BIG RIG RESCUE

This belongs to:_____

About your presenter…

BILLY LEACH, JR.

Billy has been actively involved in Emergency Services since 1976, combining career and volunteer experience. He serves as the Senior Presenter and Planner for **BIG RIG RESCUE™**. Frequently he conducts training in vehicle rescue, and has presented at the International Vehicle Extrication Learning Symposium, Firehouse Expo, Search and Rescue Disaster Response Conference, Fire Department Instructor's Conference, *Fire Rescue* Magazine's First Due Conference, American Towman Exposition, NC Extrication College, FDNY's Technical Rescue School, and many regional fire/rescue training seminars. Billy has co-authored a book, **BIG RIG RESCUE©**, on the topic of heavy truck anatomy and extrication.

BIG RIG RESCUE™
Training Description

Level 1
Heavy Lifting and Stabilization; The 5 Step Discipline for Overturns and Underrides

Level 2
School Bus Anatomy and Extrication

Level 3
Introduction to Special Needs Transportation; Anatomy and Extrication from Special Needs School Buses

Level 4
Commercial and Transit Bus Anatomy and Extrication

Level 5
School and Transit Bus and Commercial Coach Firefighting Operations

Level 6
Multiple Patient Incident Response

Level 7
Heavy Truck Anatomy and Extrication

Level 8
BIG RIG RESCUE™ Special Situations

BIG RIG RESCUE™ -7
Heavy Truck Anatomy & Extrication

Three Major Truck Categories:

Straight-These trucks range from small pickups to cargo vans. A straight truck is defined as the driver's cab and cargo area mounted on the same chassis.

Tractor Trailer-This truck is divided into two separate units, a tractor and a cargo trailer. A tractor without a cargo trailer is commonly referred to as a 'bobtail'

Specialty-This type of truck may be a straight or tractor trailer combination, however the unit serves a single purpose. An example is a cement mixer.

Truck Gross Vehicle Weight (GVW) Classifications

Classes 1 and 2-Trucks with a GVW under 10,000 pounds. Examples include passenger vans, pickups, cargo vans, and ambulances.

Classes 3, 4, and 5-Trucks with a GVW ranging between 10,001 to 19,500 pounds. Examples include walk-in vans and cargo vans.

Class 6-Trucks ranging from 19,501 to 26,000 pounds. Examples include single axle cargo vans, school buses, and flatbed units.

Class 7-Trucks with a GVW ranging from 26,001 to 33,000 pounds. Examples include home delivery fuel trucks and delivery trucks.

Class 8-Trucks with a GVW over 33,000 pounds. Examples include cement mixers, tractor trailers, fire engines, and intercity buses.

Heavy Truck Anatomy

General

Tractors are divided into two groups, cabovers and conventional cabs. In a conventional cab truck the driver sits behind the engine and the cab doesn't tilt. In a cabover truck the engine is between the seats and the cab tilts for repair. There are hinges and latching mechanisms that allow this tilting. It is important to remember that these attachment points may fail during a crash.

Air ride cabs are common in both cabover and conventional units. This system allows for a smoother ride, as air bellows adjust their internal pressure.

Heavy trucks are constructed as a body-on-frame unit. The foundation begins with two large steel frame rails. Onto that frame the cab is mounted.

The construction material of both cabovers and conventionals includes aluminum, steel, and composites. The fenders, hood, and skirting material are usually a lightweight composite such as plastic or fiberglass.

Sleepers may be integrated into the cab, or attached as an independent unit. A sleeper may contain creature comforts such as a TV/DVD, refrigerator, computer, shower, and bunk beds. After a crash the sleepers must be checked for the possibility of injured victims. Composite materials, steel, or aluminum may be used to construct the sleeper unit

Glass

Windshields of heavy trucks are made of laminated glass, most commonly mounted in a rubber gasket. Removal is simple using common extrication techniques and tools. Some manufacturers are beginning to use adhesive to mount the windshield. This method adds strength to cab construction.

Side glass is of tempered construction. Common extrication tools and techniques work well in this case.

Rear glass in trucks may be laminated or tempered, however is usually mounted in a rubber gasket. Removal is simple using common extrication tools and techniques.

Doors

Doors are mounted with conventional automotive or piano type hinges. The latching mechanism most often installed is single point with a two step action. The door panels may be steel, aluminum, or composite materials. Collision beams aren't typically found in heavy truck doors.

