



## Safety Tips for Armor Leaders

Accidents happen in and around armored vehicles. Lives are lost, Soldiers are injured, and equipment is damaged. Experience shows that the same weaknesses in operations, training, maintenance, and attitudes that produce accidents during controlled training situations in peacetime dramatically increase the chance for accidents under the pressures of combat. Eliminating the causes of accidents is an important duty for every armored vehicle crewman. Commanders and Leaders at all levels must provide necessary guidance. Supervision and enforcement of established procedures are essential to preventing accidents. Anytime you work around or operate armored vehicles, situational awareness is key. Standards and discipline are the best control measures.

The following pages list many of the common hazards associated with armored vehicle operations. Though not all-inclusive, many hazards are discussed.

**This document is not designed to replace the safety procedures in your vehicles technical manuals or any SOPs in your unit. It is only designed to raise your awareness to the many hazards you face when operating armored vehicles.**

By using the five-step risk management process for every operation you conduct, you should be able to identify and mitigate hazards.

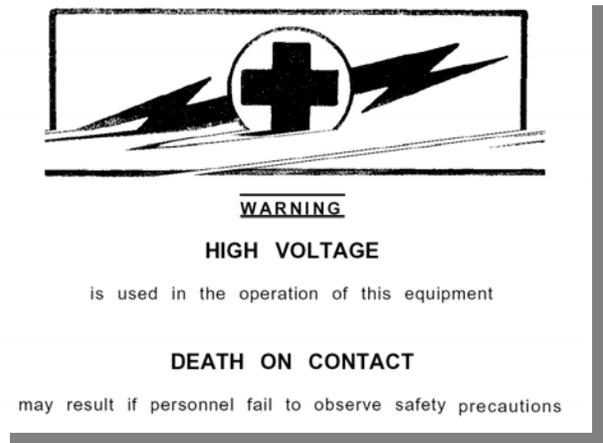




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**Technical Manuals:** Always read your TM and pay attention to the WARNINGS, CAUTIONS and NOTES to ensure Safe Operation of vehicles during:

- Normal operations
- B/D/A operations maintenance
- Extreme or unusual conditions
- Training operations
- Combat operations



Why do we need them?

- To prevent accidents/incidents while operating vehicles.
- To understand procedures in the event of an emergency or serious incident.
- To provide information where injury may occur to personnel on or near a vehicle and where damage to a vehicle may occur.

**Warnings:** Provided where injury may occur to personnel on or near the vehicle. They are boxed or preceded by the word “Warning” with an overscore or underscore.

**Cautions:** Provided where equipment may be damaged but No personnel injuries should result. The word “Caution” is underscored.

**Notes:** Provide information to operate the vehicle, but No equipment damage or personnel injury is involved.

**Warnings, Cautions, Notes, and Emergency Procedures should NEVER be ignored!!!**

**Crew Drills:** Leaders must emphasize, and crews must learn, that traversing is never done without the standard alerting commands and that the operator must take a second--or third--look to make sure no one is in the way. This includes fire drills



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and rollover drills. Crew drills are key to safe, successful operations in an emergency.

**Ground Guides:** Ground guiding any vehicle is an important matter. Knowing the proper hand & arm signals and having an experienced driver are key to moving vehicles from place to place safely. Adhering to the following will greatly reduce your chances of having a ground-guiding incident.

- The ground guide should always be stationary when guiding.
- The driver will stop the vehicle if they lose sight of the ground guide or don't understand the instructions.



- When backing your vehicle, use two ground guides. One in front and the other in the rear. The rear ground guide is in control and the front ground guide takes instructions from them.
- Do not drive faster than the ground guide can walk.
- Ground guides should walk 30 feet in front of, and to the left of the vehicle to observe traffic to the front and rear of the vehicles. The ground guide is the correct distance from the tracked vehicle when the driver can see the ground guide's feet.

**Mounting / Dismounting / External Movement:** Accidents continue to happen when Soldiers mount or dismount a vehicle. Usually from slips, trips, and falls due to wet and oily surfaces. Soldiers dismount by jumping from vehicles and injuring legs, ankles, and knees. There are cases where Soldiers attempt to mount moving vehicles and get their feet caught between drive sprocket and track. These accidents can be prevented if crewmen are more safety conscious and if they—



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- Use three points of contact at all times (one hand and two feet or two hands and one foot) when mounting, dismounting, or moving on top of the vehicle.
- Never mount or dismount a moving vehicle. Let vehicle come to a complete stop before mounting or dismounting.
- Never mount a vehicle in front of the weapons systems.
- Never dismount by jumping.
- Follow standing operating procedures (SOP) and use steps or prepared areas (roughly textured for traction) where available.
- Use extra care if mud, water, or spilled POL is on boots or vehicle surface.
- Clean oil spills from vehicles.
- Mix sand in paint or other roughly textured materials to improve traction on highly traveled areas.

