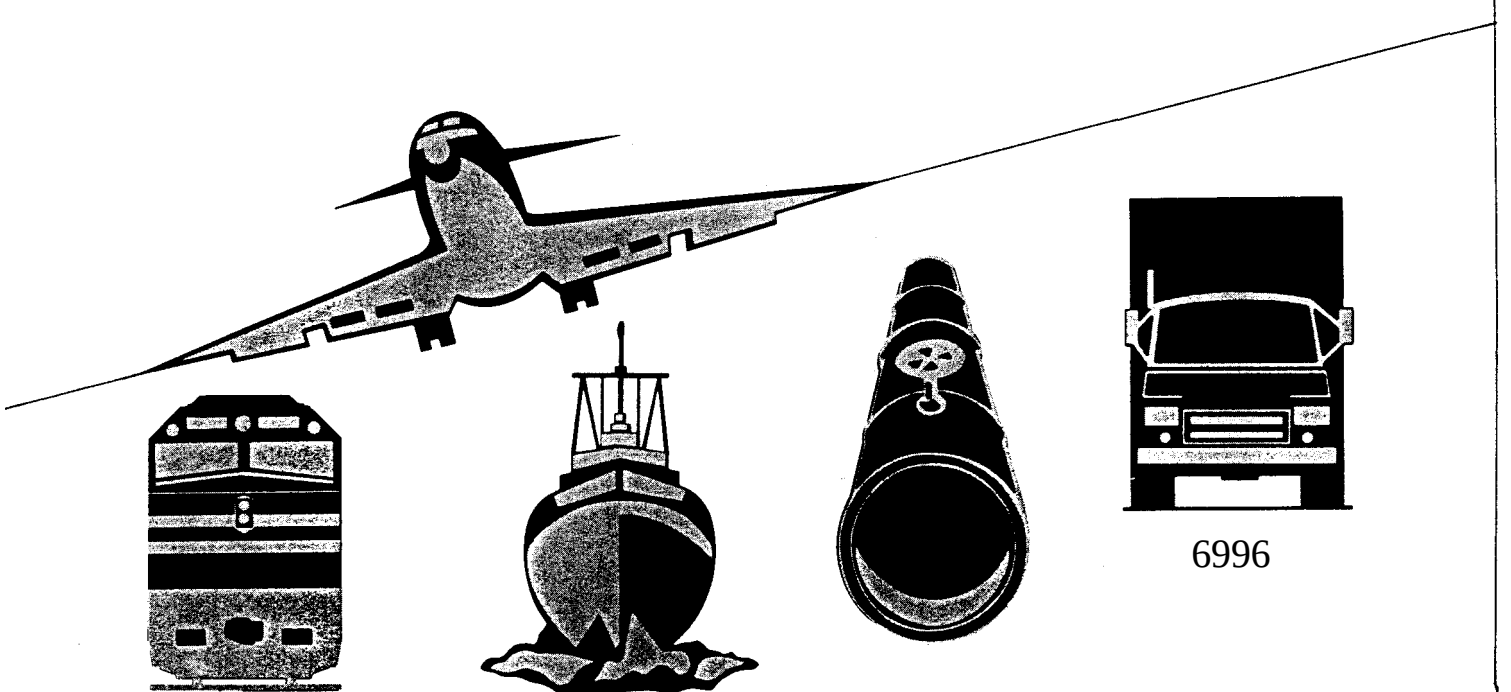
PB98-916202
NTSB/HAR-98/02/SUM

# NATIONAL TRANSPORTATION SAFETY BOARD

WASHINGTON, D.C. 20594

## HIGHWAY/HAZARDOUS MATERIALS ACCIDENT SUMMARY REPORT

### COLLISION OF TRACTOR/CARGO TANK SEMITRAILER AND PASSENGER VEHICLE AND SUBSEQUENT FIRE, YONKERS, NEW YORK, OCTOBER 9, 1997



6996

**Abstract:** On October 9, 1997, about 12:10 a.m., a truck tractor pulling a cargo tank semitrailer was going under an overpass of the New York State Thruway when it was struck by a sedan. The car hit the right side of the cargo tank in the area of the tank's external loading/unloading lines, releasing the gasoline they contained. The ensuing fire destroyed both vehicles and the overpass; the thruway remained closed for approximately 6 months. The driver of the car was killed; the driver of the truck was not injured. Property damage was estimated at $7 million.

The safety issue discussed in this report is the danger of operating a truck when its cargo tank's loading lines are carrying hazardous materials.

As a result of its investigation, the National Transportation Safety Board issued a safety recommendation to the Secretary of Transportation.

The National Transportation Safety Board is an independent Federal agency dedicated to promoting aviation, railroad, highway, marine, pipeline, and hazardous materials safety. Established in 1967, the agency is mandated by Congress through the Independent Safety Board Act of 1974 to investigate transportation accidents, determine the probable causes of the accidents, issue safety recommendations, study transportation safety issues, and evaluate the safety effectiveness of government agencies involved in transportation. The Safety Board makes public its actions and decisions through accident reports, safety studies, special investigation reports, safety recommendations, and statistical reviews.

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HIGHWAY/HAZARDOUS MATERIALS ACCIDENT SUMMARY REPORT

**COLLISION OF TRACTOR/CARGO TANK SEMITRAILER AND PASSENGER VEHICLE AND SUBSEQUENT FIRE, YONKERS, NEW YORK, OCTOBER 9, 1997**

NTSB/HAR-98/02/SUM (PB98-916202)

The report number for this report was incorrectly cited on the cover of the previously printed document as NTSB/HAR-98/01/SUM.

