Tracked Combat Vehicle Driver Training

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Preface

Training Circular (TC) 21-306 provides unit commanders and unit master drivers with guidance on developing tracked, combat vehicle driver training programs for their organizations. This TC provides guidance on how to integrate drivers training programs into unit gunnery training and other routine duties and tasks of units equipped with tracked combat vehicles. Training support packages, individual tasks associated with training drivers, additional publications, and supporting references identified within this TC are on the Central Army Registry (CAR) website. The CAR provides units with resources and guidance to support training that promotes safe driving practices, accident avoidance, and technical competence to produce more lethal and effective combat vehicle crews. Hands-on training in a controlled environment and under the close supervision of qualified and licensed trainers is stressed throughout this TC.

Commanders, staffs, and subordinates ensure that their decisions and actions comply with applicable United States, international, and in some cases host-nation laws and regulations. Commanders at all levels ensure that their Soldiers operate according to the law of war and the rules of engagement. (See FM 27-10.)

TC 21-306 uses joint terms where applicable. Selected joint and Army terms and definitions appear in both the glossary and the text. Terms for which TC 21-306 is the proponent publication (the authority) are italicized in the text and are marked with an asterisk (*) in the glossary. Terms and definitions for which TC 21-306 is the proponent publication are boldfaced in the text. For other definitions shown in the text, the term is italicized and the number of the proponent publication follows the definition. TC 21-306 is not the proponent for any terms.

TC 21-306 applies to the Active Army, Army National Guard/Army National Guard of the United States and United States Army Reserve unless otherwise stated.

The proponent of TC 21-306 is the United States Army Maneuver Center of Excellence. Send comments and recommendations on DA Form 2028 (Recommended Changes to Publications and Blank Forms) to Commanding General, Maneuver Center of Excellence, ATTN: ATZK-TDD (TC 3-21.50), Directorate of Training and Doctrine, Doctrine and Collective Training Division, Fort Benning, GA 31905-5410; or by e-mail to usarmy.benning.mcoe.mbx.doctrine@mail.mil; or submit an electronic DA Form 2028.
Introduction

Leaders must emphasize driver training within their organizations because of the length, width, and high ground pressure of tracked combat vehicles, the terrain tracked combat vehicles are required to operate in, and the numerous blind spots associated with tracked combat vehicles. These variables demand additional skills and knowledge beyond those required for tactical wheeled vehicles. Unit drivers training programs must challenge drivers to use safe driving practices, increase their awareness to improve accident avoidance, and improve crew performance. Programs must train drivers to understand the operational limitations of the vehicles they are operating so they can negotiate complex terrain under difficult and stressful conditions. This TC covers critical information ranging from vehicle operations to considerations for reducing the risk of environmental damage during training.

This TC consists of three chapters. The chapters contain the following information:

Chapter 1 describes a system for identifying, selecting, and qualifying tracked vehicle driver instructors, vehicle drivers, and planning considerations for unit programs and training events.

Chapter 2 discusses vehicle or equipment introductory training, operator technical manual familiarization, vehicle preventive maintenance checks and services procedures, instrumentation familiarization, placing vehicles into operation, self-recovery procedures, and guidance on meshing unit gunnery, and drivers training requirements.

Chapter 3 highlights the dangers and safety risks associated with operating tracked combat vehicles as well the environmental hazards that tracked combat vehicles pose. The chapter provides guidance on how to mitigate these risks to personnel and the operating environment.
Chapter 1

Drivers Training Program Management

This chapter supports AR 600-55 for identifying, selecting, and qualifying tracked combat vehicle trainers. This TC, AR 600-55, and FM 7-0 should be used to develop a drivers training program that licenses drivers according to current Army regulations while supporting the unit’s training plan and mission-essential task list (METL).

PLANNING DRIVERS TRAINING

1-1. Effective driver training requires careful planning and thorough instruction. The eight step-training model is an excellent method leaders should refer to when developing their unit’s drivers training program. If possible, leaders should conduct unit standard operating procedures (SOPs) and information regarding the licensing process prior to the start of training. Before instruction begins, the commander assesses the driver-training requirement. Based on this assessment, the commander and unit master driver—

- Reviews relevant training support packages and individual tasks.
- Develops plans and schedules.
- Selects and trains instructors.
- Identifies facilities and equipment available and subsequently recon and verifies the selected facilities and equipment to ensure they meet the needs of the program.
- Ensures the unit has a current file of all Army, post, and unit publications and policies that pertain to driver training.
- Informs students of all regulations during the first phase of training.

