

**CRASH DATA RESEARCH CENTER**  
Calspan Corporation  
Buffalo, NY 14225

**CALSPAN ON-SITE MOTORCOACH FIRE INVESTIGATION**

**SCI CASE NO.: CA10016**

**VEHICLE: 1995 MCI MODEL 102-DL3**

**LOCATION: CONNECTICUT**

**INCIDENT DATE: APRIL 2010**

Contract No. DTNH22-07-C-00043

Prepared for:

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Because each crash is a unique sequence of events, generalized conclusions cannot be made concerning the crashworthiness performance of the involved vehicle(s) or their safety system.

**TECHNICAL REPORT STANDARD TITLE PAGE**

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**CALSPAN ON-SITE MOTORCOACH FIRE INVESTIGATION**  
**SCI CASE NO.: CA10016**  
**VEHICLE: 1995 MCI MODEL 102-DL3**  
**LOCATION: CONNECTICUT**  
**INCIDENT DATE: APRIL 2010**

**BACKGROUND**

This on-site investigation focused on the origin and severity of a fire that initiated in the drive axle area of an in-transit motorcoach. The motorcoach was a 1995 Motor Coach Industries (MCI) Model 102-DL3. The motorcoach had a 55-passenger capacity and was occupied by a male driver and 40 adult passengers at the time of the incident. While traveling on an interstate roadway, the passengers heard a loud noise, detected smoke, and alerted the driver to a potential problem. The driver brought the motorcoach to a controlled stop on the right shoulder of the interstate several miles south of where the passengers initially reported the potential problem. The driver ordered the immediate evacuation of the motorcoach. All passengers exited safely without injury. Numerous cellular calls were placed to the emergency response system to request police and firefighting assistance. The local fire department responded to the call and extinguished the fire. The fire consumed the back exterior of the motorcoach and spread to the interior of the vehicle, causing extensive damage to the entire passenger compartment. **Figure 1** is an on-scene view of the motorcoach fully engulfed in fire.



**Figure 1. On-scene view of the motorcoach fire prior to the arrival of the fire department. (Image obtained from an Internet news site.)**

The notification of this incident was provided to the Calspan Special Crash Investigations (SCI) team by the Crash Investigation Division of the National Highway Traffic Safety Administration (NHTSA) on May 3, 2010. The SCI team initiated telephone contact with the Safety Director of the motorcoach company and established cooperation to allow an on-site inspection of the motorcoach. The motorcoach had been towed from the incident site to the company facility where it was inspected for this investigation. The SCI inspection involved a detailed documentation of the damage to the motorcoach, an inspection and documentation of the incident site, interviews with the safety and maintenance directors of the motorcoach company, and a brief interview with the investigating police officer. A fire expert reviewed the images and SCI documentation for this investigation. His review and opinion relating to the origin and cause is included as *Attachment A* of this report.

## ***SUMMARY***

### ***Incident Site***

This incident occurred on a divided interstate roadway during daytime hours. At the time of the incident, the conditions were overcast and dry. The temperature was 25 degree C (77 degrees F) with 20 percent humidity with 11 km/h (7 mph) winds out of the west-northwest. In the vicinity of the incident site, the interstate consisted of four southbound travel lanes, bordered by paved shoulders with a tactile warning system (rumble strips) cut into the shoulders outboard of the edge lines (**Figure 2**). The travel lane and shoulder surfaces were asphalt. A continuous W-beam guardrail system extended the full length of the outboard shoulder.



**Figure 2. Southbound trajectory view of the motorcoach.**

A grass median with a W-beam guardrail median barrier physically divided the north and southbound lanes. An off-ramp for southbound traffic was located at the incident site. The area south of the off-ramp adjacent to the travel lanes was surfaced with grass and was unprotected. On the approach to the incident site, the interstate was straight with a positive grade of less than 2 percent. The posted speed limit was 105 km/h (65 mph). **Figure 18** is a schematic of the incident site.