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# COLLISION OF TRACTOR/CARGO TANK SEMITRAILER AND PASSENGER VEHICLE AND SUBSEQUENT FIRE, YONKERS, NEW YORK, OCTOBER 9, 1997

## HIGHWAY/HAZARDOUS MATERIALS ACCIDENT SUMMARY REPORT

**Adopted: May 5, 1998**
**Notation 6996**

**NATIONAL TRANSPORTATION SAFETY BOARD**

**Washington, D.C. 20594**

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# National Transportation Safety Board

**Washington, D.C. 20594**

HIGHWAY/HAZARDOUS MATERIALS ACCIDENT SUMMARY REPORT

| | |
|---|---|
| **Accident Number:** | HWY-98-F-H002 |
| **Accident Type**: | Collision and fire |
| **Location:** | Yonkers, New York |
| **Motor Carrier:** | Mystic Bulk Carriers, Inc. |
| **Vehicle 1:** | 1994 Mack tractor and MC-306 cargo tank semitrailer |
| **Vehicle 2:** | 1990 Eagle Premier sedan |
| **Date:** | October 9, 1997 |
| **Time:** | 12:10 a.m. |
| **Damage:** | Vehicles and overpass destroyed |
| **Injuries:** | One fatality |

## INTRODUCTION

On October 9, 1997, about 12:10 a.m., a 1994 Mack truck tractor pulling a 1994 Fruehauf MC-306 cargo tank semitrailer was heading south on Central Park Avenue in Yonkers, New York. The truck, which was loaded with 8,800 gallons of gasoline, was just going under an overpass of the New York State Thruway (thruway) when it was struck by a southbound 1990 Eagle Premier sedan. The car hit the right side of the cargo tank in the area of the tank's external/loading unloading lines (loading lines), releasing the gasoline they contained. The ensuing fire destroyed both vehicles and the overpass of the thruway; the thruway remained closed for approximately 6 months. The driver of the car was killed; the driver of the truck was not injured. Property damage was estimated at $7 million. At the time of the accident, the weather was clear and dry with no overcast.

In its investigation, the Safety Board identified as a safety issue the danger of operating a truck when its cargo tank's loading lines are carrying hazardous materials. This report describes the accident, discusses the safety issue, and lists conclusions and a safety recommendation that have been developed to help prevent similar accidents in the future.

## THE ACCIDENT

On October 8, 1997, about 4:30 p.m., the truckdriver reported for work at Mystic Bulk Carriers, Inc., (Mystic) in Astoria, Queens, New York. His job was to deliver bulk gasoline from refineries in New Jersey to customers in the New York City area. He had worked 9 ½ hours on October 7 and had been off duty on October 5 and 6.

During the 7 ½ hours that preceded the accident, he had delivered four loads. He then drove to the Texaco refinery in Newark, New Jersey, to pick up his final load for the evening. According to the bill of lading, he loaded the truck with approximately 8,800 gallons of multi-grade gasoline and left the refinery at 11:08 p.m. He was going to deliver the gasoline to a Texaco service station on Central Park Avenue. According to the safety manager, the truckdriver was familiar with the delivery route and had made the trip many times before.

The car driver was a resident of Valhalla, New York, and a doctor at the Bronx House of Detention in New York City. While his activities during the hours just before the accident are unknown,[1] he was still 9 miles away from his place of employment and already 10 minutes late for work when the accident occurred. The driver's son later told the police that the road on which the accident occurred was part of his father's regular route to work. Thus, the driver probably was familiar with the roadway and may have been in a hurry to get to work.

About 12:10 a.m., the truckdriver left the thruway, which is a seven-lane, limited access road that crosses over Central Park Avenue and is a major north-south transportation corridor of New York City. He went north on Central Park Avenue and entered a 13-foot-wide, downgrade U-turn lane for Central Park Avenue south. (He planned to turn left on Central Park Avenue and go south, under the thruway overpass.) The exit from the U-turn lane to Central Park Avenue is controlled by a yield sign. The posted speed limit on Central Park Avenue in the area of the accident is 40 mph.

The driver of a car that was stopped at a traffic signal on Central Park Avenue, which is 630 feet north of the U-turn lane, witnessed the accident.

According to the witness, the truckdriver entered the U-turn lane and stopped at the yield sign. After stopping, the truckdriver turned to the left and began to go under the overpass. (See figure 1.)

The witness stated that as the truck was turning, an Eagle Premier sedan came from behind him (the witness) and passed him on the right without stopping for the red light. The witness estimated the Premier's speed to be between 40 and 45 mph. He stated that the car continued toward the truck without making any attempt to avoid it. He said he did not see the car's brake lights go on "until a second before" the car struck the truck.

The police interviewed the truckdriver at the scene of the accident. He told them that as he reached the U-turn lane he stopped, looked to the right, and saw that no vehicles were approaching. He said that he then swung the truck wide in order to make the turn and that when the truck had almost straightened, he felt the car strike the right side of the cargo tank. He applied his brakes, jumped from the truck, and ran back to the car.

After the car struck the truck, the two vehicles came to rest under the thruway overpass. The truckdriver said that when he reached the car, a fire had already started and the heat was too intense for him to approach it. The witness said that a fire began inside the car almost immediately and that several seconds later the fire spread to the ground under the cargo tank. The truckdriver said that he ran to the Texaco service station and called 911.

[1] Additional information was unavailable because the car driver's family refused to cooperate with Safety Board investigators.

