HEAVY TRUCK CRASHWORTHINESS

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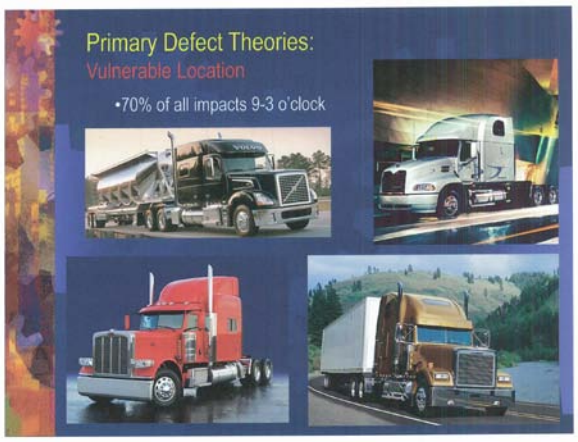
Crashworthiness of large trucks involves design issues aimed at protecting the truck driver as well as protecting motorists who might crash into a truck. Our focus here looks at some of those issues. For the trucker, we look at fuel fed fires, roof crush and cab protection from load shifts. For motorists, we review truck under-ride protection and claims that trucks at night must have lights or reflectors to make themselves conspicuous to other motorists.

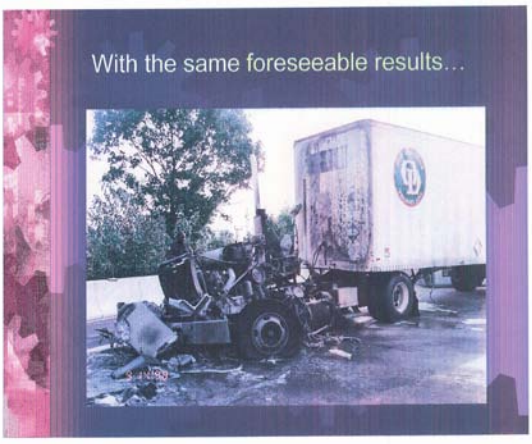
FUEL FED FIRES

Collision fuel fed fires are fifteen times more likely to kill truck drivers than passenger car occupants. That is because heavy trucks are not as regulated for fuel system safety as automobiles. The economics that drive the heavy truck industry say that the vehicle should carry maximum fuel as far forward as possible. This allows the most cargo over the rear axle. Things have really not changed since the article by Transportation Research Institute at the University of Michigan in 1993 which reported that of all fatal accidents involving truck drivers, sixteen percent of them died in fires. That is a staggering statistic considering how easily the problem can be solved by design.[1] A November 1988 study by Texas Transportation Institute found that ten of twenty-seven cases studied involved fire.[2] A study by the National Highway Traffic Safety Administration in 1989 recommended tank modifications, including increasing the puncture resistance of fuel tanks, use of bladders in the tank and protection of the tank from nearby

[1] "Fires and Fatalities in Tractor-Semitrailer Accidents," James O'Day, Umtri Research Review, Vol. 14, No. 2 (Sept 1983)
[2] "Heavy Truck Fuel System Integrity Study," Texas Transportation Institute (Nov 1988, pages 18-19, 24, 27-28).

components that might strike or rupture it.[3] In August 1995, Freightliner commissioned a study by the University of Michigan Transportations Research Institute (UMTRI) that found that in the previous three years, about nine persons per month had died from fires in Freightliner trucks.[4] In short, industry is on notice that its side-saddle, forward-position, unguarded, unprotected, large diameter, thin-walled, aluminum fuel tanks are unsafe. They cause fires and fatalities. Solutions are simple. Protect the fuel tank by placing it between the vehicle frame rails and away from most likely impact areas, shield the tank and other fuel system components, and build in redundant features that reduce or eliminate fuel spillage and admission when the system is compromised. The principle of fuel system crashworthiness is the same for heavy trucks as it is for cars: if the truck driver has survived the impact, he/she should not die in a post-collision fuel fed fire.





