property of a motor carrier, on the property of a shipper or consignee of the explosives, [or] in a safe haven. . . ." The BMCS has not designated any areas as safe havens, leaving those decisions to local and State authorities. The Safety Board could not locate any national or central list of safe havens. Motor carriers requiring the use of safe havens must contact individual local and State jurisdictions, and other motor carriers, to identify the locations of safe havens on proposed routes. Even then, they are not assured of obtaining a complete and current list. Since one criterion used by some motor carriers to determine the highway routing of explosive shipments is the location of safe havens, the FHWA should establish specific minimum standards for safe havens and encourage the establishment of a national listing of safe haven locations.

The I-25/I-70 interchange where the accident occurred is on a highway route approved by the Denver Department of Public Works for "all vehicles including those carrying hazardous materials." The interchange has been the site of many accidents and presently is being studied to determine the feasibility of rehabilitation. A Denver ordinance authorized designation of routes for transporting flammable liquids within the city, which led to the publication of a route map. Later editions of the map, however, did not limit the applicability of the route to the shipment of flammable liquids. Following this accident, Denver passed another ordinance which, among other requirements, prohibits the movement of some hazardous materials over designated routes and restricts the movement of other hazardous materials during traffic rush hours. Denver's authority to designate the routes for hazardous materials is limited to routes within its boundaries. Alternate routes and bypasses are available to trucks transporting hazardous materials around the I-25/I-70 interchange and away from the central Denver area.

A BMCS regulation recognizes the right of local and State governments to determine the need for and to designate hazardous materials routes within their jurisdictions. The FMCSR (49 CFR 397.3) states that "every motor vehicle containing hazardous materials must be driven and parked in compliance with the laws, ordinances, and regulations of the jurisdiction in which it is being operated. . . ." The Safety Board investigated an accident in Houston, Texas, on May 11, 1976, involving a tractor-semitrailer (tank) transporting 7,509 gallons of anhydrous ammonia.<sup>2/</sup> The vehicle left a highway ramp, struck a support column of an adjacent overpass, and fell 15 feet onto a street below. The accident resulted in the release of the anhydrous ammonia, 6 fatalities, 78 persons hospitalized, and another 100 persons treated for injuries. As a result of its investigation, the Safety Board issued Safety Recommendation I-77-1 on April 25, 1977, to the FHWA:

<sup>2/</sup> Highway Accident Report—"Transport Company of Texas Tractor-Semitrailer (Tank) Collision With Bridge Column and Sudden Dispersal of Anhydrous Ammonia Cargo, I-610 at Southwest Freeway, Houston, Texas, May 11, 1976" (NTSB-HAR-77-1).

Develop guidelines for local and State agencies to use in designating and periodically reviewing routes for the transportation of hazardous materials as a means of reducing injury and damage from accidents involving hazardous materials in their jurisdictions.

As a result of the Board's recommendation, in November 1980, the FHWA published "Guidelines for Applying Criteria to Designate Routes for Transporting Hazardous Materials," as an aid to local and State governments desiring to establish hazardous materials routes. The FHWA should replenish its exhausted supply of this guideline and distribute it anew to States, local jurisdictions, and motor carriers.

There is a need for coordinated action by the various jurisdictions within a State to establish through routes for transporting hazardous materials, which takes into account the safety needs of the affected local jurisdictions. 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.

As a result of its investigation of this accident, the Safety Board issued Safety Recommendation I-85-1 on January 25, 1985, to the State of Colorado:

Develop and put into effect a comprehensive program in cooperation with municipal and county jurisdictions for designating safe, practical highway routes for the transportation of hazardous materials within the State of Colorado, using as a guideline the Federal Highway Administration's "Guidelines for Applying Criteria to Designate Routes for Transporting Hazardous Materials."

On February 19, 1985, the State responded that an interagency task force on hazardous materials had identified "widespread support for the State to take action on the issue" and that enabling legislation was to be introduced. The response noted that the incident which occurred in Colorado could occur in any State, recommended that the Board encourage other States to designate routes within their boundaries, and observed the need for "a nationwide coordinated approach to this problem."

The FHWA should encourage the States to undertake the establishment of through routes for hazardous materials, and coordinate the State's designation of those routes regionally and nationally. Once States have established through routes for hazardous materials, routes can be displayed for carrier use on any general system of road maps. Such action would eliminate the burdensome and error-prone task of carriers having to contact the various States and local jurisdictions to identify any restrictions.

Interchanges are probably the most critical parts of a freeway system because of the large amount of information that must be absorbed and acted upon by the driver in a relatively short period of time. The driver's success in the decisionmaking process is highly dependent on the ability to judge what actions must be taken to safely negotiate the interchange. The Riss driver previously had not driven over the interchange ramp from I-25 southbound to I-70 eastbound, and she failed to recognize the characteristics of the ramp early enough to slow the vehicle sufficiently in order to safely negotiate the curve at the end of the ramp.