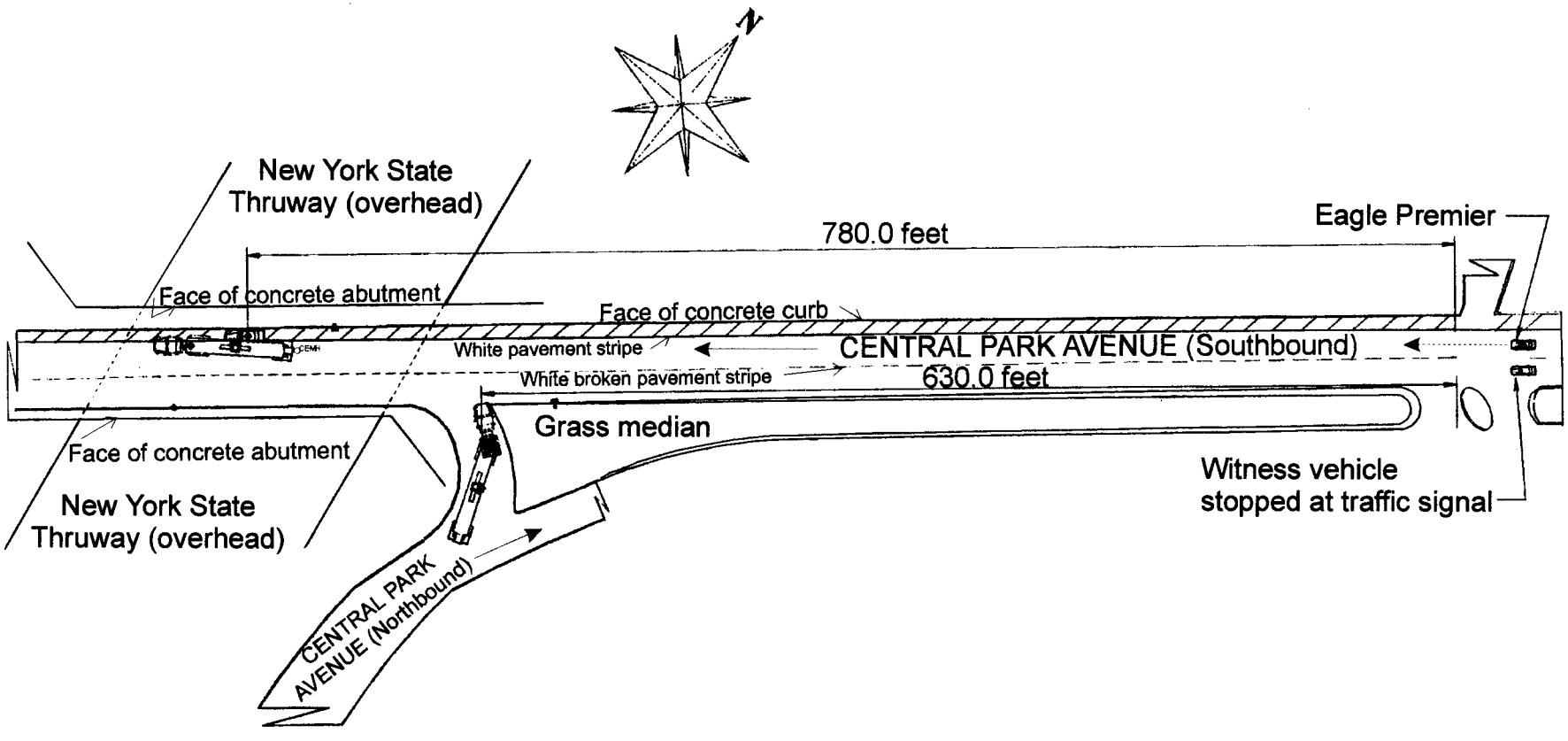


**Figure 1.—Schematic of accident scene.**

Within several minutes both vehicles were fully engulfed in a massive fire, as was the thruway overpass.

The first fire fighters from the Yonkers Fire Department arrived within 8 minutes of the department being notified of the accident and immediately requested additional fire apparatus. A total of 17 fire department vehicles and 58 employees responded to the scene before the fire was extinguished, about 1:30 a.m.

The car driver, who had been killed, was found in the rear seat area of his vehicle. The rear passenger-side door was ajar, unobstructed, and operational. About 3:15 p.m., he was extricated from his vehicle and taken to the Westchester County Medical Examiner's Office for an autopsy and toxicological testing.

## POSTACCIDENT INVESTIGATION

Several hours after the fire had been extinguished and the fumes cleared from the underpass, Safety Board investigators inspected the scene and the accident vehicles. Due to the fire, the investigators were unable to find any physical evidence, such as skid marks, on the road. (See figure 2.) The investigators later examined the truck and the passenger car more thoroughly at the New York State Department of Transportation's maintenance yard in Yonkers. The inspection revealed little about the mechanics of the vehicles because they had been so extensively damaged by the fire.

### Car

The impact pushed the left front quarter panel of the car to the right about 15 inches. A narrow, penetrating gouge ran along the left edge of the hood. The left front wheel assembly was displaced rearward approximately 18 inches, and the outboard edge of the wheel was damaged. The driver's side door was pushed inward and rearward, and the length of the door was gouged horizontally. Because of the intense heat of the fire, the entire roof had buckled inward. The interior and exterior of the car were destroyed by the fire. (See figure 3.)

**Figure 2.—Vehicles after fire**.

The accident had not intruded into the passenger's compartment, and there was no evidence that the car driver had suffered from blunt trauma or fractures. According to the autopsy report, he died from burns and smoke inhalation. That he was able to crawl into the rear seat area after the accident, in an apparent attempt to flee the car and the gasoline, also suggests that he was not seriously hurt by the impact. Consequently, the Safety Board concludes that the car driver would have survived the accident had there not been a fire.

## Truck

The truck was dark green; reflective tape had been used as part of the motor carrier's logo on the sides and rear. The cargo tank also had reflective tape on both sides and on the rear. The cargo tank had four 7 ½-inch amber turn signals; they were mounted at a 35-degree rearward angle at mid-point and rear locations. The gross weight of the truck and cargo was approximately 77,950 pounds.

The tractor had an EM7-300 diesel engine and a 7-speed transmission. Because the shifter linkage coupler had been damaged by the fire, it was not possible to determine the gear position. Mystic's records indicated that the tractor had been serviced a month before the accident and was in good mechanical condition. (See figure 4.)

The cargo tank was a 1994 Fruehauf, type MC-306[2] model. It was made of aluminum and had five internal compartments. It had a 9,200-gallon capacity and was 42.5 feet long. When it was empty, it weighed 10,270 pounds; however, at the time of the accident, it weighed about 53,680 pounds because it carried 8,800 gallons of gasoline.

Most compartments of the MC-306 model are loaded and unloaded through an opening at the bottom. Each opening has an internal valve that keeps the product inside the compartment. Each compartment is connected to an outlet valve by a 4-inch-diameter aluminum loading line. Each loading line is attached to a device that is designed to break during an accident to prevent the loading line from tearing a hole in the bottom of the compartment and releasing the contents. (See figures 5a and 5b.)

When the accident car was observed in its final position, it was wedged between the cargo tank and the curb, in the area of the cargo tank's loading lines; the left side of the car was touching the right side of the cargo tank in the area of the loading lines, and the car's right wheels were against the north curb line. A section of aluminum from the cargo tank had melted and become attached to the car. The aluminum was near the firewall at the driver's position and at the base of the "A" pillar (the pillar to which the left side of the windshield is attached). Two sections of chain (typically used to attach end caps to loading lines) had melted onto the car. One section had become attached to the car's upper door trim in the area just behind the spot where the side view mirror had been mounted, and the other section was attached to the upper edge of the left quarter panel at a point near the center of the panel. The investigators also found an end-cap cam-lock arm on the support cross member of the car's radiator; the carrier later identified the cam-lock arm as having secured an end cap to a loading line.

Based on the way in which the vehicle was damaged and on the statement of the witness, the Safety Board believes that the car probably struck the cargo tank near the loading lines. The positions of the sections of the aluminum and the chains that had melted onto the car were adjacent to the loading lines of the cargo tank.

