Investigating Tractor-Trailer Wrecks

The Question Is Not Whether You Have The Will To Win The Question Is Whether You Have The Will To Prepare.

Coach Bobby Knight
Indiana Hoosiers

In All Things Success Depends Upon Previous Preparation And Without Such Preparation There Is Sure To Be Failure.

Confucius

Introduction

Collisions involving tractor-trailers are complex matters. They are not simply big car wreck cases. The complexity arises from many factors, including the size and weight of tractor-trailers, their maneuverability and braking capabilities, and their elevated center of gravity which leads naturally to instability. These factors contribute to more severe damages and injuries resulting from tractor-trailer collisions as compared to those resulting from collisions involving only passenger vehicles. Federal regulations limit the weight of most fully-loaded tractor-trailers involved in interstate commerce to 80,000 pounds, whereas passenger vehicles range from only 3,000 to 5,000 pounds. The vast difference in mass, combined with the speed of the vehicles, make it clear that a passenger vehicle's occupants do not have much chance of escaping serious bodily injury in a collision with a massive tractor-trailer. Time is of the essence and speed required.

Due to this higher risk factor for potential harm in the case of a tractor-trailer accident, interstate trucking carriers and their drivers are held to a high standard of care and are strictly regulated by both the federal government and state legislation. It is the duty of the company and its employees to adhere to these standards, as one error could result in life-altering injury to another person. If an accident occurs as a result of carriers or their employees bypassing or otherwise disregarding the government mandated guidelines, they can be held liable for damages to injured parties. In a case involving a collision between a tractor-trailer and a passenger vehicle, it is necessary for counsel to be knowledgeable of the current standards and regulations and to begin investigation immediately for purposes of identifying and establishing liability and damages.

1. Counsel Must be Knowledgeable about Industry Standards and Regulations

In order to successfully establish liability, counsel must be fully aware of both federal and state legislation enacted to regulate tractor-trailers. In 1986, the Federal government enacted the Commission for Motor Vehicle Safety Act (CMVSA) to regulate interstate trucking - its main goals being to remove unsafe drivers from the highways and to establish minimum national standards to guide carriers in consistently hiring responsible commercial drivers. Both carriers and drivers must meet particular requirements to be in compliance with governmental standards.

Drivers

To comply with federal statutes, states must issue a commercial driver's license (CDL) to all commercial motor vehicle operators. The Federal Motor Carrier Safety Regulations (FMCSR) define a commercial vehicle as any self-propelled or towed motor vehicle involved in interstate commerce, or involved in the transport of passengers or property. With the CDL comes other requirements for which the driver is responsible. Drivers must have certain qualifications, must conduct pre-trip inspections of the vehicle, must secure loads properly, must exercise extreme caution in hazardous conditions, must know the particulars about the operation of the vehicle and about the roadways to be traveled, and must adhere to stipulations regarding hours-of-service. (*See* Appendix hereto: Interim Final Rule Pertaining to Hours of Service). Drivers must carry required documentation, such as their license and log book while they are operating the truck.

State statutes further mandate that drivers perform other tasks in seeking and maintaining employment. These include notifying both the driver's current employer and the domicile state of previous convictions, providing the prospective employer with previous driving information, and meeting the drug-testing, driving testing and licensing requirements for operating a commercial motor vehicle. Pursuant to FMCSR § 391.4, drivers must also be physically capable of operating a commercial vehicle, and they must carry with them a medical examination certificate stating their capacity.

The enhanced standard of safety and responsibility drivers must maintain is illustrated by the acceptable blood alcohol content (BAC) of a driver when on duty. Unlike the BAC limit for non-commercial drivers which ranges from .08% to .10% depending on state law, a commercial truck driver's BAC limit is .04%.

Major driver error factors include, but are not limited to, driving too fast for the conditions, running off the road, improper turning (including U-turns), overcorrecting, driving while fatigued, and using on-board computers/emailing while driving (this is a relatively new but increasingly significant factor). Other factors include cargo shift, vehicle systems failure, and poor road conditions.

Trucking Industry/Carriers

Like the drivers they employ, carriers are subject to specific regulations. Carriers must comply with, enforce, and maintain standards concerning drivers, equipment (including lighting and conspicuity taping), and record keeping, among other responsibilities. They are expected to hire able, safe drivers who are well-trained or who will receive proper training from the hiring company. A company should review a potential driver's driving record and past employment history to help determine if the candidate is proficient and responsible in his profession. If the company does not ensure it is hiring competent drivers, it risks being held liable for negligent hiring and retention.

Federal statutes mandate carriers to adhere to periods of disqualifications and penalties determined as a result of a driver's conviction record for certain offenses and violations. A carrier may not employ drivers who have a suspended license or otherwise revoked driving privileges. Furthermore, carriers must adhere to federal standards for procedures, methods, and minimum passing scores used in testing and licensing commercial motor vehicle operators.

2. Counsel Must Begin Collecting Evidence Immediately Upon Intake of a Case – Collision Scene Investigation

Beginning a crash-scene investigation immediately ensures a more accurate assessment of how and why a crash occurred. Ideally, the investigation should commence before the vehicles have been moved and before "short-lived" evidence from in and around the crash scene is lost and/or damaged. Short-lived data includes evidence that will be lost after cleanup, such as debris, tire marks and/or gouge marks on the roadway, final resting points of all vehicles and people involved, and any marks on stationary objects around the scene including buildings, trees, and signs.

The temporal nature of this crucial evidence requires immediate action by counsel. He must employ investigators and collision reconstruction experts without delay upon intake of a case. This action on the part of plaintiff's counsel is especially important since the trucking company, and quite likely the carrier's insurance company, will each have their own investigators and experts on the scene within 24 hours of the event in an effort to minimize liability.