While the posted (legal) speed limit on I-25 was 55 mph, the beginning of the exit ramp had an advisory (recommended maximum) speed of 45 mph. The advisory speed for the accident ramp was further reduced to 25 mph, and it was posted with a left-turn warning sign on the right side of the ramp 300 feet in advance of the circular curve or 150 feet in advance of the transitional spiral. The 1961, 1971, and 1978 editions of the Manuals on Uniform Traffic Control Devices (MUTCD) suggest that a minimum distance for the placement of warning signs be about 250 feet in advance of the hazard or condition. Neither the MUTCD nor the Traffic Control Devices Handbook (TCDH) published by the FHWA specifies if the beginning of the spiral or the beginning of the circular curve should be considered the hazard or condition. The 250 feet suggested by the MUTCD is a minimum distance; this becomes important when spirals are used since in some cases, this one for example, the locations of the sign would not be in conformance with MUTCD recommendations if the beginning of the spiral is considered the hazard. The Safety Board believes that the reference for measuring the distance to advance curve warning signs should be clarified; either the MUTCD or the TCDH could serve as the medium for the clarification. Following the accident on August 1, 1984, an additional left-turn warning sign and a 25-mph advisory speed plate were installed on the left side of the ramp about 400 feet in advance of the circular curve.

The Colorado Department of Highways (CDOH) failed to notice the poor condition of the turn sign and 25-mph advisory speed plate--they probably were more than 20 years old--and the obstructions blocking the motorist's view of the signs. The TCDH states that Type II (engineering grade) reflective sheeting "...can be expected to provide satisfactory performance under normal use for a period of 5 to 7 years." It was quite obvious that the signs had outlived their useful life and that their reflectivity had severely deteriorated. (Both the left-turn warning sign and the 25-mph advisory speed plate were replaced with new signs following the accident.) Various methods employed by other States to check reflectivity include the use of a reflectivity meter or the use of samples of reflective materials for comparison judgments. The CDOH should adopt a more systematic approach to the inspection and inventory of signs, especially those signs that are critical in warning motorists of hazards. The inventory should include the dates that signs were installed. In October 1984, the Center for Auto Safety petitioned the FHWA to consider formally, through the rulemaking process, the need for standards of retroreflective illumination and performance criteria for various traffic control devices, and the FHWA has issued a Notice of Proposed Rulemaking in the Federal Register (50 FR 16515, April 26, 1985) and requested that comments be submitted by February 15, 1986.

Reflective sheeting must meet minimum levels of performance on Federal highway projects that are under the direct administration of the FHWA, but after a project is accepted there is no Federal requirement that a specific level of retroreflectivity be maintained. There are no specific performance criteria established for State-administered Federal-aid projects. The interstate maintenance guidelines (23 U.S.C. 635.501 to 635.509) require that the interstate routes be "maintained at the level required by the purposes for which they were designed" and that "signs be legible and visible." The turn sign did not meet these requirements. Although one sign in poor condition does not mean that all of the State's signing is deficient or unsatisfactory, it appeared to Safety Board investigators that several other warning signs in the interchange area also were in poor condition and probably about 20 years old. Since this is about triple the 7-year life expectancy of a road sign, it is very likely that these signs do not function as designed. Because of the preeminent role of the interstate system in transportation, there is a need

for superior signing on the interstate, and the FHWA should encourage Colorado and other States to place greater emphasis on maintaining traffic signs at the level required by the purpose for which the highways were designed.

Therefore, the National Transportation Safety Board recommends that the Federal Highway Administration:

Collect and publish for use by motor carriers information on the location of safe havens and routes designated for or restricted from the transportation of hazardous materials. (Class II, Priority Action) (H-85-36)

Reprint the Federal Highway Administration publication "Guidelines for Applying Criteria to Designate Routes for Transporting Hazardous Materials" and distribute it to appropriate local and State authorities and to motor carriers that transport hazardous materials. (Class II, Priority Action) (H-85-37)

Encourage States to establish through routes for shipments of hazardous materials, and coordinate the compatibility of the designated routes regionally and nationally. (Class II, Priority Action) (H-85-38)

Revise the Manual on Uniform Traffic Control Devices and the Traffic Control Devices Handbook to indicate the specific longitudinal placement of curve and turn warning signs where spiral curves are used to transition from a tangent to a circular curve. (Class II, Priority Action) (H-85-39)

Expedite rulemaking to establish performance criteria and standards for the retroreflective illumination for traffic control devices. (Class II, Priority Action) (H-85-40)

BURNETT, Chairman, GOLDMAN, Vice Chairman, and BURSLEY, Member, concurred in these recommendations.

By:   
Jim Burnett  
Chairman