The loading lines, which the Safety Board calculated held approximately 28 gallons of gasoline, had been heavily damaged by the fire and were fractured and deformed. Because the front-end left side of the car hit the loading lines, it is reasonable to believe that the impact broke the driver's side window, allowing gasoline from the loading lines to enter the car's passenger compartment. Therefore, the Safety Board concludes that the car struck and fractured one or more of the loading lines of the cargo tank, thus releasing up to 28 gallons of

[2]As of September 1, 1995, MC-306 cargo tanks were no longer authorized for construction; they have been replaced with DOT-406 cargo tank construction designs. The DOT-406 cargo tank incorporates the same specifications for external loading lines as its predecessor, the MC-306.

**Figure 3.— Car after fire.**

**Figure 4.—Truck after fire.**

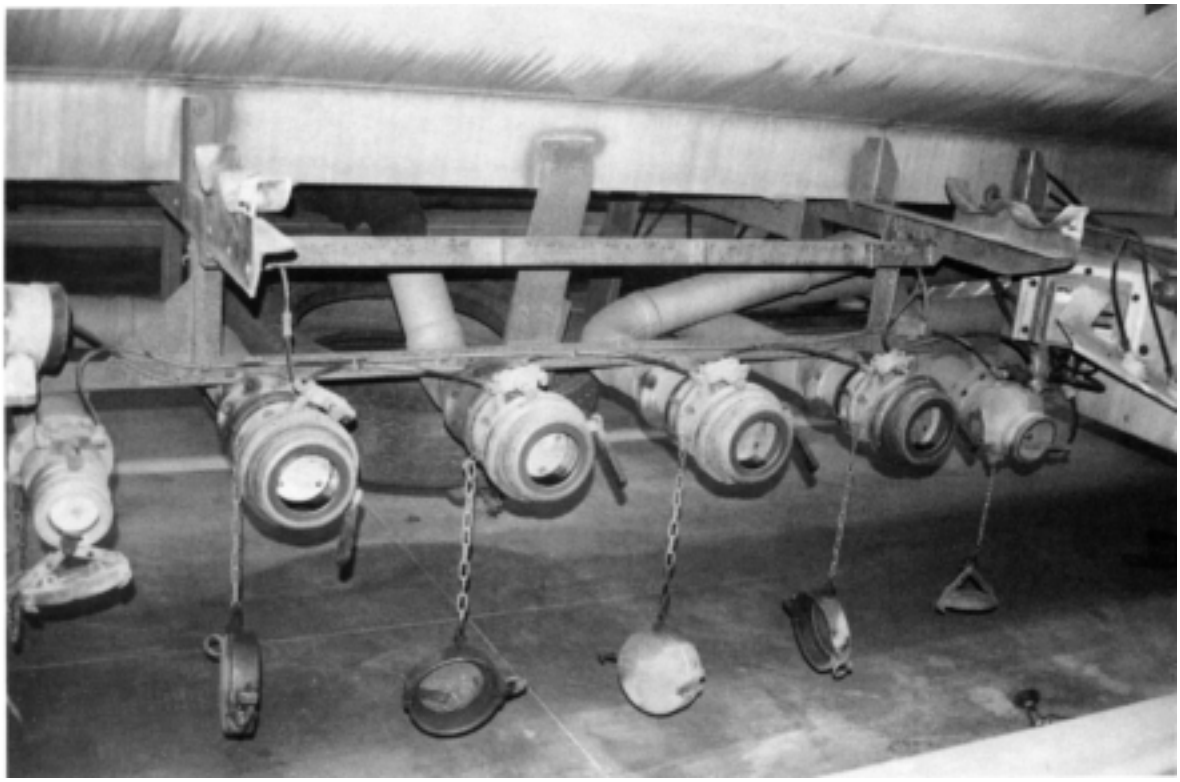

**Figure 5a.—View of loading lines.**

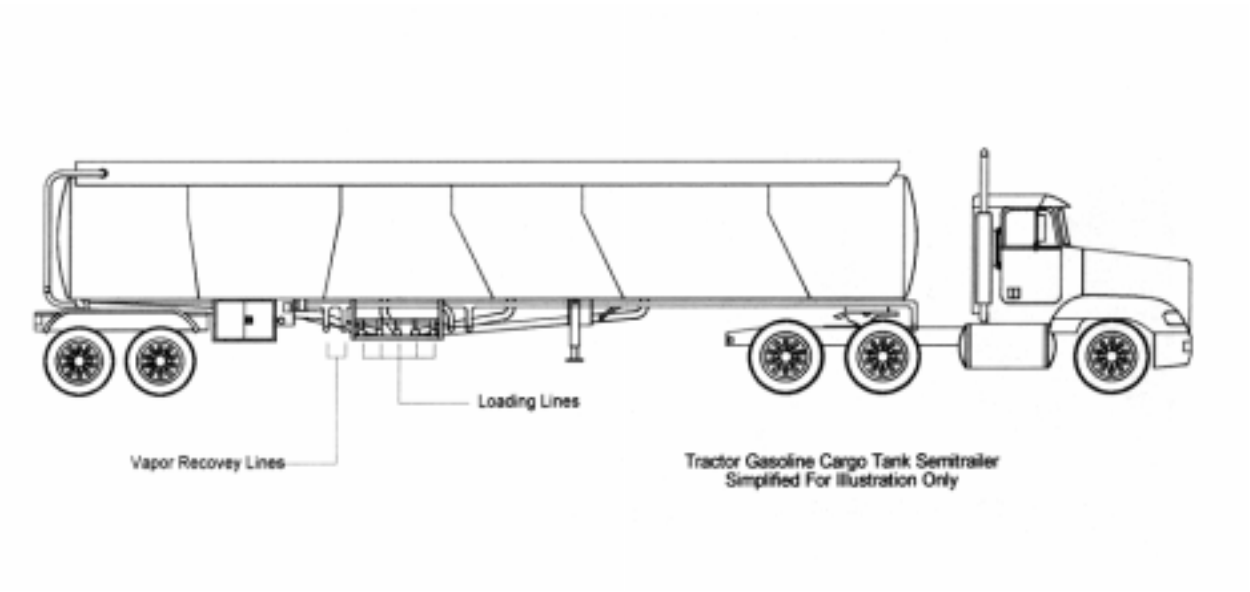


**Figure 5b.—Schematic of tank truck showing location of loading lines.**

gasoline. The Safety Board believes that the immediate result was a fire inside and below the car.

The heat of the fire had partially consumed the cargo tank, melting much of the shell in the upper half of the tank. (See figure 6.) Consequently, the fuel for the initial fire was the gasoline that was released from the cargo tank's loading lines during impact. The fire was then fed with gasoline from the cargo tank's compartments. The Safety Board concludes that had the loading lines been empty, the fire would likely not have occurred.