### ***Vehicle Data***

The involved motorcoach was a 1995 MCI Model 102-DL3 that was configured for 55 passengers. The motorcoach was manufactured in April 1995 and was identified by Vehicle Identification Number (VIN): 1M8PDMPA5SP (production number deleted). The motorcoach was powered by a Detroit Diesel Series 60, 11.1-liter engine that was linked to an Allison B-500 automatic transmission with four-forward speeds and one reverse. The service brakes were air-activated drum with DD-3 emergency and parking brake chambers on the drive axle. The suspension was an air-ride system that automatically maintained a constant ride height.

The fuel tank was located on the right side of the motorcoach between the E and F-pillars, immediately aft of the wheelchair lift. The steel fuel tank was manufactured by MCI of Winnipeg, Canada in March 1995. The tank had a capacity of 689 liters (182 US gallons/152 Imperial gallons). The side body panel and the filler cap had been salvaged from the motorcoach prior to the SCI inspection. The fuel tank was placarded with the following:

*This Fuel Tank Meets All FHWA Requirements For Non-Side Mounted Fuel Tanks.*

The vehicle placard listed the Gross Vehicle Weight Rating at 20,140 kg (44,000 lb). The Gross Axle Weight Ratings were 6,532 kg (14,400 lb) for the steer axle, 10,206 (22,500 lb) for the intermediate drive axle, and 5,443 kg (12,000 lb) for the tag axle. All axle ratings were with manufacturer specified 12.75-22.5(H) tires on 21x57 cm

(8.25x22.5 in) wheels. The manufacturer recommended cold tire pressures were 793 kPa (115 PSI) for the steer axle and 655 kPa (95 PSI) for the drive and tag axles. At the time of the incident, the motorcoach was equipped with 315/80R22.5 tires mounted on steel wheels. The specific tire data for the motorcoach at the time of the SCI inspection was as follows:

| <b>Position</b>     | <b>Manufacturer / Model</b> | <b>Measured Pressure</b> | <b>Measured Tread Depth</b> | <b>Damage</b>                                       |
|---------------------|-----------------------------|--------------------------|-----------------------------|---|
| Left Front          | Firestone / FS400           | Unknown                  | 13 mm (16/32 in)            | None  |
| Right Front         | Firestone / FS400           | Unknown                  | 13 mm (16/32 in)            | None  |
| Left Drive – Outer  | Unknown                     | Flat                     | Unknown                     | Tread burned smooth, sidewall burned full thickness |
| Left Drive – Inner  | Unknown                     | Flat                     | Unknown                     | Near complete burn of the sidewall and tread        |
| Left Tag            | Unknown                     | Flat                     | Unknown                     | Tread burned smooth, sidewall burned full thickness |
| Right Drive – Outer | Firestone FS400             | Flat                     | 10 mm (12/32 in)            | Tread and sidewall burned                           |
| Right Drive - Inner | Unknown                     | Flat                     | 10 mm (10/32 in)            | Tread and sidewall burned                           |
| Right Tag           | Firestone FS400             | Flat                     | Unknown                     | Tread and sidewall burned                           |

The battery compartment was located aft of the fuel tank between pillars E and F. The batteries were salvaged from the motorcoach along with the battery equalizer prior to the SCI inspection. The master cut-off switch was in the off-position.

The motorcoach was equipped with a wheelchair lift that was incorporated into the right side of the vehicle at the D- to E-pillar location. The system utilized a forward hinged door to the passenger compartment and a Ricon wheelchair lift that was stowed under the floor of the motorcoach. The wheelchair lift was not required for this trip as the interior was configured with seats at the location of the lift. The passenger seats in right rows 5 and 6 folded and detached from a floor track system to facilitate a wheelchair. Safety

belt restraints were mounted to the E-pillar to secure a wheelchair in position. There were no wheelchairs onboard the motorcoach at the time of the fire.

The interior of the motorcoach was configured with a right front loading door that was forward hinged. The staircase was stainless steel and consisted of four steps. The steps were surfaced with ribbed rubber matting. A handrail was mounted to the aft wall of the staircase and a grab-bar was mounted to the forward wall.