Body of Vehicle

As the necessity for greater fuel economy and efficiency increases the materials used to construct cabs is changing. Cabs once constructed primarily of steel are being fabricated with increasing amounts of aluminum and composites.

The roofs of tractors are usually made of lightweight materials such as aluminum or composites.

Cabs begin with a framework of high strength steel or aluminum to which body panels are attached. This is representative to space frame construction found in autos.

Air foils are added to improve the aerodynamics of the tractor, and are made of lightweight aluminum or composites.

Electrical System

The electrical requirements of a heavy truck are greater than that of autos. Large batteries are parallel wired together to produce a higher amperage flow. The location of these batteries varies according to the specs for the truck itself. Separate batteries may exist to power optional devices such as generators and other items.

Responders must search for the battery compartments and de-energize the electrical system promptly after arriving. Master electrical shutoffs are not generally found on heavy trucks.

Fuel System

Fuel for heavy trucks is carried in tanks mounted alongside the tractor known as 'saddle tanks'. Tank construction is generally aluminum and the capacity varies from 75-150 gallons each. Heavy trucks may have two tanks with as much as 300 gallons of fuel total.

By far the most common fuel for heavy trucks is diesel. Though not as volatile as gasoline, diesel should be considered dangerous. This is especially true when fuel is spilled onto a hot highway or motor surface.

Brake System

Class 8 trucks are equipped with air brake systems. An air compressor supplies an average of 13.5 cubic feet per minute of air at 120 psi. Optional units may supply more volume. The pressure is regulated by an air compressor governor. The air is supplied through the system from tanks terminating into spring brake chambers. These chambers are mounted on the rear axles of the tractor and also the trailer. Air pressure is used to keep the brake shoes disengaged. A decrease of air pressure below 60 psi automatically engages the brakes.

Air is supplied to the trailer brakes through flexible hoses connected with 'glad hands'. The hoses are commonly colored red for emergency brakes and blue for service brakes. If the air supply to the trailer is interrupted the trailer brakes will engage.

It may become necessary to move a unit after a collision. If the brakes are engaged they must be released. A procedure known as 'caging' is performed, which involves inserting a special tool into the chamber to release the brakes. Alternately an exterior hex nut may be turned to release the brakes.

Never attempt to disassemble the brake chamber to release the brakes! This is deadly as a heavy spring will release and rocket outward. Firefighters should be aware of this during a heavy truck fire and avoid standing in direct line with the chamber. The outer casing may melt and release the heavy spring.

Specific Information

Air adjusted seats are very common in big rigs. Air is used to inflate a bag or bellows and adjust the seat for the driver or occupant. The air pressure inside the bag is usually the same as truck air system pressure, averaging 120 psi. The inflation/deflation is controlled by a manually operated switch most commonly found on the lower section of the seat on an outboard edge. Inflating the bag raises the seat, while deflating the bag lowers the seat.

If a bag is punctured the seat may travel several inches suddenly, thus rescuers should avoid puncturing the bag or associated air lines.

Lowering the seat is certainly an acceptable method for creating sufficient room for patient removal, provided the movement is carefully controlled.

Steering wheels are larger in diameter than those in autos. Commonly the driver will have the wheel positioned close to their body while driving. It is this larger wheel that tends to trap drovers especially when the dashboard is displaced rearward.

A common option found on big rigs is the tilt steering wheel. Responders should look for an adjusting mechanism when the driver is trapped by the steering wheel, and use it to relocate the wheel itself.

Some manufacturers are offering SRS (airbags) in their latest models. At this time the bags are contained in the steering wheel hub and deploy similar to the automobile counterparts. As with autos, the SRS deploys with a frontal crash.

In concert with the SRS some manufacturers are providing seatbelt pretensioners. These function very similar to those found in autos.

The ‘fifth wheel’ on a big rig is the receiving point for the trailer connector. Each trailer is equipped with a ‘king pin’ which enters a slot of the fifth wheel. A locking mechanism is engaged which secures the tractor and trailer as a unit.

Initial Assessment

Assessment begins with initial dispatch information. While responding to the scene the information should be evaluated. Of primary importance is the truck’s cargo. Prior to any extrication efforts, the truck’s cargo should be identified.

Cargo may be identified through various methods. These methods include type, shape, or color of the container(s), plus placards and markings. For a more effective determination the shipping papers should be inspected.