### Truck's Visibility

On January 22, 1998, the Safety Board conducted tests to determine the amount of time it took the truck to complete the U-turn and to determine whether the car had been visible to the truckdriver during this time. The tests were done at the accident site, and the investigators used a Mystic truck that was similar to the accident truck and loaded with approximately the same amount of gasoline. The time and distance calculations for the relative positions of the vehicles were based on estimates of the car's speed (ranging from 35 to 50 mph) and of the average rate of acceleration for the truck.

The tests showed that the accident truck had probably occupied the entire area within the U-turn lane while it was stopped and that to complete the U-turn, the truck had probably had to occupy both lanes and the shoulder of Central Park Avenue.

The tests showed that the average amount of time that it took the truck to reach the area of impact was 14.6 seconds; the distance from the yield sign to the area of impact was approximately 50 feet. The tests also showed that a car traveling 39 mph or more would not have been visible to the truckdriver when he began to make the U-turn. (See the appendix for details.) Because the accident car was traveling at least 39 mph, the Safety Board concludes that when the truckdriver made his U-turn, he could not have seen the car.

At the time of the accident, the southbound entrance of the thruway overpass was

**Figure 6.—Melted tanker truck.**

illuminated by the parking lot lights of a restaurant that was next to the roadway. The Safety Board believes that the accident truck was visible to any approaching vehicle on Central Park Avenue. The truck was so visible to the witness that he was able not only to verify that the truck's lights were on, but was also able to identify the truck's color and markings. Therefore, the Safety Board believes that the driver of the accident car should have been able to see the truck and avoid the accident.

### Truckdriver

The truckdriver was 41 and had been employed by Mystic since November 1993. He held a Class A New York Commercial Vehicle Driver's License with endorsements that licensed him to operate the accident truck. His records showed that his license had been suspended twice, once in 1989 and once in 1990. Since being employed by Mystic, he had not received any additional traffic citations. However, he had been involved in three minor traffic accidents. His records also showed that at the time of the accident he was in compliance with the hours-of-service regulations.

The truckdriver told the police at the scene of the accident that he had taken some cocaine about 8 a.m. the previous morning. The police later stated that he did not exhibit any obvious signs of physical or cognitive impairment. Approximately 2 hours after the collision, he was taken to a local hospital, where he gave blood for toxicological testing. The Westchester County Medical Examiner's Office tested his sample and found 0.023 micrograms/milliliter of cocaine and 1.23 micrograms/milliliter of benzoylecgonine, a metabolite of cocaine.

The level of cocaine in his blood was indicative of relatively recent use, probably before or during his shift. Nevertheless, he had stopped his vehicle before entering the intersection. Safety Board tests established that he could not have seen the southbound car when he began the turn. Once the truck had entered the southbound lanes, he was committed to completing the turn and did so without delay. There is no reason to believe that an unimpaired truckdriver would have performed the U-turn any differently. Therefore, the Safety Board concludes that the truckdriver's use of cocaine did not cause or contribute to the accident.

### Car Driver

According to the records of the New York Motor Vehicle Department, the 62-year-old car driver had a valid driver's license. He had been involved in two accidents that had resulted in injuries and in one accident that had resulted in property damage. One of the accidents that resulted in injuries happened on October 11, 1994, in the Bronx; the other one happened on April 5, 1995, in Queens. The accident resulting in property damage happened on April 28, 1996, in Westchester County. He had also been cited for disobeying a traffic control device in Manhattan on March 6, 1996.

His toxicology test was negative for alcohol and other specified drugs.[3] After the accident, he was found in the rear seat of his vehicle, suggesting that he was trying to escape from the vehicle and fire, evidence that he was not seriously injured immediately after the collision.

The Safety Board could not determine the cause of the car driver's actions. He could have (1) stopped for the red light, (2) reduced his speed while he was approaching the truck, and/or (3) applied his brakes soon enough to avoid the collision. Instead, for unknown reasons, he continued driving until his car struck the truck. Therefore, the Safety Board concludes that the car driver's actions were inappropriate and caused the accident.

### Motor Carrier

Mystic is an interstate common carrier, a New York corporation that has served New York and New Jersey with flammable and combustible petroleum products since 1973. Mystic is registered with New York and New Jersey, the Department of Transportation (DOT), the Federal Highway Administration's (FHWA's) Office of Motor Carriers, and the Research and Special Programs Administration[4] (RSPA) as a hazardous materials carrier.

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[3]Cocaine (metabolites), amphetamine, cannabinoid carboxy, opiates, and phencyclidine.

[4]RSPA is a regulatory agency within the DOT; RSPA

Mystic is associated with Mystic Transportation, Inc., which is also an interstate common carrier of dry non-bulk goods. The same principal owns both companies, and they share mechanics, vehicles, and drivers. The companies employ about 175 drivers and operate 24 hours a day, 7 days a week, making deliveries to residential and commercial customers. Mystic owns 157 truck tractors, 220 cargo tank semitrailers, and 57 straight tank trucks, which travel a total of approximately 9.6 million miles a year.

All Mystic drivers are required to participate in random and "for cause" drug screens. In his time with Mystic, the truckdriver had passed one drug screen that was part of his biannual medical examination and four random drug screens that were for the drugs, including cocaine, that are specified in DOT regulations.[5] (The drug screens were on November 16, 1993, March 10, 1994, November 2, 1995, and June 11, 1996.)

Although the truckdriver tested positive for cocaine after the accident, the Safety Board believes that the motor carrier screened its drivers for drugs in accordance with applicable regulations. Since 1993, the truckdriver had been tested for drugs five times. Each time, the results were negative. Thus, Mystic, through its drug screening program, had made a reasonable effort to oversee the truckdriver.

promulgates hazardous materials regulations in Title 49 *Code of Federal Regulations*.

[5]Cocaine (metabolites), amphetamine, cannabinoid carboxy, opiates, and phencyclidine.

## SAFETY ISSUE

While investigating the Yonkers accident, the Safety Board found that the accident's most significant element was not its cause, but its severity. A similar error on the part of a car driver might have had far less serious consequences—such as some damage to the car and truck, slight injuries, or both. In this case, however, one person died and the property damage was substantial. The crucial difference was the presence of gasoline in the loading lines. Therefore, the Safety Board considered whether and how the effects of the accident could have been reduced.

Most MC-306 and DOT-406 cargo tanks used to transport petroleum distillate fuels are loaded through bottom loading lines and then operated on the roads with cargo in these lines. However, because of their design, location, and vulnerability to being hit by other vehicles on the road, the practice of transporting hazardous materials in loading lines significantly increases the potential seriousness of any accident because cargo may be released from the damaged lines.