### **Inattention/Situational**

**Awareness:** Another common accident involves soldiers not paying attention to what they are doing or what other soldiers or crewmembers around them are doing. These accidents result in fingers, hands, arms, and feet getting closed in hatches and doors. Other reported cases involve Soldiers working in or around engine compartments. They get fingers and hands caught in fans, and clothing caught between belts and pulleys, or burn themselves on hot engine parts. Crewmen can prevent these accidents by—



- Being more observant and keeping all parts of the body away from hatch and door openings.
- Warning others before closing hatches or doors and ensuring they are clear before closing.
- Stopping the engine before working on or near fans or belts, ensuring good communications between mechanics and helpers, and ensuring no one can start the vehicle while it is being worked on (disconnect battery cable or attach a highly visible warning tag in driver's compartment).



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- Using extreme caution when working in or around the engine compartment or hot engine parts. If time permits, wait for the engine to cool or take precautions such as wearing long sleeves or gloves.

**Excessive Speed:** Excessive speed is the most frequent contributing cause of rollover accidents. Attempting turns at speeds excessive for conditions too often results in rollover accidents. Drivers must be aware of speed, turns, and rollovers. A full right- or left-hand turn at speeds over 20 mph (32 kph) can cause any vehicle to go out of control and/or turn over. The maximum operating speeds stated in the TM are only guides to the mechanical capacity of the vehicle. Maximum safe speed is not determined by the figures on the data plate or on a chart in the TM. Road conditions, weather, visibility, and load determine the speed at which vehicles should be driven.

**Personal Protective Equipment:** Protective equipment makes working in and around armored vehicles and heavy equipment safer. To get the greatest protection from such equipment, you must clean and maintain it properly. Most important personal protective equipment cannot protect you unless you use it.

- **Eye protection.** Liquid splashes and particles from grinding wheels are just two of the hazards that can injure your eyes. Eye protection must be worn in hazardous situations. There are many different kinds of safety glasses, goggles, face shield, and side shields available to provide the right protection needed for the job.
- **Hearing protection.** Excessive noise levels can threaten your hearing. Depending on the conditions, the work you are doing may require a specific type of ear protection, plug, muff or CVC. It is your responsibility to make sure you and your crewmen are provided and wear the required protection.
- **Foot protection.** Your feet can be injured by falling objects or other hazards. Always be aware as to where your feet are in relation to pinch points, and moving parts. Situational awareness is the best way to guard against injury.
- **Hand protection.** Since most work is done directly with the hands, they are vulnerable to many different hazards. There is, however, a specific kind of



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work glove for almost every kind of job. For instance, special gloves are required for handling corrosives or chemicals, and leather gloves are used in some work areas. Remember, however, that gloves should not be worn around moving parts or equipment.

**Battery Safety:** Mishandling of vehicle batteries is another frequent cause of injuries around armored vehicles. Batteries cause lifting injuries. They leak acid, which can burn anyone who comes in contact with it. They explode. No matter how harmless batteries look, they should always be handled as a potential danger.

- **Lifting batteries.** Batteries are heavy and awkward to handle. In fact, the leading type of battery-related injury involves sprains and strains. Mechanical means should be used to move batteries whenever practical. In other situations, two personnel may do the lifting. There is no quick or easy way to hand batteries down into a vehicle. It must be done deliberately, cautiously, and alertly to avoid twisting and overexertion. Follow this rule: when in doubt, get help.
- **Protective equipment.** The electrolyte in batteries is corrosive, and it can splash or drip out. Always wear sealed goggles and rubber or acid-resistant gloves. When performing battery maintenance, wear face shields and acid-resistant aprons in addition to the gloves.
- **Battery Handles.** The handles of some batteries can become covered with electrolyte, which can corrode the handles enough to cause them to break. It is safer to use a battery-carrying clamp or handle. If you use the built-in handles, hold the battery away from the body, and of course, always wear protective footwear.
- **Jump-starting.** Some batteries are prone to explode during jump-starting. This is especially true if the jump-starting is done incorrectly. Therefore, always wear eye protection, keep your face well back, and adhere strictly to the procedures outlined in the TM.

**Towing:** Always ensure proper towing procedures are followed. Extreme care must be taken when connecting the vehicle being towed. Always ensure an experienced driver is in the towing vehicle. Before towing another vehicle, ensure



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all cotter pins and locking pins are in place. Failure to do so can result in a loose vehicle with grave consequences to personnel and equipment. Keep your speed down. The faster you travel, the greater the chance of something going wrong. Never allow personnel to ride in a vehicle being towed.

**Jump-Starting:** Always park vehicles side by side when jumping. Never get in front of or between any vehicles. A vehicle may lurch during jump-starting and cause injury and even death along with damage to equipment.