During highway transportation the shipping papers are to be kept in a pocket or container on the inner side of the driver’s door during tractor operation. Should the driver leave the cab, the papers are to be placed on the driver’s seat. Obviously during a crash these papers may be found anywhere.

The shipping papers are known as the Bill(s) of Lading. These papers will detail the proper US Dept of Transportation shipping name of the product, the shipper, hazard classification, hazmat identification number, and an emergency contact for further information.

For greater information regarding emergency actions responders should refer to the latest edition of the US DOT ‘Emergency Response Guidebook’ (ERG)

If the dispatch information suggests the need for a heavy wrecker or other resources not already enroute they should be requested immediately.

Responders should walk around the crash site, commonly referred to as the ‘circle survey’. Do not touch the vehicles involved until you are certain they aren’t energized with electricity or contaminated with a hazardous material. During the circle survey look for such things as number of patients, leaks, vehicle stability problems, extrication problems, cargo contents, and damaged utility poles or downed wires.

Downed wires may be concealed from responder’s view due to the size of the tractor trailer combination. Utility companies must be called to handle all downed wire situations, as they are the professionals in this instance.

Additional resources should be quickly requested after the initial assessment. When requesting resources be specific as the number and type needed. Advise the incoming resources as to the best travel approach. Attempt to dedicate a single way into the scene and one for departure also.

Hazard Control

The potential for a fire erupting exists after a crash, thus fire prevention and protection measures must be implemented as soon as possible after arriving.

A charged fire hose should be positioned between the primary fire hazard(s) and the patients as soon as possible. The minimum flow for this hose should be 100 gpm. A minimum of two firefighters should operate this hose, and they should be protected by a full ensemble of PPE including a SCBA with mask in place. Due to the physical size of the vehicle(s) involved firefighters may consider placing a second charged fire hose on the opposing side of the vehicle(s). Appropriate foam concentrate should be introduced into the fire hose if possible. A fuel spill hazard should be mitigated with a blanket of foam, and the blanket maintained to minimize vapor production.

Fuel leaks should be halted using appropriate materials, according to the level of hazardous material training the responders have. Tanks may be plugged or patched, and a container placed beneath to catch spilling fuel. Fuel lines may be crimped or plugged. Absorbent materials should be used to contain any spills. Most big rigs are equipped with a leak/spill kit, and the driver should be asked if one is available. Leaks/spills should be reported to the appropriate environmental protection agency as soon as possible.

The electrical system of a big rig should be de-energized as soon as possible after a crash. The negative (ground) cable should either be disconnected or double cut first. Then, the positive cable should either disconnected or double cut also. The cables are approximately the size of 00 gauge electrical wire.

Stabilization
Vehicle Upright

Initial efforts should be directed towards preventing horizontal movement of the big rig. This can be accomplished by placing 6”x6” cribbing timbers in front of, and the rear of one (or more) tire(s). Commercial tire chocks may also be used. During stabilization the big rig’s tires are not deflated.

Once initial stabilization has taken place efforts can be directed towards preventing cab movement. Cribbing timbers and wedges can be placed strategically to prevent vertical movement. Struts systems may also be employed.

If a cabover has disconnected from its latching mechanism and tilted forward, it must be stabilized prior to extrication efforts. Rigging tools such as commercial load binders and comealongs may be used to secure the cab. Points of connection between the cab and chassis must be structurally substantial to be utilized. A forward tilted cab is a common occurrence and must be quickly stabilized to prevent danger to responders and further injury to the patients. Patient removal from the cab will obviously be affected, and will require some common procedures to be modified.

Stabilization
Vehicle Sideresting

Timber cribbing pieces should be placed in contact with structural strong parts of the cab to prevent unwanted movement. Typically those points are located near the corners of the cab. Also, struts are useful during stabilization of the sideresting tractor. Generally these vehicles are relatively stable unless on a slope or damage produces instability.

Stabilization
Vehicle Inverted

The cab will be supporting the weight of the heavy chassis, including the motor and drivetrain. This elevated center of gravity, along with the damaged cab will present dangers to both responders and patients. Timber cribbing pieces, struts, jacks, and air bag rescue systems may be quickly placed to provide initial stabilization. They can be sustained by a heavy recovery truck using wire rope and winches, supporting the weight above the center of gravity.