In making a successful case for liability and damages it is necessary to have as much information as possible about the key elements in a collision - the vehicle, the roadway, and the people involved. The condition of the key elements before, during, and after the collision must be analyzed and documented. This requires experienced investigators to gather data about the key elements in a collision and competent experts to analyze the data.

Immediate assessment and documentation of the scene is just the first step in the investigative process. The marks left at the scene will often be the "DNA" of your case. Counsel must also request all potentially useful documents, records, and data as soon as possible, to ensure valuable evidence is not lost, thrown away, tampered with, or overwritten. Examples of these documents are driver's employment records, driving records, and company maintenance records. As the investigation develops, counsel may determine the need for additional documents and should request these directly.

Initial Data Collection

Upon arriving at the scene of a collision to document and preserve short-lived data, the investigators must first secure the scene and ascertain the final resting points of all vehicles and people involved in the crash. Photographic documentation should occur before vehicles and other evidence is removed for testing or other purposes. Photographs may be taken with digital camera equipment (the benefits of which will be discussed later), but should also be taken with 35mm SLR equipment to ensure against digital editing and manipulation of images. Color film should also be used, especially when documenting paint transfer. Standard video equipment is also necessary, but digital videography can also be helpful in recreating the accident. Counsel should also ensure investigators use methods to produce accurate and descriptive images useful for potential presentation to a trial jury. Counsel should be sure that all investigators understand that no steps should be taken which might destroy or affect any evidence until first seeking counsel's advice. Data should not be downloaded from an event data recorder, for example, without the advice and participation of counsel in the entire process (to determine, for example, whether the opposing party or opposing counsel should be involved in the downloading process,

what safeguards should be taken to establish proof of the integrity and reliability of the downloading process, etc.)

It is important to give a jury the most accurate portrayal of events possible. Therefore, counsel should request images be recorded with a lens approximating the perspective of the natural eye. Also, investigators should use a marker to show distance and depth in any photographs intended to illustrate dimensions. Identify and document the marker for each photo and use captions for photos that may not be self-explanatory. Along with photographs and video recordings, diagramming the scene is useful in giving the jury an accurate view of the scene and in placing the elements involved in the collision. Once these images have been properly documented, it is important to process, duplicate and store all photographs and video recordings, along with the dates of the recordings and any accompanying field notes for further analysis.

Vehicles

After securing control over and documenting the final resting points of the vehicles and the people involved in the accident, the investigators must examine the vehicles. It is imperative to document and photograph every aspect of their condition prior to them being moved in order to assess damages and recreate the incident as accurately as possible. Also, it is important to note, counsel must obtain permission for the investigator to photograph or videotape any part of the tractor-trailer before beginning the investigation. Think of the investigation in the same way you would a products liability case.

Exterior Damage Inspection

Once permission is given, all vehicles involved should be examined in a similar and systematic manner. For each vehicle, document with 12 to 14 photographs all sides of the vehicle and the top and bottom of the vehicle, if possible. Both damaged and undamaged parts of the vehicle must be examined and documented, noting any and all damage, including minor scrapes or dents. It is also important to document the window condition – whether they are cracked or broken and if they were open or closed at the time of impact. If applicable, counsel should request notes and photographs of any specific deformation of the vehicle pillars, the rocker panel, the frame, or the quarter panels when examining the smaller vehicle(s).

If this type of damage is present, counsel should request a damage index matrix, which is a diagram of the roof divided into subdivisions relating to the roof and the roof supports of the vehicle. The destruction depicted in this type of matrix yields a more accurate description of the overall damage and provides a useful exhibit for a trial jury. The damage index matrix is particularly important in the case of under-ride collisions. In an under-ride collision, the expert should note and photograph any interaction of the smaller vehicle with tractor-trailer components such as dollies, rear dual frames, rear dual wheels, sliders, or underbelly cages. If the smaller vehicle exits from underneath the tractor-trailer, the investigator must approximate and record an exit speed. The investigator should then move to the interior of the smaller vehicle.

Interior Damage Inspection

The interior should be inspected and documented as to any intrusion into the inside of the vehicle (even if it may not be directly related to the crash). Any and all other physical evidence

on the interior of the vehicle should be documented including hair, blood, and any other distinctive marks.

Next, the same methods used to examine the interior of the smaller vehicle(s) should be applied to the inspection of the tractor-trailer. All contents of the interior must be documented and photographed; pay special attention to the presence of a CB radio, police scanner, radar detector, or on-board communication system. Finally, the inspector must note the location of blind spots and mirror positions as these are necessary for the driver to be aware of and use to safely operate the tractor-trailer. Once the on-site vehicle inspections are complete, the investigator must assess the second key element of a collision, the roadway.

Roadway

The roadway and area surrounding the collision can provide much information necessary to a collision reconstruction. However, this "short-lived" evidence must be collected, documented, and photographed/videotaped as soon as possible after the collision occurs to ensure it is not lost and thus, ineffectual. First, the investigator must inspect the roadway for raw data such as skid marks, scrapes, gouges, lateral marks (yaw), and collision debris (including any fluid spills or leaks). Next, he should note all marks on nearby stationary objects such as trees, buildings, and signs. Any and all marks and debris on the roadway or surrounding structures should be recorded, whether or not they are thought to be related to the incident.

The investigators must also analyze other features of the roadway. The actual road and its physical features, including a reasonable distance of the area leading up to and leading away from the collision area, should be documented, photographed, and diagramed. In line with these recordings, the investigator should systematically photograph and video each available approach leading to and through the collision area and record the direction and location from which the footage is being recorded, the height of the camera, and the location of any targets placed in the photographs.