The driver's position was equipped with a suspension seat with an adjustable head restraint and a 3-point lap and shoulder belt system.

The passenger area on the motorcoach was configured for 55-passenger seating. The seats consisted of fabric covered high-back seats with reclining seatbacks and outboard armrests. There were 14 rows of seats on the left side and 13 rows on the right side of the center aisle. The back left of the motorcoach was configured with a 3-passenger seat adjacent to the partitioned restroom located in the back right corner.

Aircraft-style overhead luggage compartments were mounted to the ceiling of the motorcoach. These compartments were equipped with top-hinged fiberglass doors. Reading lights were incorporated into the bottom aspect of the overhead compartments. Four video monitors were positioned under the overhead compartments for passenger entertainment. The motorcoach was also equipped with wireless Internet access (Wi-Fi).

The motorcoach was equipped with two roof emergency exits at pillar locations B to C (seat rows 1-2) and G to H (seat rows 10-11). Both roof exits were destroyed by the fire. All side glazing panels were emergency push-out exits. None of the emergency exits were used during the evacuation of the motorcoach.

### ***Incident Sequence***

#### ***Pre-Incident***

The motorcoach was en route between major cities on a scheduled trip of approximately 362 km (225 miles). The motorcoach was occupied by the driver and 40 passengers. The motorcoach departed the terminal during daylight hours and traveled approximately 145 km (90 miles) on interstate roadways, traveling in a southerly direction. The driver conducted a brief stop at a rest area on the interstate. The passengers re-boarded the motorcoach and the driver continued in a southerly direction en route to the final destination of this trip.

#### ***Incident***

Within an hour of departing the rest area, the passengers reportedly heard a loud bang followed by a popping noise. They alerted the driver to the potential problem; however, he continued to drive at highway speeds for several minutes. Within this time frame, the passengers detected the odor of smoke in the back of the motorcoach and again alerted the driver. He slowed the motorcoach and brought the vehicle to a controlled stop on the right shoulder of the interstate immediately past an off-ramp to a local highway (**Figure 3**). At this point, smoke and fire was visible from the back of the motorcoach. The



driver ordered the immediate evacuation of the motorcoach and all passengers safely exited the vehicle through the right front loading door. They were instructed to leave all personal belongings on the bus to expedite the evacuation process. The passengers proceeded to the grassy area between the interstate and the exit ramp, a safe distance from the motorcoach.

### ***Post-Incident***

Cellular telephone calls were placed to the emergency response system to request police and firefighting assistance. The local fire department responded to the call and arrived on scene within 10 minutes of the call. The firefighters used water and foam fire retardant to suppress the fire. The firefighters also used a pike pole to remove the side windows from the motorcoach in order to ventilate the fire and gain access to the interior for water and foam retardant. The motorcoach company dispatched two motorcoaches to the scene of the fire to transport the passengers to their destinations. The motorcoach was subsequently towed from the scene and transported to a motorcoach company facility where it was inspected for this SCI investigation.

It should be noted that the motorcoach company initiated a salvage operation of the motorcoach on the day prior to the SCI inspection. This effort was initiated to remove all salvageable parts that could be used to repair other motorcoaches within their fleet.

### ***Vehicle Fire Damage***

#### ***Front***

Fire damage to the front of the motorcoach was confined to components above the beltline. The left windshield glazing was fractured and cracked at the lower aspect with two large cracks that radiated upward approximately three-quarters of the height of the glazing from the lower left corner. The right windshield glazing was intact. Both windshield glazing panels were soot and smoke stained on the interior surfaces, with the heaviest evident at the upper aspects. The windshield header was intact on the exterior, but displayed similar smoke staining on its interior aspect as well.

The frontal exterior below the level of the beltline was not damaged by the fire. The windshield wipers and bumper system were removed from the motorcoach prior to inspection. The spare tire was new and was located behind the bumper system. The spare tire was not damaged by the fire. **Figure 4** is a frontal view of the motorcoach.