Likely the greatest direction of movement of the damaged cab is vertical. Efforts should be directed towards preventing that movement, most importantly during extrication operations. Struts perform this task well.

Extrication Techniques to Gain Access
Doors

The door is the primary point of access. A purchase point is made near the latch using common tools. Hydraulic spreader tips are inserted into the purchase and the arms opened. Continue the spreading effort to force the door down and away from the latch. A strap or rope may be attached to the door itself to prevent unwanted movement.

An option to the latch first entry method attacks the door hinges first. If the hinges are exposed, either disassemble or cut them. If the hinges aren't exposed the hydraulic spreader may be used to expose them. When the door is opened in this manner the latch can usually be overcome by using the door as a lever.

If the big rig is upright responders may be working some six to eight feet above surface. Ladders or platforms may be used to facilitate working at this height, however they must be secured. Also, a flatbed car carrier may be used as a platform by placing it nearby the work area.

Extrication Techniques to Gain Access
Windows

Access is often easily gained by removing glass. Common vehicle rescue techniques and tools are utilized. Remember the safety of all when removing glass.

Extrication Techniques to Gain Access

Body of Vehicle

If access can't be made through the doors or glass openings the cab body is considered. The primary entry point is usually at the rear of the cab into the sleeper area or driver's compartment. An opening is made through the metal and expanded using an air chisel or reciprocating saw. An opening large enough to pass a responder is made and access for lifesaving care is obtained. This opening is then expanded to allow removal of a packaged patient.

Generally two walls exist in a cab, the exterior being metal. The second interior wall is typically lightweight construction and easily removed. Between the walls lie insulation and electrical wiring.

Extrication Techniques for Disentanglement

Steering wheel/column entrapment is common during big rig crashes. Responders should attempt to adjust the wheel/column if this is possible. An option is to completely cut the column with a reciprocating saw. Responders should avoid 'pulling the column'.

Producing the steering assembly entrapment is often intrusion of the dashboard. To provide space a 'dash push' is performed. Similar to a common 'dash roll' relief cuts are made at floor level and the A post is severed. A hydraulic ram is inserted into the door opening and expanded. If possible the ram is positioned horizontally in the door opening. As the ram expands, the dashboard will move away from the patient. Place a wedge into the relief cut as it expands with dashboard movement.

As opposed to flapping a roof a section may be cut away to facilitate patient removal. The hydraulic cutter and reciprocating saw work best to perform the cuts needed. Typically air and electrical lines are routed through roof posts and between the roof layers.

Trailers

Vans

The dry van is the most common trailer in use. A vast array of commodities is transported in these.

The maximum length allowed on designated highways in most states is 53', while 'pups' are 28' in length. Late models trailers are generally frameless, with each component interdependent upon another for strength.

Wall construction in van trailers varies, ranging from aluminum, Fiberglass Reinforced Plywood (FRP), to soft sides. Regardless, the walls of a van trailer offer little structural support for lifting.

Common van trailers utilize both spring and air-ride suspension systems.

Landing gear is used to support a trailer when it is not connected to a tractor. Both 'crank-down' and 'pin-type' are used. Responders should not rely upon landing gear alone to support a trailer.

Sliding tandems allow the rear wheel assemblies on a trailer to move. This assists in load distribution and support. In the event of a rear underride the landing gear may be lowered and the tractor disconnected. The gear is them retracted which may create some space at the rear of the trailer.

Trailers
Refrigerated

Cargo transported in refrigerated trailers is considered perishable. If possible, allow the refrigeration unit to continue to operate. Refrigeration units are usually mounted on the front of the trailer, weighing 300-600 pounds. Refrigeration units are thermostatically controlled, thus starting and stopping automatically. Operating controls are found on the unit itself.

If a fire or crash damage weakens the trailer walls the threat of failure is prevalent. Responders should remain aware of this danger and remain out of the potential collapse zone of the walls, generally two times the height of the trailer.

Fuel tanks are mounted on the trailer to supply the refrigeration unit, usually 40 gallon capacity. The most common fuel is diesel. A shutoff valve is typically found on the tank, with a flexible line transporting fuel to the unit.

A 12 volt DC electrical system powers the refrigeration unit's electronics. Typically a separate battery for this power is mounted within the refrigeration unit.