The roadway diagrams, photo/video recordings, and written documentation of these areas should include the number of lanes on the road, the geometric layout of the road, and the composition of the road - whether it is made of concrete, dirt, gravel, or asphalt, as tractor-trailers respond differently on asphalt than on the other road types. The condition of the road itself should be included, whether it is smooth, rough, grooved, potholed, or cracked, as these factors affect vehicle control in different ways. Investigators should also document whether the surface was wet or dry and if it was in good or poor condition at the time of the incident.

In addition, documentation should detail all traffic control devices at and leading up to the collision site such as warning/cautionary signs, lane markings, speed limit signs, and traffic signals. Any external lighting, stationary objects such as median strips and guard rails, as well as any other potential obstructions to view or distracting features present should be included. The documentation should also include the traffic volume and type, and the location of all vehicles and/or pedestrians involved. All measurements should be recorded clearly, in a way that is understandable to others. Proper documentation of all data ensures the experts base their analysis only on evidence related to the crash in the post-collision analysis and can also be helpful in disproving or discrediting the defendant's theory of the case.

Finally, counsel should request documentation which could prove helpful in ensuring accurate diagramming of the area when compared with the investigators' documentation. These documents include state, city, or county highway plats, as well as state highway department

roadway video logs, which include a date stamped photograph, or videotape of a particular section of the roadway. Counsel should request aerial satellite views of the area - which can be found on the Internet for most any location in the country, and any photographs or video made by traffic control devices or surveillance cameras in the area. The last step in the collision scene investigation is to explore the human factors involved.

Human Element

Counsel must direct the investigators to identify and record all persons involved in the accident including their personal information, visible injuries, and points of rest. It is also necessary to identify witnesses at the scene, as well as any public service employees such as police officers, emergency personnel, firefighters, anyone covering the scene for news or radio reports, and anyone else who could corroborate what happened and how. These sources may have useful photographs, video footage, or official reports. Gather whatever on-site information time and investigative manpower allow, on videotape if possible.

Both counsel and the investigative team must be able to follow-up on these sources during the post-collision investigation. Therefore, counsel must request the investigators document the names and contact information of any and all persons who could be a potential source of useful and reliable information. Counsel should also request or subpoena, if necessary, any reports, photos, or video footage taken by any of the sources identified above. For instance, "9-1-1" recordings can be subpoenaed to assist in locating other eyewitnesses who have already left the scene. Proper collection of this information is necessary for an effective analysis.

3. Counsel Must Identify and Establish Liability and Damages – Post-Collision Investigation

The post-collision investigation includes analysis of long-term data, as well as further analysis of data collected during the collision scene inspection. Long-term data consists of information and evidence that will not immediately be cleared away or altered, thus it can be collected later in the analysis process. This data includes vehicle specifications and performance information, as well as documentation concerning trucking company and driver conduct. Field documentation and testing of previously collected data and evidence also occurs in the post-collision investigation.

Integral to this stage of the investigation are professional experts who will analyze and interpret the data to determine why and how the collision occurred. This step will result in a more comprehensive understanding of the factors contributing to the collision and will also help counsel to determine which parties are liable and the extent of that liability.

Experts

Once the primary data has been collected, various experts will be necessary to systematically analyze the data and form an informed and accurate opinion by applying scientific knowledge to the evidence particular to the key elements involved in the collision. Counsel must be sure to employ those who are experienced and knowledgeable in their fields, and he will most likely need to incorporate experts from various fields for an efficient and accurate investigation. For instance, an automotive expert can determine which vehicle factors may have influenced the

collision – indicating the need for further investigation; he can also determine non-contributing factors. He will also be able to analyze the mechanical performance of the truck and its vehicle components, including event data recorders (EDR). EDRs and other vehicle information and collection systems will be discussed later.

Some other necessary experts are, of course, the collision reconstruction expert who will apply the laws of physics to the physical evidence – essentially forming a scientific account of how and why the collision happened, a truck driving professional who will help in evaluation of driver training, driver qualifications, and carrier responsibilities, a human factors engineer who will help in interpretation of visual cues, lighting issues, and other visual signals drivers may allege as a defense, and a forensics expert. In turn, counsel will use the experts' various analyses and opinions to build a successful case for the injured party.

Experts must have all available data, access to the newest data collection and analysis techniques – and also knowledge of the traditional techniques used in collection and analysis, and awareness of timing guidelines such as court deadlines. Everyone involved in the investigation and the case must be up-to-date on what is needed in order to facilitate a successful outcome. The investigation proceeds with further data collection and analysis of data from the key elements in a collision – the vehicles, the roadway, and the people involved. Counsel should ensure this part of the investigation is video recorded in case opposing counsel or the court questions the analysis methods or the authenticity of the evidence.

Vehicles

General Inspection of all Vehicles Involved

Counsel should direct the experts to assess background information about the vehicles involved in the collision. These vehicle specifics include the year, manufacturer, make and model, approximate height and weight, and interior and exterior colors of the vehicle. In determining the weight of each vehicle, the investigator must note the empty weight and the gross vehicle weight ratio (GVWR). The GVWR is the weight of the vehicle with all cargo and passengers. This measurement is important to understand the force of the collision. It also provides information that may yield a finding the tractor-trailer was exceeding the load regulations of the FMCSR. Also, determine the gross axle weights to determine if the tractor-trailer was off balance.

Other useful data includes diagrams of the general damage to each vehicle, including distinctive marks or substances such as paint, scrapes, and dents. It is important to note the location of cracked or broken lights and to determine if lights were on or off at the time of impact by analyzing the bulbs and filaments. Also, test the horn to determine if it was functioning properly at the time of the incident. Any electrical shorts or functional abnormalities should be noted.