**Figure 3. Area of the fire on the right shoulder of the interstate.**



**Figure 4. Frontal view of the motorcoach.**

### *Left Side*

The body paneling on the left side was intact on the forward half of the motorcoach. There were three underbody luggage compartments located between the left C- and D-pillars, D- to E-pillars and the F- to G-pillars. The air conditioning system was mounted between the second and third luggage bays. The top-hinged luggage bay doors and the AC system components were not damaged by the fire. The fire damage to the sheet metal surfaced



**Figure 5. Left side view of the fire damage to the motorcoach.**

began 170 cm (67 in) forward of the left drive axle. Progressing rearward from this point, the body panels and paint showed increasing heat damage, primarily blistering of the painted surfaces. High heat oxidation of the sheet metal body panels between the floor and the beltline was located 43-104 cm (17-41 in) forward of the left drive axle and were warped from the heat. The paint was burned off of the lower body panel forward of the left drive axle. The body paneling directly above the left drive and tag axle positions was heavily blackened from smoke and heat damage. There was an area of high heat oxidation 18-147 cm (7-58 in) aft of the tag axle with warping of the sheet metal. **Figure 5** is an overall view of the fire damage to the left side of the motorcoach.

The fire extended directly upward over the left rear axle positions into the three rear side glazing panels. Evidence of high heat was present on the left H- and I-pillars with the same evidence extending along the roof side rail from the G-pillar to the midpoint of the I- and J-pillar location.

The paint was burned off the lower body panel aft of the tag axle and the side access door to the engine compartment. The fiberglass corner panel at the left rear corner was melted, with damage extending full height to the roof area. The rubber splash shield over the rear axles was completely consumed by the fire.

### *Back*

The fire damage to the back plane of the motorcoach was extensive (**Figure 6**). The rear bumper fascia was charred, but intact with no burn-through. The center closing sheet metal doors to the engine compartment were closed with areas of isolated heat blistering, smoke staining, and paint charring. High heat evidence was located on the upper aspect of the left and right doors. These doors could not be opened due to heat induced body distortion. The louvered fiberglass radiator fan shroud that was located above the engine compartment was fully consumed by the fire. The copper core dual radiators were intact. The left radiator was not damaged,



**Figure 6. Fire damage to the back of the motorcoach.**

although the right sustained core damage from water pressure by the firefighters during the extinguishment activities. Both cooling fans were melted and the fire consumed the

drive belt. The fiberglass enclosure above the radiators was burned full-thickness in the lower middle area, with melted fiberglass remnants at the side and upper aspects. The left taillight assembly was fully consumed by the fire. The right taillight was moderately melted, though the assembly itself remained in place.

### ***Engine Compartment***

The SCI investigator could not access the engine compartment through the center closing rear doors. The painted surface of the doors was burned and the doors were jammed closed due to heat-related deformation of the door and surrounding structure. The engine compartment was viewed through the left side access door. This door provided access to the turbocharger and the exhaust system (**Figure 7**). The exhaust system and the turbocharger were intact. The turbocharger and the surrounding area did not display evidence of high heat commonly associated with fire origin. The cold air intake at the aft side of the left side mounted turbocharger was dislodged as the silicone connector burned from the intake tube. The fire spread rearward into the engine compartment and consumed the flammable insulation of the wiring and the rubber connectors for plumbing of coolant and air flow.



**Figure 7. Left side of the engine compartment and the turbocharger (arrow).**

### ***Right Side***

The right side of the motorcoach was burned to a lesser extent than the left side with the entire midsection between the floor and the beltline intact; inclusive of paint and body panels (**Figure 8**). The paint on the roof side rail at pillar locations G- through I- was smoke stained with minimal heat blistering. The paint on the lower rear compartment door, aft of the tag axle, was burned and blistered. The rear half of the rubber splash shield above the rear axles was intact with heat warp. The forward half of this shield was consumed by the fire. The remaining lower luggage compartment doors were removed pre-inspection and were not damaged. The batteries were undamaged and were salvaged from the motorcoach. The master switch was in the Off-position, and the battery equalizer was removed.