Safety Board investigators demonstrated the vulnerability of loading lines by placing 12 passenger vehicles (varying in type and size) near the loading lines of a cargo tank that was similar to the accident cargo tank. Each vehicle was placed so that the angle between it and the truck was approximately the same as the angle between the accident car and the accident truck. The investigators found that each of the 12 vehicles would have struck the loading lines of the truck had the vehicle moved forward. (See figure 7.) Therefore, the Safety Board believes that most vehicles currently in use are capable of striking the loading lines of cargo tanks.

Five months after this accident, the Safety Board investigated a similar accident that happened on February 15, 1998, in Wilmington, Delaware. A 1995 Freightliner tractor pulling a Heil MC-306 cargo tank carrying 8,900 gallons of gasoline was on I-495. As the truck crossed a bridge, the right front of the tractor struck the left rear of a 1988 Chevrolet parked on the right shoulder, pushing it into a concrete barrier bordering the shoulder of the bridge. A fire ensued that destroyed the car and moderately damaged the truck. The car occupant was killed by the impact; the truckdriver was not injured. The estimated property damage was $90,000. The Safety Board determined during its investigation that three of the four loading lines fractured during the collision, releasing approximately 12 gallons of gasoline.

In 1978, an FHWA memorandum established the FHWA policy of allowing gasoline to be carried in loading lines because of "economic and practicality considerations."

In 1985, RSPA issued a Notice of Proposed Rulemaking (NPRM) (Docket Nos. 183 and 183A) that increased bottom accident damage protection for cargo tanks, including the loading lines. In the process of developing the final rule, the RSPA staff prepared an issue option memorandum in 1988 that discussed the external piping issue. The internal memo noted:

> It is unreasonable and illogical to allow the piping to be considered as an acceptable container for the transport of gasoline. Therefore, the petroleum industry's decision to bottom load in compliance with the Clean Air Act [CAA] and their unwillingness or inability to drain the cargo lines has resulted in widespread noncompliance with the intent and letter of the Hazardous Material Regulations as interpreted by RSPA for the transportation of gasoline.

When RSPA published its final rule in 1989, it noted that loading lines are not appropriate packaging for hazardous materials:

> Bottom loading and unloading outlets on cargo tanks, although very useful, present the inherent risk that if damaged the entire contents of the tank may be released. Piping attached to the outlet valve is provided with a sacrificial

**Figure 7.—Two views of cars next to loading lines.**

device that is designed to break under accident loads…. Because such piping under the current regulation is not specifically a part of the product containment vessel and is designed to fail in an accident, RSPA's position is that piping between the tank outlet valve and any loading valves is not an appropriate packaging for the transportation of hazardous materials.

As a part of the implementation of the CAA, the Environmental Protection Agency required that cargo tanks used in areas operating under the Environmental Protection Agency's State Implementation Plan for the CAA must be equipped with a vapor recovery system. The petroleum industry chose to use bottom loading in conjunction with tank top vapor recovery as their method of compliance with the CAA. All motor fuels must be metered for tax purposes. Unfortunately, in implementing this system the industry did not provide for a way to drain product from the cargo tank piping back into the loading facility and maintain proper accounting for tax purposes. As a result, cargo tanks are currently operated with gasoline in external piping that is designed to fail in an accident. The operation of cargo tanks with lading retained in external piping is generally limited to petroleum distillate fuels metered for road fuel tax purposes and transported in bottom loaded MC-306 type cargo tanks. The scope of these operations encompasses the vast majority of all gasoline transported.

RSPA strongly believes the practice of transporting hazardous materials in exposed unprotected piping designed to fail, if impacted in an accident, is an unnecessary risk.… Accordingly, RSPA proposed in the NPRM a prohibition on the transportation of hazardous materials in external piping unless the piping is protected by very substantial guards.

Commenters for the petroleum industry, represented by the American Petroleum Institute (API)[6] and several large petroleum companies, argued that the need for bottom damage protection structures to protect piping containing lading is not justified. They argued that, based on statistical data showing the infrequency of accidents involving these lines, the relatively small amounts of product exposed, and the integrity and operation of current self-closing valves, the loss of lading from piping is not a significant problem. [Footnote added.]

RSPA agrees that accidents resulting in damage to unprotected external piping carrying lading are infrequent, but the consequences of such accidents can be substantial, particularly if the material released has inherent hazards greater than that of gasoline.…[W]ith the exception of gasoline, the transportation of hazardous materials in external unprotected piping is prohibited. For hazardous materials other than gasoline, transportation in external unprotected piping is less common and thus the prohibition of such transportation will have a much lower cost impact. However, if the transportation of gasoline in external unprotected piping were prohibited, the impact on the petroleum industry could be substantial.

Although we have very serious concerns with the practice of transporting gasoline in external unprotected piping, we do not have sufficient data regarding incidents that can be attributed to the dislodging of piping to justify prohibiting the practice for gasoline at this time. Nor do we have adequate information concerning possible alternative procedures or equipment for accomplishing vapor recovery and road fuel tax metering and the costs associated with these alternatives. Many of the potential cost effective ways to eliminate the risk

[6]The API is the trade association that represents the petroleum industry in exploration and production, transportation, refining, and marketing.

> associated with the transportation of gasoline in external unprotected line may entail alterations to the cargo tank piping, fixed loading and unloading equipment, or both. For these reasons we are excepting gasoline from the prohibition on the transportation of hazardous materials in external unprotected piping. However, we encourage the petroleum industry to consider the risk they accept in employing this practice, and work to eliminate it. We believe the petroleum industry is best positioned to consider and evaluate all the possible ways to eliminate this risk in the most cost effective manner.

In response to RSPA's encouragement to eliminate this practice, the API analyzed the risks of carrying hazardous materials in loading lines. It reported to RSPA in 1994 that:

> The analysis of wet line [loading line] accident statistics indicates that the probability is quite low that a fatality will be directly attributable to a wet line failure in an MC-306 tank truck accident. Twenty-four of the 25 MC-306 accidents involving wet line releases did not result in an injury (11 years of data).
>
> The wet lines are most vulnerable to side-on impacts…. The majority of reported wet line spills are under 20 gallons…. For this spill size of 20 gallons the calculated maximum injury radius is 36 feet. The potentially hazardous areas are then limited to the immediate vicinity of the tank truck and do not directly threaten the public in the neighboring community.