**Rollovers:** During fast-paced operations, armored vehicles may roll over. The crewmember that first notices that the vehicle is beginning to roll over announces "ROLLOVER." Refer to the appropriate TM for roll over drills.



**Fire Prevention:** Fire prevention demands the entire crew's attention in several areas:

- Ensuring the integrity of the fuel system, especially following maintenance that involves pulling the engine. Fuel is the major source of fires. The typical fire involves a faulty connection or break in the fuel line, with the fuel reaching an ignition source within the engine compartment. Often, even





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after the fire suppression system knocks the fire down, more fuel sprays on the hot engine and reignites the fire.

- Keeping the engine compartment as clean as possible to prevent a buildup of dust and dirt soaked with flammable oils and greases.
- Ensuring that fire protection systems are fully charged.

### Crew Compartment Ammunition Fires

- Most fire suppression systems are designed to suppress hull and crew compartment fires (fuel, hydraulic fluid); the system will not suppress ammunition propellant fires. The propellant contains its own oxygenating agent and will continue to burn, even under water. To minimize the chance of an ammunition fire in the crew compartment, it is important that the loading procedures described in the operator's manual be followed.
- **Note.** Ammunition doors must remain closed, except when the loader is removing a round to load immediately into the empty breach, or returning a round to the compartment after it has been removed from the breach. All guards and safety devices must be in place before firing.

**Water Crossings:** Water crossings are always a potential hazard to armored vehicles. By adhering to these simple rules you will greatly reduce your chances of a problem while negotiating a water crossing.

- Never enter a water crossing until you know for sure the vehicle in front of you has already exited the far side and there is enough room for you to exit the far side before you start across. You do not want to get into water crossing and find yourself stopped while crossing.
- As depicted in this picture this tank was in the water crossing with a very low water level. A wall of water created by





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rain upstream hit them. This rain caused a flash flood. The result was one dead Soldier because he couldn't get out of the drivers compartment fast enough. These things happen that fast. Be prepared!

**Limited Visibility:** Total blackout conditions, dust, and fog contribute to accidents. These conditions cause crewmen to lose sight of approaching vehicles or the one they are following. Other reported cases involved vehicles driving off roads or bridges. These accidents included head-on and rear-end collisions and vehicles overturning and running into trees. These accidents can be decreased or prevented by drivers—

- Adjusting speed to conditions and maintaining proper intervals between vehicles.
- Using ground guides when traveling cross-country during periods of reduced visibility and when operating in areas where troops are on the ground (such as in the assembly, cantonment, and bivouac areas).
- Halting vehicle if vision is obscured.
- Always remaining alert for dangers that could result in injuries to the crew or damage to the vehicle.



**Rough Terrain:** Because armored vehicles can travel easily over rough terrain, drivers often operate their vehicles at speeds too fast for terrain conditions. Personnel and equipment are thrown around inside the vehicles and are thrown against gun mounts, cupolas, and hatches. The chances of a rollover are greatly increased in this situation. Crewmen can prevent these accidents by—

- Operating at a speed safe for terrain and conditions.
- Ensuring equipment is secured inside the vehicle.
- Ensuring all personnel are wearing seatbelts.



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**Hatches:** Most armor crewmen would describe a hatch as a "solid" item. Those who have had the latch slam shut on their fingers or heads would agree 100 percent. Each year, Soldiers incur such injuries as a result of improperly secured hatches or hatches with faulty latches. Avoid those injuries. Make sure hatch latches are working properly. Have crewmen double-check the hatch each time it is opened to ensure that it is latched securely and that the safety pin is securely installed. Finally, during any cross-country dash, warn crewmen to keep an eye on open hatches. A severe enough jolt can defeat any latch. Stay out of the way when it happens. Crewmen can prevent these accidents by—



- Not operating vehicles until all hatches are secured.
- Inspecting locking pins for serviceability and replacing unserviceable pins.
- Securing hatches in the open position with rope, straps, or chain if the bracket or locking pin is unserviceable or missing.