It is also necessary to assess and document occupant restraint system information including the condition of the seatbelts and where they were found, and the condition and state of shoulder harnesses and airbags. Next, document the location of the seats relative to the dashboard and the type and location of headrests. Investigators should measure and photograph the location and depth of the impact damage, or the crush profile for each vehicle. All damage needs to be classified as contact versus induced and old versus new. It can be helpful to use a

prototype of each vehicle for comparative analysis during the post-collision analysis. The investigation continues with a comprehensive examination of the tractor and the trailer.

Inspection of the Tractor and Trailer

Begin this part of the inspection with the tractor. The investigator should note any items in the windows of the truck including stuffed animals, stickers, or the like, assess and photograph the driver's line of sight over these items and note any obstructions to the driver's view. He must also record the condition of the driver's log book and photograph each page of the book in order. Next, the trailer's interior should be closely examined.

The investigator must record and photograph the trailer's entire contents including the type of load, the load resting position, and any materials used to secure the load which should be retained as evidence. Also, if cargo is covered, for example with a tarp, determine if it was properly secured so as to not block any mirrors or lights. Accordingly, if the tractor-trailer exceeds regulation length or width, determine if all warning signs or lights are properly mounted, and if the driver has in his possession the appropriate permits allowing these exceptions. Once these tasks are completed, there are some integral components to the tractor and trailer that must be analyzed and documented in order to ensure counsel will have all potentially contributing factors for further testing. Identifying these factors is imperative for counsel to be able to accurately determine any and all liable parties.

Mechanical Inspection of the Tractor and Trailer

The mechanical part of the investigation includes inspecting and documenting all components of the engine and contributing systems. It is important to note the vehicle identification number (VIN) and the vehicle manufacture data, as this information may play an integral role in establishing liability as the investigation unfolds. This data can be used to obtain vehicle specifications such as bumper heights, bumper types, model data, ownership data, and in acquiring recall information.

Next, the investigator must document all fluid levels, tightness and excessive wear of belts, and possible leaks and/or improperly secured wires in the engine, transmission, and exhaust systems. The inspector should then start the engine and record any unusual noises. The gauges should be read and proper or abnormal function should be documented. The following should be checked for looseness, sticking damage, and improper settings: steering system, clutch, accelerator, transmission controls, inter-axle differential lock, windshield wipers, all lights, and all brake controls. It is also important to determine if the condition of the coupling assembly was a contributing factor to the collision.

The coupling assembly links the fifth wheel of the tractor to the kingpin on the trailer creating an articulating hinge. If this assembly is not adequately lubricated, it becomes stiff and less purposeful, thus the tractor-trailer can become very difficult to control. The expert must document the functionality of the assembly and determine whether a coupling malfunction contributed to the collision. The expert must continue the inspection by analyzing the condition and functionality of all other vehicle components.

Continuing this part of the inspection, the investigator should determine if required emergency equipment is present and in working condition. The investigator must inspect both the left and right sides of the tractor-trailer to analyze and document conditions of all vehicle

components. These include the front axle, the fuel tank(s) – which should be properly mounted with components secured and free of damage or leaks, the primary and secondary safety cab locks – which should be engaged, and the battery box – which should be properly secured and covered. All lights (including signal and brake lights), and reflectors should be clean, operating properly, and of proper color (red at the rear and amber elsewhere). Any component not in standard operating condition must be documented for further analysis. Next, the investigator must examine the front wheels, the suspension system, and the brake system.

Wheel Condition

The wheels and rims should not be bent or have any broken components. The tractor and trailer tires should be checked for size, tread depth, width, style, air pressure, rolling radius, front and rear track width, and general condition. Any imbalances or abnormalities can affect vehicle maneuverability, as well as the way the load is balanced in the trailer. Furthermore, if tires are not balanced and air pressure is not consistent, an axle of any tire with less pressure than the others is less capable of supporting the weight of the vehicle which can contribute to a crash. The rolling radius, the front and rear track width and the general function and condition of each tire should be measured and documented. Also record the make, the model, and the DOT or serial number on each tire in case of product defects or recalls. Wheel bearings and seals should not be leaking. Suspension components should be secured and not leaking; if the truck is retractable axle equipped, check the condition of the lift mechanism – if air powered, check for leaks. Any mechanical defects or maintenance issues should be recorded for further analysis. Next, a thorough inspection of the braking system is necessary.

Suspension System

The expert must determine what type of suspension is present on both the tractor and the trailer, as suspension issues can contribute to tractor-trailer collisions. In general, there are three different suspension types found on tractor-trailers: air ride tractor, air ride suspension, and elliptical spring suspension. The tractor and trailer can have different types of suspension, which can cause the rig to handle differently than if each has the same type. The driver must be aware of the characteristics of the type(s) of suspension on the tractor and the trailer in order to maintain control over the rig when making sudden lane changes or turns. In addition to operational issues arising from suspension type, the expert must also check the condition of the suspension components for defects or maintenance issues.

Braking System

Due to the fact that of the percentage of tractor-trailers that fail inspection annually (50%), half of these failures are due to faulty braking systems, meticulous inspection and documentation of the braking systems and related components is a top priority, requiring photo and video recording. In addition, the expert should include the brake manufacturer(s) and any specific product information along with his analysis of the braking components, in case of product defects or recalls. If a tractor-trailer's braking system is not functioning properly, the risk of a collision is greatly heightened. This is carelessness on the part of drivers and carriers, since most problems can be easily detected with a general inspection.