The API also reported that based on the results of this risk analysis, it had cancelled a study to evaluate alternate means of loading cargo tanks that would result in dry loading lines.

In the interim, RSPA amended the regulations in 1990 to prohibit the transportation of poison B liquids, oxidizer liquids, liquid organic peroxides, and liquids corrosive to the skin in loading lines unless there was adequate bottom damage protection. The rulemaking permitted carriers to continue to transport petroleum products and other hazardous materials in loading lines without bottom damage protection.

The Safety Board concludes that transporting hazardous materials in loading lines creates a hazardous condition. Therefore, the Safety Board believes that the DOT should prohibit the carrying of hazardous materials in external piping of cargo tanks, such as loading lines, that may be vulnerable to failure in an accident.

The statistics that RSPA used in developing its 1989 Final Rule came from the Hazardous Materials Information System (HMIS), managed by the DOT's Office of Hazardous Materials Safety. The HMIS is a data base of information taken from Hazardous Materials Incident Reports, the reports that interstate motor carriers must file when hazardous materials are released from packaging, including cargo tanks

Safety Board investigators reviewed the HMIS data from January 1990 through August 1997 involving MC-306 cargo tanks. During this period, 501 incidents were reported as accidents; 47 involved loading line failures caused by impact. Of the 47 failures, 27 involved collisions with other vehicles; 16 involved trucks hitting stationary objects; and 4 involved overturned vehicles.

While interstate carriers are currently required to report hazardous materials releases, wholly intrastate carriers are not. Therefore, the data reviewed may not include all loading line failures during accidents.

The Safety Board in its *Cargo Tank Rollover Protection Special Investigation Report* dated February 4, 1992, noted, "In addition to the underreporting of accidents, inadequately reported and recorded information can also mask trends or a specific pattern of performance." The Yonkers accident is an example of an inadequately reported and recorded accident. The incident was reported to RSPA, but the Hazardous Materials Incident Report did not identify the incident as a loading line packaging failure. Instead, the motor carrier marked "other" on the report. In the description of events, the motor carrier stated, "motorist collided with tanker." The Safety Board's *Cargo Tank Rollover Protection Special Investigation*

*Report* concluded, "The FHWA and RSPA accident data bases are not adequate to identify important trends or potential problems related to the design and construction of bulk, liquid cargo tanks." Therefore, the Safety Board believes that the number of loading line accidents may be underrepresented in the HMIS data base.

In its *Cargo Tank Rollover Protection Special Investigation Report* the Safety Board recommended that RSPA:

H-92-6

Implement, in cooperation with the FHWA, a program to collect information necessary to identify patterns of cargo tank equipment failures, including the reporting of all accidents involving a DOT specification cargo tank.

The Safety Board also recommended that the FHWA:

H-92-9

Implement, in cooperation with RSPA, a program to collect information necessary to identify patterns of cargo tank equipment failures, including the reporting of all accidents involving a DOT specification cargo tank.

On January 21, 1998, the FHWA responded that it and RSPA agreed with the Safety Board and were pursuing methods to improve the data collection and analysis. The FHWA said the two agencies were (1) revising the Hazardous Materials Incident Reports to identify patterns of cargo tank failures; (2) developing a commercial motor vehicle crash reconstruction course that included a segment designed to educate investigators about documenting damage to cargo tanks; and (3) requiring their field staffs to report significant crashes involving fatalities, multiple injuries, road closures in excess of 4 hours, fire, explosions, evacuations, and other significant occurrences involving cargo tanks. The FHWA stated that it ultimately expected these efforts to identify unsafe trends and to measure the success of its safety programs.

The Safety Board is disappointed that after 6 years action has not been completed to identify and collect information needed to evaluate cargo tanks and include this information on RSPA and FHWA reports. The Safety Board urges RSPA and the FHWA to expedite action on these recommendations. Safety Recommendations H-92-6 and H-92-9 are classified "Open—Unacceptable Response." The Safety Board reiterates Safety Recommendations H-92-6 and -9.

The Safety Board is unable to determine the number of MC-306 and DOT-406 cargo tanks currently in use. None of the government agencies or industry associations, including the FHWA, RSPA, the API, the Truck Trailer Manufacturers Association,[7] and the National Tank Truck Carriers,[8] are able to provide an accurate count. In 1984, Dynamic Sciences estimated for the DOT that the MC-306 cargo tank population was approximately 57,900. However, based on comments from the industry during this investigation, the Safety Board believes that the current number of MC-306 and DOT-406 cargo tanks is larger than the 1984 estimate suggests.

[7]The Truck Trailer Manufacturers Association is a trade association. Its purpose is to establish confidence between truck trailer, cargo tank, and intermodal container manufacturers and their suppliers to bring about a mutual understanding of the problems confronting all manufacturers.

[8]The National Tank Truck Carriers is a trade association. It represents and promotes the interests of the highway bulk transportation community before the U.S. Congress and other Federal agencies.

# FINDINGS

## CONCLUSIONS:

1. The car driver would have survived the accident had there not been a fire.

2. The car struck and fractured one or more of the loading lines of the cargo tank, thus releasing up to 28 gallons of gasoline.

3. Had the loading lines been empty, the fire would likely not have occurred.

4. When the truckdriver made his U-turn, he could not have seen the car.

5. The truckdriver's use of cocaine did not cause or contribute to the accident.

6. The car driver's actions were inappropriate and caused the accident.

7. Transporting hazardous materials in loading lines creates a hazardous condition.

## PROBABLE CAUSE:

The National Transportation Safety Board determines that the probable cause of this accident was the failure of the car driver to (1) stop for the red light or (2) reduce his speed or (3) apply his brakes soon enough to avoid the collision. Contributing to the severity of the accident was the fire resulting from the release of gasoline that the cargo tank's loading lines were carrying, as permitted by the U.S. Department of Transportation.

## RECOMMENDATION

As a result of its investigation of this accident, the National Transportation Safety Board makes the following safety recommendation.

--**to the Secretary of Transportation**:

Prohibit the carrying of hazardous materials in external piping of cargo tanks, such as loading lines, that may be vulnerable to failure in an accident. (H-98-27)

**BY THE NATIONAL TRANSPORTATION SAFETY BOARD**

**JAMES E. HALL**
**Chairman**

**ROBERT T. FRANCIS II**
**Vice Chairman**

**JOHN A. HAMMERSCHMIDT**
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**GEORGE W. BLACK, JR.**
**Member**

**May 5, 1998**

# APPENDIX

**Table 1:** Time and Distance for the Eagle Premier:

| **Eagle Premier Speed** [a] | **Approximate Distance to Impact Area** | **Calculated Time** |
|---|---|---|
| 35 mph (51.3 fps) | 680 feet | 13.3 seconds |
| 40 mph (58.6 fps) | 680 feet | 11.6 seconds |
| 45 mph (65.9 fps) | 680 feet | 10.3 seconds |
| 50 mph (73.3 fps) | 680 feet | 9.3 seconds |

a. Assumes a constant velocity for the passenger car.