Trailers
Specialty

Specialty trailers vary greatly due to their unique uses. Bulky or heavy objects may be transported, plus a great variety of other uses. Responders should become familiar with any specialty trailers operating in their response area.

BIG RIG RESCUE™

Heavy Truck
Anatomy & Extrication

Familiarization Exercise

BIG RIG RESCUE™
Heavy Truck Anatomy & Extrication
Familiarization Exercise

General:
Make & Model of Truck:
Empty Vehicle Weight:
Vehicle Height: Vehicle Length: Vehicle Width:
Engine Stop Switch: Yes No
Engine Stop Switch Location:

Fuel System:
Fueled by: Fuel Tank Location:
Fuel Tank Capacity:
Fuel Tank Filler Location:
Fuel System Valve: Yes No Location:
Fuel Tank Construction Material:

Electrical System:
Battery Location:
Battery Voltage:
Master Electrical Shutoff: Yes No Location:

Access & Removal Areas:
Door Hinge Method:
Door Latch Method:
Windshield Mounting Method:
Rear Window: Yes No Mounting Method:
Sleeper: Yes No

Special Features:
Adjustable Steering Column: Yes No
Adjustable Seats: Yes No
Supplemental Restraint Systems: Yes No

BIG RIG RESCUE™
Heavy Truck Anatomy & Extrication
Familiarization Exercise

<u>Please perform the following tasks:</u>

Tractor:

- Set parking brake
- Operate all doors
- Access battery compartment
- Locate master electrical shutoff
- Locate fuel fill point
- Locate fuel system valve(s)
- Locate engine stop switch
- Adjust all seats
- Adjust steering column
- Locate service and emergency brake air supply lines
- Locate trailer electrical cable and connectors
- Locate truck's fire extinguisher
- Locate storage area for Bills of Lading ('shipping papers')

Trailer:

- Operate landing gear
- Locate rear tandem sliders
- Locate reefer unit fuel tanks and valves
- Operate airline and electrical connectors
- Connect and disconnect trailer
- Operate rear trailer doors

HYDROCARBON BLENDS, MIXTURES, and RELATED COMPOUNDS
EXPOSURE INFORMATION

Routes of Exposure:
Skin/eye contact, Inhalation of vapors, Ingestion, Skin Absorption

Target Organs:
Primary- Skin, Eyes, Central Nervous System, Cardiovascular System, Hepatic System
Secondary- Respiratory System, Renal System, Gastrointestinal System

Life Threat:
CNS depression may lead to respiratory arrest, also seizures, pulmonary edema, and cardiac arrhythmias

Signs and Symptoms by Body System:
Cardiovascular: Cardiac Arrhythmia, Tachycardia, Hypotension, and Shock
Respiratory: Upper respiratory tract irritation, Dyspnea, Crackles, Pulmonary Edema, Tachypnea, Burning sensation in chest
CNS: Confusion, Disorientation, Headache, Drowsiness, Weakness, Seizures
Gastrointestinal: Nausea, Vomiting, Diarrhea, Irritation of GI mucous membranes
Eyes: Chemical Conjunctivitis
Skin: Irritant Dermatitis
Renal: Kidney Failure
Hepatic: Liver injury

Acute Exposure Symptom Onset:
Immediate, however symptoms/signs of Pulmonary Edema may be delayed

Product Reduction:
- Wear full PPE, including SCBA
- Remove patient from contaminated area ASAP
- Quickly remove and isolate patient's clothing
- Blot excess product from patient's skin
- Rinse patient with warm water
- Wash patient with warm water and mild liquid soap

Medical Treatment:

- Maintain airway and support respiration
- Don’t induce vomiting and start IV of choice @ KVO rate
- Administer oxygen via non-rebreather mask at 15 LPM
- Maintain body warmth and limit patient movement
- Monitor cardiac rhythm and treat arrhythmias accordingly

Flush eyes with sterile water or normal saline if contaminated/exposed

THANK YOU!

For attending

BIG RIG RESCUE™

I sincerely hope that the knowledge you gained will never be used, however it is realized that the potential for serious accidents exists everyday and anywhere.

I encourage you to become proactive and lead an effort to begin preparation now. This effort must include preparing rescuers and gathering equipment.

If I can be of assistance to you in the future, please don't hesitate to contact me. Should you have questions, comments, or training needs please let me know.

Again, **thank you** and I trust your return trip will be safe.

Billy Leach, Jr.