**Figure 8. Right side fire damage to the motorcoach.**

### ***Roof***

The roof of the motorcoach was constructed of a grid pattern of square stock tubing and surfaced on the outside with overlapping aluminum panels that spanned the pillar locations. The fire spread into the roof from the high fuel source of the left side drive and

tag axle tires. The roof was completely burned through at the left G- to I-pillar locations. The burn-through extended laterally from the side rail to the midline of the roof. The heat of the fire caused the roof structure to sag 5 cm (2 in) over left seating rows 9-11, at pillar locations G- to I. The right longitudinal roof rail was heat sagged approximately 3 cm (1.25 in) adjacent to the right G- to I- pillars. The right side of the roof and roof side rail was not involved and the forward aspect of the left roof (A- to F-pillars) was not involved. The fire spread forward through the interior overhead compartments and the headliner. **Figure 9** is a view of the fire and heat-related damage to the roof of the motorcoach.



**Figure 9. Burn-through and sag of the roof and roof structure of the motorcoach.**

### ***Glazing***

The laminated windshields remained intact within the gasket mounts. As previously noted, the left windshield was cracked by heat with smoke and soot staining to the upper inside surface. The lower corner was pulled out by firefighters during the containment activities. The right windshield was smoke and soot stained with the heaviest concentrations on the upper surface.

The sides of the motorcoach contained eight large glazing panels for the passenger compartment. This glazing was deep tinted laminated glass bonded to aluminum push-out emergency exit frames.

The firefighters used a pike pole to penetrate and remove the rear side glazing panels in an effort to ventilate the fire and gain access to the interior for water and fire suppression foam. The glazing panels between the left A- and B-pillars, adjacent to the driver's position, were removed by the motorcoach company post-event. The two forward glazing panels for the passenger compartment were intact with smoke and soot staining. The firefighters holed the third glazing panel located between the D- and E-pillars. This glazing panel remained in place with smoke and soot staining present on the inside surface. The last five glazing panels were completely removed from the motorcoach. Glass fragments remained in the aluminum framing at the E- to F, F- to G, and the I- to J-pillar locations. This was indicative of removal by the firefighters. The glazing panels and the aluminum frames over and aft of the drive and tag axle locations were presumably consumed by the fire as the fire was intense at this location prior to the arrival of the fire department.



**Figure 10. Glazing damage to the left side of the motorcoach.**

These glazing areas served as a portal for the fire to spread into the ceiling and roof area of the motorcoach. **Figure 10** is a view of the left side glazing damage.

The forward two glazing panels on the right side were intact with smoke and soot staining on the interior aspects. The third glazing panel, located in the wheelchair access door was cracked, but in place. The fourth glazing between the E- and F-pillars was holed, but remained in place. The four rear glazing panels were disintegrated with glass fragments remaining within the aluminum frame. All of the damage to the right side glazing appeared to be related to firefighting activities as the perimeter frames and adjacent painted surface had minimal fire related damage. The passenger loading door forward of the right front axle was intact and undamaged.

### ***Tires/Wheels***

The front tires and the steel wheels were not damaged by the fire. These tires and wheels remained on the motorcoach at the time of the SCI inspection.

The left outer drive axle tire was heavily burned by the fire. The inner and outer sidewalls were burned full-thickness with the steel cords of the sidewalls fully exposed. The only remaining sidewall was located at the bottom of the tire at the 5-8 o'clock positions. The rim bead and shoulder area of the tread were burned but intact. The tire tread was burned smooth with the exception of the tire patch that remained intact with the ground.

The inner drive axle tire was severely burned with fragments of the tread remaining, held only in place by the steel belts. The steel bead and the sidewall wires were entangled around the axle area. The upper tread and sidewalls of the tire were completely consumed. The bottom tire patch that remained intact was rotated to the upper position post-event.