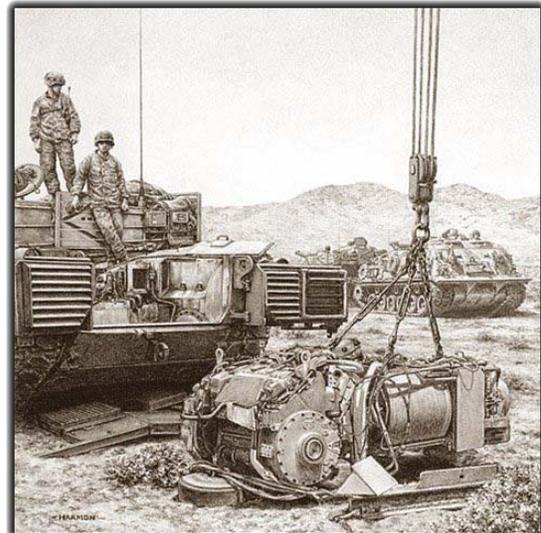
**Maintenance:** Armored vehicle maintenance tasks are inherently dangerous. The accident potential is high. These vehicles are massive pieces of machinery, and most of their components are massive as well. When two of these pieces come together, with a Soldier between them, the result is almost always a severe injury. The process of properly maintaining your vehicle demands the same attention to detail normally reserved for explosives and weapon systems. Most maintenance injuries occur while Soldiers work around road wheels and tracks. These suspension system components are heavy, hard to reach, and often under tension. Track and suspension system maintenance is a team or crew effort. This work must be done by following procedures in the appropriate TM. If the TM does not provide the needed guidance, the more detailed unit standing operating procedure (SOP) should be followed. Repetitive maintenance tasks should be done "by the numbers" under experienced supervision. Crewmen should be aware of the following to reduce these accidents from happening —

- Obeying all Warnings, Cautions and Notes.



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- Remove all jewelry before performing maintenance. Jewelry can cause arcing and/or shocks when using wrenches in the vicinity of electrical terminals.
- Ensuring proper before-, during-, and after-operation preventive maintenance checks and services (PMCS) are performed by the book.
- Final drive breaking.
- Prop shaft to steering control differential breaking.
- Tracks breaking or being thrown.
- Sprocket bolts sheering off.
- Laterals becoming inoperative.
- Differential overheating or locking up.
- Governors being defective (causes engine to exceed braking capacity).
- Perform routine after-operation maintenance checks and services such as checking transmission oil level carefully. Remember that the transmission and other engine parts are hot after operation.
- Ensuring brake cylinders are properly installed.
- Ensuring the brake system is FMC.
- Adjusting steering stops in accordance with the maintenance manual.
- Ensuring steering play and brake play are correct.
- Being safety conscious and anticipating possible equipment malfunctions.
- Not using the brakes if the vehicle throws a track while in operation. Let off the accelerator and allow the vehicle to coast to a stop.



**Weapon System:** Use the procedures outlined in the TM when cleaning or repairing the weapons system. Always ensure weapons are cleared before attempting to remove them from the vehicle for cleaning.



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**Cannon:** The cannon is king. Nobody can win an argument with it. The cannon can catch the careless in three ways –

- It recoils into them.
- Traverses or depresses the breech down on them.
- Catches fingers or hands in the block.

Accordingly, every crewman must learn how to avoid the hazards. This is done in two ways.

- The first is through individual training, teaching each crewman where to stand or not to stand, how to load and not to load.
- The second is through a coordinated crew effort as established and practiced through crew drills. Crew drills are key to safe operations.

**Note:** Never walk under the gun tube.

**Traversing Ring / Turret Movement:** Accidents involving the traversing ring normally occur during tactical training operations when one crewman is moving around inside the turret and another crewman fails to alert the crew that the turret is being moved.

- Announce **POWER** anytime the turret is going to be moved.
- Do not enter or exit the turret while the turret power is on.
- Keep the turret shield door closed and latched while the turret power is on.

**Insufficient Training:** Special training is required for armored vehicle drivers. Drivers training must include:

- Environmental effects (weather and terrain) on vehicle handling.
- Special handling characteristics.
- PMCS procedures.

**Load Plan / Unsecured Equipment:** Armored vehicles are designed to operate off roads in most terrain. When armored vehicles leave the road, however, it can be rough on the inside. Many accidents occur because odds and ends accumulate, equipment is not secured, and minor maintenance needs are ignored. When the



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vehicle hits an unseen ditch or bump, improperly stored items become flying objects, ammunition comes out of racks, and machine guns fall off their mounts. Additionally –

- Do not stow or strap equipment on blow-off panels. This could prevent proper functioning of panels during bustle compartment fire.
- Do not stow equipment in the ramp hydraulic unit (damage to the unit could cause a "free fall" ramp).

Several elements are vital in preventing these hazards from injuring the crew and damaging equipment: These are good housekeeping, good maintenance, and attention to detail. At the end of each day, the job is not done until the vehicle is reasonably clean inside, equipment is properly secured, and after-operation maintenance is completed. These actions should be added to the unit's after-operation checklists. The result of this vigilance, in keeping with the old maxim "A place for everything and everything in its place," will invariably result in a safer, more combat-ready crew.



These are just some of the hazards armored vehicle crewmen face everyday. By using TMs, established procedures, your experience and the five-step risk management process, you can reduce the chances of an accident.

**Train your Soldiers to STANDARD and execute training to STANDARD!**