Braking systems for tractor-trailers are more complex and function differently than for passenger vehicles. For instance, there is a time lag between brake application and onset of braking for tractor-trailers. Also, brakes are less efficient and potentially ineffective if they become hot as a result of continual braking on a downgrade. These intricacies require the system components be used in combination and with proper execution to maintain the highest level of safety. For optimal performance, the braking systems for the tractor and the trailer must be compatible as far as timing and brake force distribution. The driver must be aware of system component specifics and be able to accurately operate the braking mechanisms.

The expert should carefully inspect and document whether the brakes are unbalanced. He must check the brake condition and balance from front to back and from side to side. Imbalance can cause the tractor and trailer to have inadequate stopping capacities; it can also mean a wheel or axle is not functioning properly. He should continue with a detailed analysis of the braking system components. Although there are different types of brakes for tractor-trailers including surge brakes, electric brakes, engine brakes, and air brakes, air brakes are the most common type installed.

Most air brake systems require manual adjustment; this adjustment is a factor experts must examine following a collision. On a vehicle equipped with air brakes, the investigator must check the air leakage rate, the low air warning device, and the air pressure buildup. Braking components to be checked are chamber size, brake type (cam or wedge), brake slack (manual or automatic), governor, actuators, braking camshaft, pushrod travel length, slack adjusters, air system valves, brake valves, control valves, and presence of anti-lock brakes. It is also important to note the condition of brake drums and hoses to determine if poor maintenance has led to wear due to rubbing.

Other braking system components to be analyzed are the steering axle brakes (front axle brakes), the retarder brake ("Jake brake") - if the truck is thus equipped, the spring brakes (part of the emergency braking system), the parking brake, the service brakes (or foot brakes) on the truck, and the service brakes (or hand valve) and spring brakes on the trailer. It is imperative the expert pay close attention to the functionality and condition of each system component.

Certain of these braking system components demand considerable attention, as they provide extra or emergency braking power. The steering axle brakes (front axle brakes) provide 12% of the total braking power to the tractor-trailer. These will lock in the case of sudden or emergency braking if they are functioning properly, and the tractor-trailer will continue to move straight ahead and will decelerate in a controlled and rapid manner. Unfortunately, truckers often disconnect the steering axle brakes because they feel they have more control over the vehicle with only the drive axle or trailer axle brakes engaged. Disengaging steering axle brakes can contribute to the tractor-trailer jackknifing or rolling over. In the majority of collisions involving tractor-trailers, these brakes were disengaged at the time of incident. It is therefore imperative to document their condition and functionality.

The expert must also carefully inspect and document the condition and functionality of the retarder, or "Jake brake", which provides the tractor-trailer with extra braking power. This brake functions by releasing pressurized air into the engine, increasing engine pressure, and slowing engine rotation. In turn, this transfers resistance to the drive train of the truck which slows the wheels. The drive train is located to the side of the fifth wheel assembly. In the case of a rapid slowdown, a jackknife can occur if too much pressure is exerted on the other side of the hinge. Therefore, a non-functioning or poorly maintained retarder can contribute to a tractor-trailer collision.

Since the effectiveness of the tractor-trailer braking system is integral to many collision reconstructions, it is important for counsel to be aware of federally mandated tractor-trailer braking standards. For instance, in 1986, the federal government passed a law mandating all tractors have functioning front brakes. If truckers disengage these brakes, they are breaking the law and are responsible for accidents resulting from this action. Once the expert has physically analyzed and documented the condition and functionality of the tractor-trailer's mechanical components, he must investigate certain engine-related information that may facilitate a more accurate determination of how and why the collision occurred.

Internal Data Source Investigation

Computerized data can yield information about how the vehicle components were functioning in the moments leading up to the collision which may facilitate both experts' analyses and also help counsel in determining liability. The expert must document the engine make, model, size, and serial number. This information, along with the VIN, can be used to determine what type of internal data sources are available including "black box" data from electronic control modules (ECMs), and data stored in on-board communication systems.

All engines constructed after 1992 are fitted with ECMs. These are essentially engine mounted computers that distribute fuel to the engine efficiently, and thus were originally used to increase vehicles' fuel efficiency and to reduce air pollution. ECMs function by monitoring the engine's status and by recording various parameters, such as how many hours the engine spends running, how many hours the engine is idle, how many hours the engine is off, and speeds at which the engine is functioning. These modules serve a dual purpose, as the data they store can be used to determine whether or not drivers are adhering to hours-of-service guidelines.

Trucks assembled after 1996 are often equipped with software that allows the ECM to record data such as hard stops and sudden deceleration exceeding seven feet per second. They can record data for up to 40 seconds prior to the incident of sudden braking or deceleration, including engine speed and other parameters. The information recorded by these modules can yield information helpful in determining how the truck was operating immediately prior to an accident. Analysis of this information can be utilized to determine whether certain factors contributed to an accident.

All ECMs do not record the same data, nor do they store data for the same amount of time. Counsel must ensure potentially useful ECM data is not lost or overwritten. Therefore, it is imperative the investigator determine what type, if any, of ECM the tractor has and what type of information it contains as soon as possible. This information must be downloaded, and should be printed, dated, and stored in a file. If possible, the data recorder should be removed and stored to ensure it is not tampered with. Technological advances have created other types of vehicle data recorders.

Most trucking companies now have on-board vehicle locating systems, such as Qualcomm®. These function as a GPS - which can identify a truck's location, a communication device – which allows communication between the driver and the dispatcher at any time, and an on-board fax machine – which allows the driver to send and receive documents. It is counsel's responsibility to request or, if necessary, subpoena information from these sources, as trucking companies are not required by law to download and/or retain information for investigative inquiry or any other reason. The request must be made within 30 days of the accident, or there is a significant chance the data will be irretrievable.