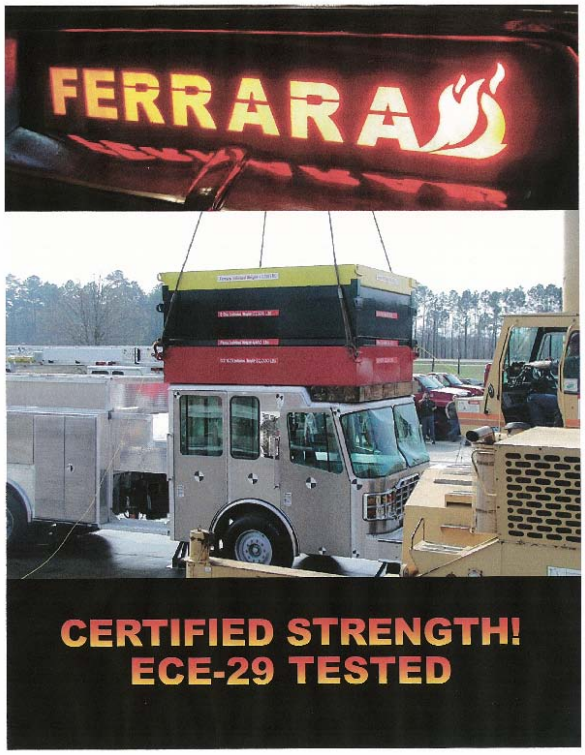
An alternative theory in fuel system cases, and one that has been successfully used, is the lack of an escape hatch. Volvo, Freightliner, Mercedes and others equipped many heavy trucks with roof escape hatches. The design of these varies widely. If your truck driver died in a fire after his truck overturned and he was unable to escape because there was no hatch, you have a

[3] "Heavy Truck Fuel System Safety Study," NHTSA DOT HS 807 484 (Sept 1989)
[4] "Freightliner Trucks Involved In Fatal Accidents 1991-1993," UMTRI (Aug 1995)

good case. For those trucks which have the escape hatch, but it was unusable for some reason, the design and location are potential defect theories. If your trucker was trapped in his cab and died in a fuel fed fire, you probably have a case.

TRUCK CAB ROOF CRUSH AND RESTRAINT SYSTEMS

Roof crush and restraint issues are no different for trucks than cars from a technical standpoint. Truck crashworthiness is a matter of comparing the best designs to your design. Trucks manufactured in this country have no roof crush crashworthiness government standards, so look to Europe. The Economic Commission for Europe (ECE) Structural Standard R29 requires a built in Rollover Protective Device that supports ten metric tons (22,000 lbs). European trucks follow this requirement. Kenworth Australia follows this requirement. A fire truck manufacturer in Louisiana, Ferrara Fire Apparatus, Inc., has advertised since 2003 that it does also.



In the U.S. the trucking industry has successfully convinced the government to send the issue back for more study for decades. That is despite the fact that a study conducted by the University of Michigan Transportation Research Institute found that of 583 heavy trucks involved in fatal accidents in 1993, 288 (49%) were rollover accidents that resulted in fatal injuries to the driver. (F. Krall, Heavy Truck Occupant Crash Protection, A Historical Chronology. 2006). Crashworthiness cases for roof crush require a seat belted truck driver to be feasibly prosecuted. Black box download will usually be the telling evidence of that. It also helps to be in a State where the cause of the accident is not a defense. Roof crashworthy designs are in natural conflict with the desire of trucking companies for lighter, fuel efficient trucks.

CAB GUARDS

A crashworthiness issue is the design of guards intended to protect the driver from shifting cargo. Performance requirements under Federal Motor Carrier Safety Regulation 393.114 require that a cab guard be able to resist a static load equal to one-half of the weight of the cargo being transported, uniformly distributed over the guard. For certain taller cab guards, the requirement is 40% of the weight of the cargo. The cab guard cannot be penetrated when the vehicle decelerates at a rate of 20 feet per second, or about .5 g's. Most guards in the U.S. are aluminum, and designed to fail at 20,000 - 25,000 lbs. Aluminum guards face welding issues that are much different than steel, and carriers are generally unaware how aluminum welds deteriorate over time. The warning stickers for these guards frequently indicate that they have been tested as suitable for loads of 40,000 – 50,000 lbs. In fact, these are static tests, not dynamic tests. By contrast, in Sweden there is a dynamic test that applies a pendulum device

rather than a static load. Many truckers are killed, or caused to lose control, when they are subjected to load shifts not tolerated by the cab guards.

REPRESENTING THE DRIVER

Representing a truck driver who has been seriously injured or killed has special problems. You probably have a worker's compensation carrier looking over your shoulder, and asserting a lien against the recovery. FMCSR 395.8 only requires that the log book be maintained for six months, so it is important to move quickly to obtain that evidence along with the printout from the onboard computer. Once you find out if your truck was equipped with GPS technology to monitor the trip, you must obtain the information about speed, location, route traveled, and other details stored on the main computer at the truck home office. Comparing that to the entries in the logbook, the bills of lading and the fuel tickets will be necessary.