The left tag axle tire was burned in a pattern similar to the outer drive axle tire. The sidewalls were burned full-thickness and the tread was burned smooth. The tire had rotated during the towing process. The bottom aspect of the tire that sustained the least amount of fire damage was rotated to the 6:30 - 9 o'clock position. The steel cord of the sidewall retained the shape of the tire. **Figure 11** is a view of the left drive and tag axle tire damage. **Figure 12** is a view of the remains of the left inner drive axle tire.

The painted surfaces of the steel wheels were completely burned with heat induced discoloration of the wheels. The grease/dust cap on the tag axle wheel was partially burned, exposing the axle end and the outer jam nut.



**Figure 11. Fire damage to the left drive and tag axle tires.**



**Figure 12. Remains of the left inner drive axle tire (arrow).**

The sidewalls and the tread of the right outer drive axle tire were burned at the upper areas. The fire damage was minor; however, the tire was flat and de-beaded from the steel wheel. This tire rotated approximately 90 degrees clockwise (when viewed from right side) from its position at the time of the fire to its position at the time of the inspection.

The inner sidewall and tread surfaces of the right inner drive axle tire were burned from the 12-4 o'clock positions; indicative of tire rotation post-event. The burn pattern was superficial although the tire was flat and de-beaded at the time of the SCI inspection.



**Figure 13. Right drive and tag axle tire damage.**

The right tag axle tire was flat and de-beaded with the tread and inner sidewall burned. The outer sidewall was burned superficially at the upper half of the tire. **Figure 13** is a view of the right drive and tag axle tire damage.

The painted surface of the outer drive axle steel wheel was intact and undamaged. The inner wheel sustained subtle paint damage due to the fire. A hub meter was affixed to the right drive axle and was intact and undamaged. The observed hub meter reading was 64,043 km (39,795.8 miles). This hub meter reading does not reflect the actual mileage of the 1995 model year motorcoach. The paint on the right tag axle wheel was blistered from heat and fire.

### ***Undercarriage***

Due to the low profile of the motorcoach and the inability to raise the vehicle for inspection; the undercarriage inspection was limited to the rear axle areas. The three left rear suspension air bags were burned with fiberglass-like fibers remaining on the mounts. The right suspension air bladders were burned with the rubber components retaining their original shape. The shock absorber bushings were completely burned on both sides of

the motorcoach. The trussed cross member at the drive axle location displayed evidence of high heat as the steel surface was burned clean of paint and grease.

The exposed air lines for the air brake chambers were burned in the vicinity of the axle locations. The wire insulation that extended across the rear axle area was burned.

### *Interior*

The interior of the motorcoach sustained extensive fire damage that originated in the back of the vehicle and extended forward. The fire spread into the passenger compartment through the plywood aisle floor between the H- to I-pillars, through the left rear glazing, and through the roof over the left rear axle areas.

The back of the passenger compartment of the motorcoach was heavily charred. The fire consumed the fabric covering of the plywood partitions for the restroom and the back wall behind the left 14<sup>th</sup> row of seats. The plywood remained in place; however, it was heavily charred. The fabric and foam padding of the passenger seats was completely burned from left rows 6-14 and right rows 7-13. The fabric on the back surface of left rows seat back rows 4-5 was burned at the top aspect of the seats. The top and back surfaces of right rows 4-6 were partially burned. The first three rows of seats on both sides of the center aisle were undamaged.

The plastic and fabric interior trim on the side surfaces between the floor and the beltline and over the pillars was completely consumed at the back of the passenger compartment and was charred and melted at the forward section of the motorcoach.

The aircraft-type overhead storage compartments sustained heavy damage from the fire and heat. The compartments over left rows 7-13 were completely consumed by the fire. The plastic doors on the forward left side compartments were burned and melted. The right rear overhead compartments were heavily burned from seating rows 7-13. All of the right side compartment doors, with the exception of the first row, were consumed by the fire and heat.