Incident Data

It is important to document data related to pre-collision and post-collision information. Document where on the road the collision occurred and the location, direction, and description of impact and damage. Investigators must also determine the direction the vehicles were traveling and the speed at which they were traveling before, at the time of, and after the collision. They must also determine the location of vehicle occupants at each of these stages. Experts must analyze the movements of the vehicles and occupants during the incident and also the points of perception of drivers and occupants. It is also important to determine if any driver involved tried to avoid the collision, or if evasive action was even possible.

Trucking Company (Carrier) and Driver Conduct Investigation

As discussed earlier, both federally and state mandated criteria regulate the trucking industry and its employees. When the industry-wide standards and responsibilities are not met or maintained, the consequences can be severe, leaving both trucking companies and their drivers at least partially responsible for damages in the case of a tractor-trailer collision. This part of the investigation entails collecting information about the carrier and the driver in order to determine whether their actions contributed to the collision.

Carrier

First, it is necessary to focus on the conduct of the company, and how its policies, practices, and actions (or inaction) could have contributed to the collision. Counsel must determine if the company is in compliance with industry-wide standards and regulations, and whether or not the company is hiring safe drivers, promoting safe driving practices, and properly maintaining and repairing its vehicles. The Internet can be useful in conducting preliminary investigations on a company. Many companies use the Internet to recruit new drivers, to post their policies and hiring guidelines, and to display their safety record. For instance, one can view a company's safety snapshot online at (http://safer.fmcsa.dot.gov/CompanySnapshot.asps).

The carrier is ultimately responsible for consistently adhering to safety guidelines. The FMCSA regulations require that carriers maintain a driver qualification file, which can be a good place to start when investigating a negligent hiring and retention claim. Investigators must fully explore all records in the carrier's risk management and safety departments. To monitor carriers, the American Association of Motor Vehicle Administrators assigns a United States Department of Transportation (USDOT) number to commercial vehicles in order to enable both federal and state governments to identify the motor carrier(s) responsible for the safety of vehicle(s), and to monitor the safety performance of both the carrier and the individual vehicle(s). In the case of a collision, counsel must request or subpoena any and all information from the carrier pertaining to actions of both the carrier and the driver that potentially contributed to the collision.

Driver

Since it is the responsibility of the carrier to hire safe drivers, it is important for counsel to request any and all documentation concerning the driver's history. The driver's employment

records should be examined including reasons for leaving prior employment. Furthermore, drivers are professionals who should be familiar with the rules and regulations of the trucking industry. It is important to establish the degree of the driver's awareness. This analysis must include information about the driver's training. His training records should be requested with special attention given to his training while under the current employer and how his training (or lack thereof) relates to the collision. Aside from the driver's employment records, there are many other sources of information helpful in building a successful case.

It is important to note the driver's personal information, such as nicknames, which may help identify the driver's characteristics. Also, request that the driver sign and print his name during the deposition if there is suspicion of forged documentation, request a copy of the driver's license to be produced through written discovery, and request the driver provide his license for copying during deposition

Counsel must request the driver's medical history and any medications prescribed. Any drug tests performed on the driver, along with discipline records and any other wreck reports, must be reviewed. It is also helpful to know the driver's whereabouts in the days prior to the collision. Counsel must request fuel, food, credit card, and toll receipts, along with cell phone/email records, weigh station tickets, bills of lading, expense sheets, and fuel gauge information. If possible, determine how many hours the driver slept during this time. (*See* Appendix hereto: Interim Final Rule Pertaining to Hours of Service). Request a map of the driver's route and stops made. Use the driver's log book to determine if he conducted pre and post-trip inspections. Determine if the driver followed industry protocol after the wreck. For instance, did he complete an incident report or take photographs at the scene? All of this information can be useful in determining if the driver was adhering to industry standards in his employment and also if he is being compliant with officials and counsel.

The driver's log book is critical in development of a case, and an expert will probably be needed to interpret the log and to advise the jury on log book requirements. Drivers are required to maintain logs to establish the amount of time they have been driving and the amount of sleep they have had. Many drivers keep two logs, one "regulation" log for Department of Transportation inspections and another for actual mileage to submit to the company. Counsel must ensure he acquires all log books kept by the driver, and may have to subpoena this information. Immediate action on counsel's part is imperative, as federal regulations, (FMCSR § 395.8(k)(2)), require drivers to retain in their possession and make available for inspection their records of duty for the seven days prior to a wreck. Furthermore, companies are only required by regulation to maintain all documents for a period of six months from date of receipt.

It is necessary to put both the carrier and the driver on notice by letter that these items are being requested in case a record is missing that may support the theory of the case. This letter may become necessary for proof to the court that the jury should be instructed on spoliation.

4. Defendants

It is important to establish the identity of all proper defendants as soon as possible. It is necessary to establish the relationship between the driver and the company, as well as relationships with other potential parties. Look for the following relationships: independent contractor, employee, owner, lessor, lessee, broker, shippers, purchasers, and any others that could create an agency relationship. Request copies of any and all contracts and any amendments to these contracts, and secure from the defendants the documents related to

insurance coverage for review as to who is the responsible party. In drafting requests for relationship information, refer to FMCSR § 390.5 and review FMCSR §376.12(c) to define exclusive possession and responsibilities in a written lease.

Requests for admission may be a useful tool in establishing whether a truck driver is an employee of a particular defendant and whether the driver was acting within the scope of his employment at the time of the accident. Remember to plead fictitious parties in your complaint to cover any party who may later be revealed during discovery.

Along with documentation concerning the driver and other defendants, it is important counsel not overlook repair bills for the truck, especially for damage caused by the wreck which may detail damage unseen by the naked eye, dispatch records, title registration, wreck report, and hospital/coroner's reports. Identify how the wreck happened and identify and contact investigating officers and witnesses.