**Table 2:** Time and Distance for the Exemplar Truck

| **Distance Truck Traveled from a Stop to Impact Area** | **Measured Time** | **Calculated Acceleration Rate/Factor** |
|---|---|---|
| 176ft | 17.17 sec | 1.2/0.04 |
| 176 ft | 15.27 sec | 1.5/0.05 |
| 176ft | 14.56 sec | 1.6/0.05 |
| 176 ft | 13.53 sec | 1.9/0.06 |
| 176 ft | 12.44 sec | 2.3/0.07 |
| Average | 14.60 sec | 1.6/0.05 |

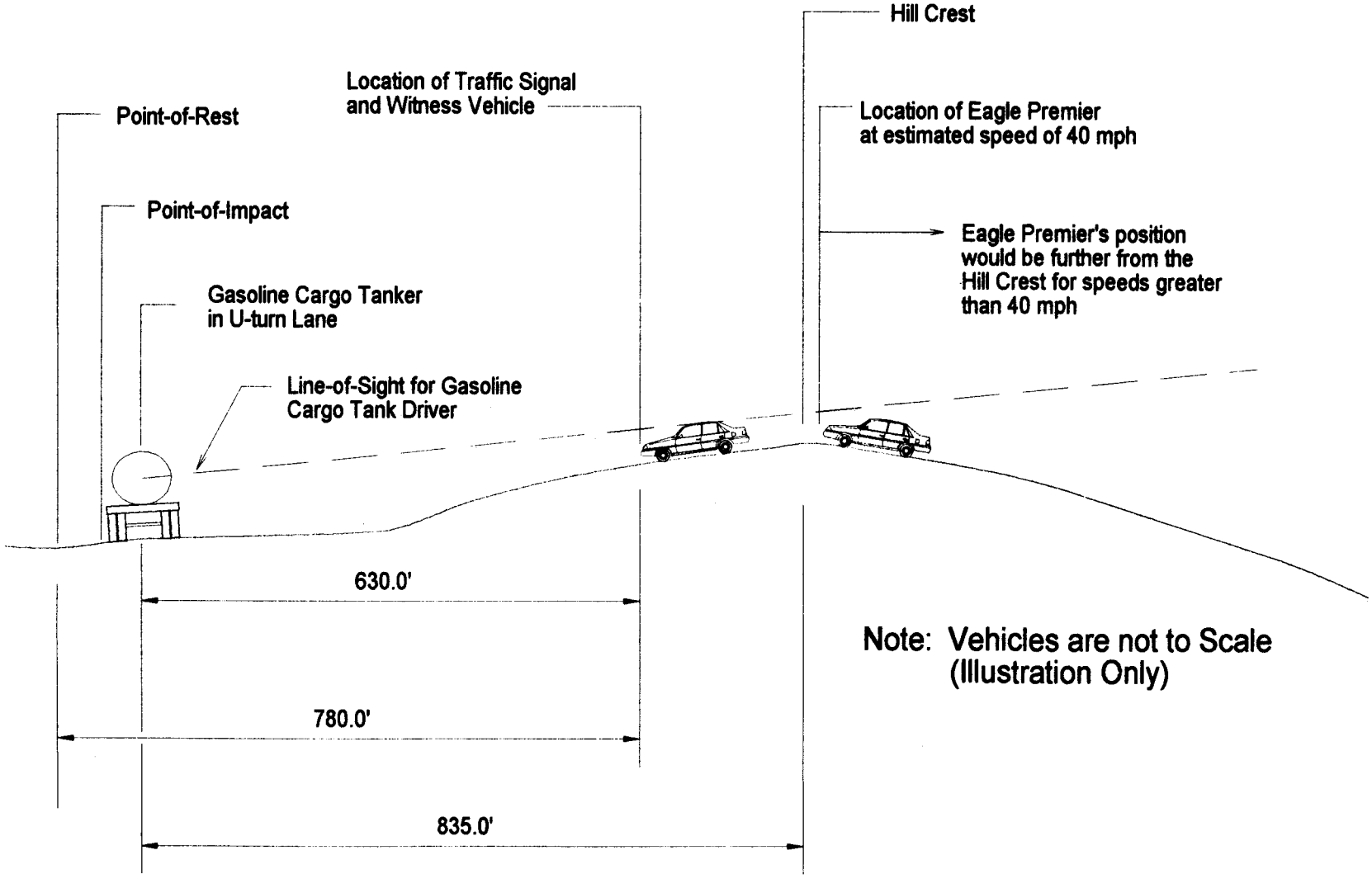
**Table 3:** Relative Time and Distance to Impact Area

| Truck | Eagle Premier | Speed/Velocity | Time |
|---|---|---|---|
| 176 ft | 749 ft | 35 mph/51.3 fps | 14.6 sec |
| 176 ft | 856 ft | 40 mph/58.6 fps | 14.6 sec |
| 176 ft | 962 ft | 45 mph/65.9 fps | 14.6 sec |
| 176 ft | 1070 ft | 50 mph/73.3 fps | 14.6 sec |

**Additional Calculation Information**

According to the profile drawings of Central Park Avenue that Yonkers gave the Safety Board, the apex of the vertical curve was about 835 feet from the position of the truck while it was stopped in the U-turn. Safety Board investigators measured the height from the ground to a position relative to the center of the passenger side window, representing the truckdriver's seated height; which was approximately 7 feet 9 inches above the ground. With the truck stopped at the U-turn, the driver's field of view, looking northbound through the passenger side window, would be 2 feet 3 inches below the crest of the hill.

Calculations were made to determine where the Eagle Premier would have been 14.6 seconds before the accident and whether it would have been visible to the truckdriver. Several factors were considered in arriving at appropriate speed estimates. First, the witness estimated the speed of the Eagle Premier as between 40 to 45 mph; second, the speed limit on Central Park Avenue is 40 mph; and third, the Eagle Premier driver was late for work. Given this information, speed estimates ranging from of 35 mph to 50 mph were used.




Profile & Line-of-Sight