The fire spread into the ceiling and roof of the motorcoach. The interior and exterior panels were completely burned from left pillars G- to J, extending from the left roof side rail to right of the centerline at the rear roof emergency exit. The remaining interior ceiling was charred and blistered from the G-pillar forward. **Figures 14 and 15** are interior views looking rearward.



**Figure 14. Interior view of the motorcoach looking front to back.**



**Figure 15. Interior view looking rearward from seating row 8.**

### *SCI Fire Source*

The origin for this motorcoach fire was at the left inboard drive axle tire position. Passengers onboard the motorcoach heard a loud bang followed by a popping sound. The initial sound was believed to be a blow-out of the inboard drive axle tire followed by a rotational sound caused by a possible tread or sidewall flap. The driver continued to travel on the interstate at highway speeds with the aired out tire. This travel on the dry asphalt road surface generated frictional heat buildup within the tire from the wheel rotating against the bead of the tire, the tread and sidewall possibly engaging the outboard tire sidewall, and the flat tire remaining in contact with the pavement surface. As a result, the tire self-combusted and the fire ensued. **Figure 16** is a view of the remains of the left inner drive axle tire.

The tire became a significant source of fuel for the fire as it spread to the adjacent drive and tag axle tires. The fire continued to spread through the undercarriage and minimally involved the right side tires. The fire subsequently burned through the plywood floor over the rear axle positions and spread to the interior of the motorcoach through the left rear glazing and roof areas. The fire spread forward throughout the interior and burned through the roof of the motorcoach. The high heat burn pattern was vertically oriented over the left rear axle area, indicative of a left side origin in the axle area fueled by the tires (**Figure 17**). The fire damage resulted in a total loss of the motorcoach.