5. New and Improved Technology

Technological advances will continue to provide more accurate reconstructions of collision investigations. New and improved technologies work in combination with and improve upon older methods. For instance, cell phone records can show whether the driver was talking or texting while driving and it can be determined if this was a contributing factor to the accident. Fixed, mounted video cameras at intersections and lights, as well as surveillance cameras at banks and shops, can be analyzed to glean information about what occurred before, during, and after the collision. Satellite photos can provide aerial views of roadways, and can be found on the Internet and potentially shaped into accurate scale diagrams of the area where the collision took place.

Total Station Survey

Total station surveying is now considered "older" technology, but is still necessary and useful in collision scene reconstruction. This consists of a capture unit, a transit, and a prism. The transit shoots a laser beam toward a prism and a beam bounces off the prism and is sent back to the transit where it is recorded by a small hand-held computer. The computer, or capture unit, records the position of the prism relative to the transit as well as the elevation of the point. This provides data that can be rendered in 3D and can be input into computer applications to allow for 3D analysis of a collision. Total station surveying can be used in combination with laser scanning, or high definition surveying.

High Definition Surveying (Laser Scanning)

Like total station surveying, laser scanning records measurements of objects using a reflected laser light. But whereas traditional surveying may record a few hundred measurements during a survey, a laser scanner will take a million measurements in approximately fifteen minutes. A laser scanner can take measurements of complex objects, such as vehicle crush profiles, foliage, building structures, and complex terrain grades. The raw data file cannot be changed, therefore eliminating the risk of manipulation or modification by opposing investigators. Also, measurements can be modeled or converted into a format by which advanced simulation packages can be used to analyze an accident.

Computer-Aided Design (CAD)

Sketches and diagrams for collision scenes can be prepared using collected data. It is important to note, the accuracy of the diagrams depends on the accuracy of the field data, as well as the competence of the expert rendering the drawings. CAD provides the user a level of analysis not previously available, as it provides the user with a means to produce realistic exhibits, models, and animations in an accurate and cost-effective manner. Animations can provide a visual re-enactment of a collision from start to finish.

Digital Photography

Digital photography allows the user to store, utilize, and print images in ways impossible with traditional photography. Images can be viewed before the expert leaves the location where they were taken. Also, images can be plotted to whatever size may be needed in a matter of seconds. As the images can be manipulated using the computer, extra care is required to keep track of the chain of events from when the pictures are taken to when they are produced in the desired format, and testimony as to the authenticity of the image produced may be required.

Accelerometer

An accelerometer eliminates procedural and technical issues inherent in traditional methods calculating the speed at which a vehicle was traveling. The "drag" factor, or coefficient of friction between the road surface and a vehicle's tires, to determine speed is based on tire marks or post-impact movements. In the past, this has been measured manually using a weighted tire, a rope, and a scale. An accelerometer is a small computer that mounts on a vehicle and measures variables of time, distance, and speed as a vehicle slows to a stop or accelerates. By applying the appropriate laws of physics to the recorded variables, an expert can accurately produce the "drag" factor.

Videography

In addition to still photography, video footage can be a useful tool in collision reconstruction. It can be used to archive, examine, and exhibit data. For instance, an engineer with the proper tools can extract dimensional data, such as the length of tire marks, the location of gouges, or the speed of vehicles from video recordings. It is also a useful way to exhibit information as it can demonstrate objects in motion and illustrate a re-enactment of an event.

Other Technological Innovations

There are many other technological innovations helpful in reconstructing a collision scene. A light meter/contrast meter can be useful in determining how much a driver can see at night. Photogrammetry can be used to extract data in the form of measurements in diagramming a collision scene accurately. Damage based and simulation based computer applications can be used to accurately assess damage and also to create a visual image of the collision from start to finish for presentation. Bore scope cameras can be used to video engine components and brake

components that may be difficult to assess with the human eye. These and other continued innovations will help in current and future collision reconstruction analysis.

Conclusion

While truck drivers might be professionals, they are often driving poorly maintained trucks and driving while fatigued. Commercial vehicle drivers must have the required training and skills to operate large and complex vehicles. No driver, commercial or otherwise, can be expected to operate a vehicle perfectly under all circumstances. However, the potential for serious injury or death resulting from an accident involving a tractor-trailer is exponentially greater than in an accident involving only passenger vehicles. Therefore, commercial drivers are held to a higher standard of care when operating tractor-trailers and other large trucks.

In order to obtain the most favorable outcome for a client in a case stemming from a collision involving a commercial vehicle, it is imperative for counsel to begin investigation immediately upon receiving a client's case. The trucking industry and its insurance companies are prepared with investigators, experts, and legal teams to begin working as soon as an accident occurs. These investigators and experts are on the scene within 24 hours of an accident, necessitating plaintiff's counsel to have his own investigators and experts on the scene as quickly as possible to eliminate potential loss of data and evidence. Counsel will develop liability through discovery of documents and information.

It is important that counsel employ experienced and competent experts to analyze the data which will not only facilitate a more complete and more accurate reconstruction, but also help lower the cost of the investigation. Furthermore, once counsel's investigators and experts complete their report, it can be compared to the police report to ensure no detail has been overlooked. Lowering cost of reconstruction analysis begins and ends with knowledge – of what data to collect, of the available data sources, of how to get the data documented, to let the data dictate the ultimate opinions derived. Developing a sense of which claims warrant further investigation will save time and money, and this requires a basic knowledge of the systems and components that have been and will continue to be the subject of your truck accident investigations. The Internet, of course, is a useful tool in gaining a basic understanding of truck systems and components.