REAR UNDER-RIDE GUARDS

Turning our attention to motorists who collide with trucks, we will look at crashworthiness from a different aspect. Heavy trucks are required to have rear impact guards that meet 49 USC §521.223. This standard sets the requirements for rear impact guards for trailers and semitrailers and has the purpose "to reduce the number of deaths and serious injuries that occur when light duty vehicles collide with the rear end of trailers and semitrailers." While standard 223 set the requirements for the guard, the next section 571.224 requires them on all trailers and semitrailers with a gross vehicle weight rating of "4,536 kg or more," the equivalent of about 10,000 pounds. The final rule went into effect in 1996 and applies to most trucks on the road. Almost every guard passes this standard when manufactured, but may under-ride guards

on trucks in operation in this country fail to meet it. The reason is that often trucks back into loading docks until they strike the under-ride guard. This weakens the guard, often producing cracks in the metal, and means that the effectiveness of the standard is lost. Trucking companies are well aware of this. Their practice is usually to arrive on accident scenes within twenty-four hours of the accident, take the guard from the truck and destroy it. Because this happens before you have been retained in the case or have been able to send a letter demanding that they preserve the evidence, you have a possible case for spoliation of evidence, but a difficult product liability case.

What if you have the guard and find that it meets the federal standards? You may still have a case. In 2004, Transport Canada concluded that the U.S. standard for rear under-ride at FMVSS 223 and 224 was not strong enough. Canada's standard now requires that the guard be tested with a force of 78,652 pounds for a displacement of only five inches. This is close to the original test of 75,000 pounds proposed in NHTSA's 1969 rule making, and much stronger than the U.S. Standard.[5] The Transport Canada standard relied upon a series of crash tests into guards meeting the NHTSA standard, which showed catastrophic results. [6] Because the Canada standard has now become the State of the Art, it can easily be met by many guard designs. This fact weakens the NHTSA defense argument offered by the trucking manufacturers and trucking industry that the device is not defective because it complies with the U.S. standard. The trucking company, as the maintainer of the guard device, is as an important of a defendant as the truck and guard manufacturer in these cases.

Currently NHTSA and Transport Canada regulations only address guards from the rear. The absence of side guards is also potentially an issue. One accident scenario is that the truck

[5] www.underridenetwork.org/history.html
[6] "A Discussion on Rear Under-ride Protection in Canada," D. Boucher and D. Davis (Transport Canada) showed test results on a Honda Civic, Ford Windstar and Chevrolet Cavalier at 30 and 35 mph.

gets sideways on the interstate because of loss of control, and following traffic runs underneath the side, killing one or more passengers. In England, side guards have been mandated since 1984, along with rear guards. The side under guards cost about $500 per trailer according a 1999 survey by the Consumer Federation of America. Since installing side guards absent federal regulations makes the truck more expensive, there will need to be significant litigation to change the conduct of the American trucking industry.

In March 2011, the Insurance Institute for Highway Safety petitioned NHTSA to strengthen the under-ride guard requirements in the US. IIHS cited a study of one thousand crashes involving under-ride guards. The guards provided protection from significant under-ride only twenty-two percent of the time. In a series of crash tests, IIHS demonstrated that guards meeting Canadian standards provide significantly more protection than those meeting only the US standard. According to Adrian Lund, Institute president: "Under current certification standards, the trailer, under-ride guard, bolts, and welding don't have to be tested as a whole system. That is a big part of the problem. Some manufacturers do test guards on the trailer. We think all guards should be evaluated this way."

This is how a car looks after a 35 mph full-width crash into the rear of a Hyundai trailer with a weak Under-ride guard.

This is a car after a 35 mph full-width crash into a Wabash trailer with a strong guard. The occupant compartment is intact.

CONSPICUITY

Failure of a trailer manufacturer and trucking company to properly illuminate trailers are frequent issues in trucks that have pulled off on the side of the highway at night where the driver has failed to place reflector triangles as a warning. Trailers having an overall width of 80 inches and a gross vehicle weight rating of 10,000 pounds must be equipped on the sides and rear with reflective tape. The standard DOT C2 reflective tape alternates red and white. The NHTSA standard applies to trailers manufactured after December 1, 1993 and tractors manufactured after July 1, 1997. The regulation is found at 49 CFR §571.108, §5.7 "Conspicuity Systems." Once again, the regulations are stronger in Europe. ECE-104 and ECE-48 require bigger tape and more of it. Cases involving conspicuity frequently also involve underride guard claims.

THE FUTURE

In 1998 the Society of Automotive Engineers published nine crashworthiness test procedures that address the issues in this paper. Most are static tests. The dynamic tests are J-2421 COE Frontal Strength; J-2423 Cab Roof Strength, J-2419 Occupant Restrain Systems, Frontal; J-2426 Occupant Restraint Systems, Lateral. Although some are being used, manufacturers are driven by the truck market, which is focused on fuel efficiency and cost. The result is a continued lack of crashworthiness in U.S. trucks and no likely shortage of crashworthiness litigation. Tort reform that has reintroduced the fault in the underlying accident to crashworthiness claims now threatens the practicality of pursuing some truck driver cases more than before. The ECE crashworthiness regulations are favorably influencing development of stronger US manufacturing standards.

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