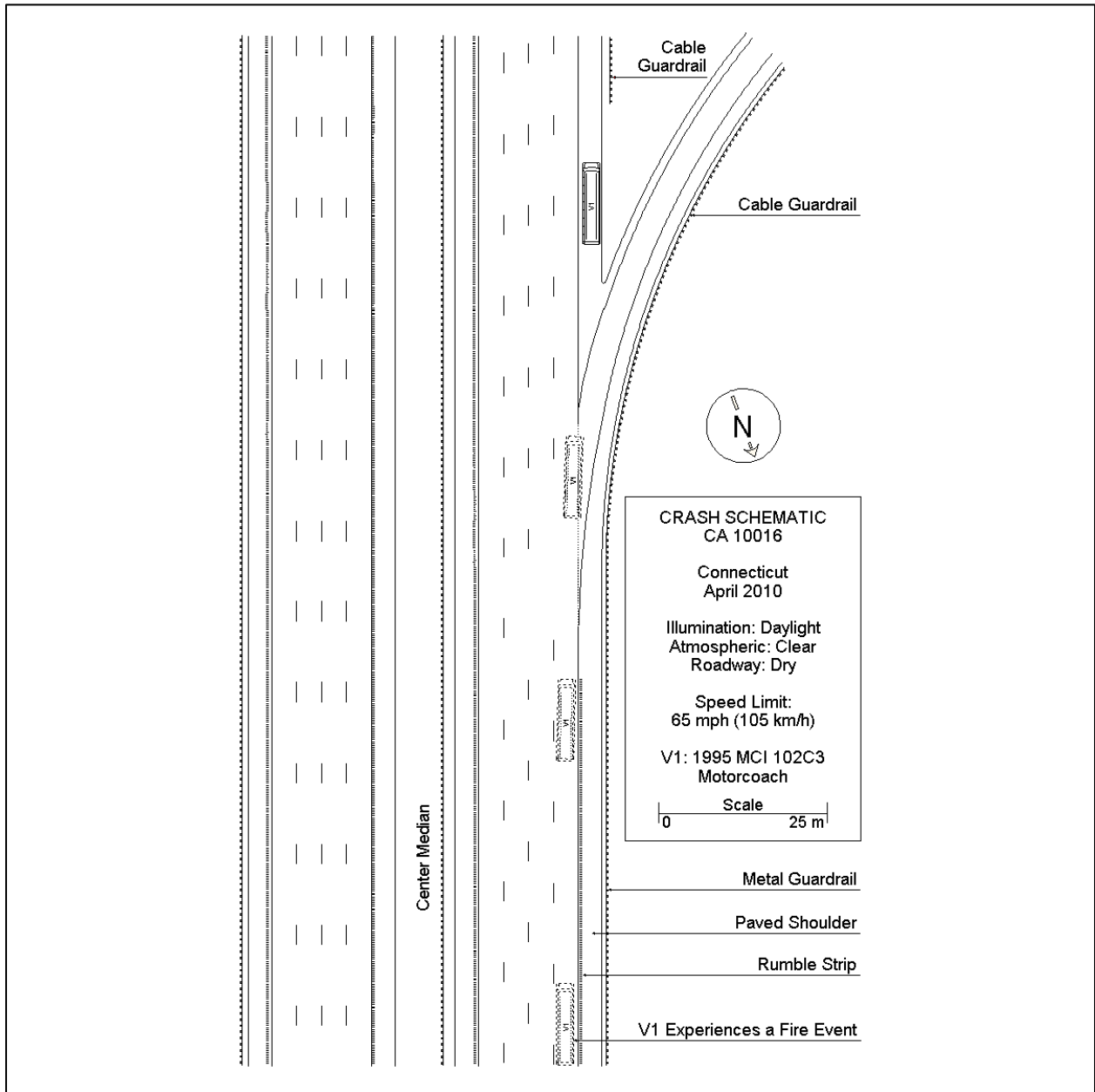


**Figure 16. Remains of the left inner drive axle tire.**



**Figure 17. High heat damage above the left drive and tag axle locations.**





**Figure 18. Incident Schematic**

**ATTACHMENT A:**  
**FIRE EXPERT'S REVIEW AND OPINION REPORT**

**Independent review and subsequent opinion by a fire origin and cause investigator:**

It should be noted that this investigator was not directly involved with the vehicle fire or scene inspections, but rather depended on the photographs and documentations collected by the Calspan SCI team. Whereas this is not the optimal process when conducting an origin and cause investigation, the option of reviewing previous documentation is acceptable methodology according to NFPA 921, “Guide for Fire and Explosion Investigations” (2008 edition), and is adequate for the subject investigations given the scope and purpose of these evaluations.

For each case, photographs and documents were reviewed initially to determine an area or point of origin for the fire. Then this area was analyzed to determine a most probable cause. The area of origin was determined by an interpretation of the fire patterns left by the fire and supporting witness information. Interpreting fire patterns involves assessing the different amounts of damage to the various components involved taking into consideration the progression of the fire which is determined by the various fuel loads involved, the physical properties of the various materials, environmental effects, and the dynamics of the fire itself.

**SCI Case Number CA10016**

***Determination of Origin:*** Exterior examination of the motorcoach shows only very minimal damage to the front of the vehicle. The majority of the damage is confined to the left side and rear of the vehicle. The damage to the rear is significantly skewed towards the left side, with only very minimal intrusion in to the engine compartment. Along the left side, the fire patterns are most pronounced directly above the rear axles, with the most severe damage being to the area above the drive axle. This correlates well with this similar area on the right side of the vehicle as the majority of the damage surrounds the drive axle. Passengers in the coach reported hearing a loud “bang” and latter followed by the odor of smoke several minutes later. The area of origin was therefore determined to be the left side drive axle.

***Determination of Cause:*** In evaluating the left side drive axle, it is apparent that the largest amount of damage is to the inner tire which has been completely consumed with the steel cords wrapped around the wheel. The left outer drive tire and tag axle tire were also severely burned, but not to the extent of the inner drive tire. The wheel bearings in the hub and the foundation brake components at the wheel end were not inspected. The cause of this fire is consistent with an inner drive tire blow-out. However, the influence the brakes and bearing had on this blow-out could not be evaluated.