In the case of necessary destructive testing of evidence/information, the chronology of inspection and testing should be documented via photo/video. Remember to process, document, date, and store any and all photographs/video recordings. Make sure to have information about the type, make, model, and manufacturer of all major components to determine product defects (therefore liability) and/or recall information. Furthermore, retain items that will add a human element to the circumstances (may not be included in police report or official records) – baby doll, bloody hat, etc. – which will help in securing the desired award of damages.

If counsel acts immediately and with knowledge of factors necessary to building a strong and successful case, he should be able to properly assign liability for damages and obtain the most appropriate and just compensation for his client.

APPENDIX

Large Truck Crash Causation Study (LTCCS)

Published in 2007, the LTCCS was conducted by the Federal Motor Carrier Safety Administration (FMCSA) and the National Highway Traffic Safety Administration (NHTSA) to determine reasons for serious collisions involving large trucks (trucks with a gross vehicle weight rating over 10,000 lbs.). The study's findings are helpful in determining how and why certain variables contribute to a higher risk of collision. The study also might be helpful in developing a methodology for collecting evidence to accurately reconstruct the collision.

Defining Causation

In this study, causation is defined in terms of factors most likely to increase the risk of collisions involving large trucks. According to the FMCSA and NHTSA, the main elements influencing the occurrence of a crash are driver training and experience, vehicle design and manufacture, highway conditions and traffic signaling, and weather conditions. These, as well as other factors including drinking alcohol, fatigue, speeding (which have all been determined major factors in motor vehicle crashes overall), and of course, driver, vehicle, and environmental factors can increase the risk of a collision. Crash reconstruction experts rarely conclude one single factor as the sole reason of a collision; rather it is the occurrence of any number of variables under particular circumstances.

Data Collection

A crash researcher and a state truck inspector were sent to each crash site as soon as the collision occurred. They collected data through interviews with drivers, passengers, and witnesses, and conducted thorough inspections of the trucks, the driver's log books, and other documentation. Additional data was collected through interviews with motor carriers and drivers. Researchers also reviewed police crash reports, hospital records, coroners' reports, and revisited the crash scenes. Data were collected on up to 1,000 elements, including the condition of the truck driver and the other drivers involved before the crash, the drivers' behavior during the crash, the condition of trucks and other vehicles, roadway factors, and weather conditions.

National Crash Estimates

According to the NHTSA's estimate, there were approximately 120,000 fatal and injury crashes nationwide involving at least one large truck during the 33-month study period (April 2001-December 2003). In 2002 alone, of 43,000 deaths from overall vehicle collisions, 5,000 were related to commercial motor vehicles.

The study coded three key variables for assessing crash risk. The first of these variables is the "critical event." This is the action which put the vehicle(s) on an unavoidable collision course and is the variable assigned to the vehicle responsible for the accident. Three major types of critical events assigned to large trucks in the sample are: (1) running out of the travel lane or off-road (32% of LT in sample assigned this event), (2) vehicle loss of control, including

traveling too fast for road/weather conditions, cargo shift, vehicle systems failure, poor road conditions, and other (29% of LT in sample assigned this event), and (3) colliding with the rear-end of another vehicle in the truck's travel lane (22%).

The second variable is the "critical reason." This is the immediate reason for the critical event, which is assigned to the vehicle responsible for the critical event. These can be coded as driver error, vehicle failure, or environmental conditions. The study shows that of all crashes (single and multi-vehicle) involving large trucks, in 55% of the crashes, large trucks were assigned the critical reason. Of all two-vehicle crashes (between one truck and one passenger vehicle) involving a large truck, 44% were assigned the critical reason.

The third variable is "associated factors." These are human, vehicle, and environmental conditions present at the time of the crash. No judgment is made as to whether any factor is related to the reason of a particular crash, just whether the factor was present when the crash occurred. There are some important differences in the coding of associated factors between the two vehicle types. For large trucks, but not passenger vehicles, following too closely (a traffic situation requiring a stop before the crash) and distraction outside the vehicle were statistically related to assignment of the critical reason.

Furthermore, for passenger vehicles, but not for trucks, alcohol and illegal drug use have a statistically significant association with coding of the critical reason. These factors, combined with fatigue (coded twice as often for passenger vehicles as for large trucks) and illness (coded five times more often for passenger vehicles), show passenger vehicle drivers were subject to adverse physical conditions more often than truck drivers.

U.S. Department of Transportation (USDOT)/Interim Final Rule (IFR) Pertaining to Hours of Service

In 2003, the FMCSA significantly revised the hours-of-service guidelines in an effort to cut down on collisions resulting from driver fatigue. It limits drivers to operate a truck for 11 hours in a 14 hour duty period followed by at least 10 hours off-duty. A release made public by the FMCSA in December 2007, presents a rule concerning the 11 hour operating limit in order to ensure it is continued, applied and enforced. This rule (IFR) was developed after new data showed safety levels have been maintained since the 11 hour limit was first implemented.

Since 2003, the percentage of large trucks involved in fatigue-related crashes during the 11^{th} hour of driving remained below the average from 1991-2002. If followed, the rule significantly reduces crashes due to driver fatigue, thereby reducing overall the number of crashes involving commercial vehicles. The significant reduction in fatigue-related crashes as a result of the "11 hour" rule invokes a stricter standard for the trucking industry. In efforts to regulate and enforce compliance with this rule, the agency is working on a proposed rule to require drivers and trucking companies with serious or repeat hours-of-service violations to track hours-of-service using electronic, on-board recorders. The IFR is available at http://www.fmcsa.dot.gov/about/news/news-releases/2007/hos.pdf.