1-2. Training support packages and individual tasks are an integral part of developing a drivers training program. Commanders and master drivers need to utilize these training products when developing and planning training for their organizations. Unit master drivers need to make sure that they are continuously checking the Central Army Registry (CAR) website to ensure they are utilizing the most up-to-date training products. Training support packages and individual tasks are updated when there are equipment changes, safety updates, doctrinal changes, or changes to supporting reference materials. If users of these products identify an issue with the training products, it is important that they use the contact information located in the preface section of this TC to alert the appropriate personnel so updates to the products can be implemented.

1-3. Training support packages and individual tasks provide trainers with an instructor-to-student ratio, known as I:S ratios, for lessons. Using the I:S ratio ensures that trainees are receiving the proper amount of guidance and supervision during training. Reviewing the I:S information while planning training provides commanders and master drivers with a more accurate estimate of the number of personnel they need to select and train to administer their drivers training program. Trainers can find lesson times, such as how many hours the training should take, equipment requirements, and a plethora of additional information critical for planning successful training in training support packages and individual tasks.

ESTIMATE OF DRIVERS TRAINING SITUATION

1-4. When preparing to conduct a drivers training program, estimate unit training needs by asking the following questions:

- How many personnel require qualification (monthly, annually)?
- How many previously licensed drivers need verification or recertification?
- What are the capabilities and general experiences of new drivers who need qualification?
● What are the seasonal requirements for unit location?
● How much time is available?
● What type of tracked-vehicle accidents has the unit experienced?
● How many instructors are available?
● Will the training be part of unit in processing?
● What special training do the instructors require?
● What facilities, supplies, and equipment (including training aids, vehicles, and driving ranges with varied terrain) are available?
● Does the unit have any major training events scheduled?

1-5. Analyze the answers to help develop and organize an effective plan to carry out the training. In organizing the training program, refer to the appropriate training support package to determine the following:

● The number of instructors who need training and a schedule for their instruction.
● The duties and responsibilities of each instructor.
● The number of drivers who require training or retraining and a schedule for their instruction.
● How to group students and how to rotate each group.
● Identify necessary facilities, supplies, and equipment and how to get them ready.
● The standards for training required by the appropriate training support package and your unit's needs.

LICENSE INSTRUCTORS AND LICENSE EXAMINERS

1-6. The license instructor is a vehicle or equipment expert who is selected and appointed by the company commander or civilian branch chief. License instructors are responsible for conducting phase II equipment training, including the classroom equipment introduction and all hands-on training (see chapter 4 of AR 600-55 for more guidance concerning license instructor roles and responsibilities). The license examiners are required to administer the Phase I: Initial Operators Training Exam, Phase II: Equipment Training exam, and the Phase III: Training Validation/Performance Road Test exam. AR 600-55 contains guidance for the development and implementation of the necessary examinations. Guidelines for the selection, appointment, and qualification of license instructors and license examiners is located in chapter 4 of AR 600-55.

DRIVER SELECTION

1-7. Commanders select drivers according to the guidelines established in chapter 3 of AR 600-55. Commanders or their authorized representative must document all driver selection activities according to AR 600-55. When selecting personnel to become tracked vehicle drivers, it is best to pick those with previous driving experience; however, if a person meets the requirements, prior experience is not necessary. If a potential driver meets one of the criteria listed below, they are ineligible for an OF 346, U.S. Government Motor Vehicle Operator’s Identification Card, or DA Form 5984-E, Operator’s Permit Record (EGA):

● Revocation of a state driver's license.
● Any medical (pathological, psychological, or physiological) restrictions that would limit their ability to operate vehicles or equipment.
● Accident records, traffic violations, and recommendations of medical officers or supervisors, which would cause renewals to be denied.

PROGRAM ADMINISTRATION

1-8. Publications, forms, historical records, and reports are part of daily operations. Commanders record and maintain the driver’s information obtained from the interview, battery tests, physical qualification tests, and the road test on DA Form 348, Equipment Operator’s Qualification Record (Except Aircraft), (for proper use of this form, see AR 600-55). Forms used at the unit level should be part of the drivers training program to ensure proper management, control, and compliance with maintenance procedures and local licensing SOPs. Master drivers and units should maintain drivers licensing assessments and records for future
reference, to aid in accident investigation proceedings, or to provide additional documentation for recognizing driver skills or achievements.

1-9. The Army publications listed in the references section are necessary to properly manage and supervise the drivers training program. Requirements for the selection, appointment, and specific duties of master drivers and master driver managers is in appendix F of AR 600-55.

INCENTIVE PROGRAMS

1-10. Army policy encourages incentive awards programs to motivate personnel to improve their skills. Every organization should have an incentive awards program for its drivers to make sure they receive recognition for their efforts.

1-11. Competitive operator maintenance inspections, obstacle driving, and vehicle maneuvers are a few programs the commander may initiate. These events give drivers a chance to demonstrate their abilities. In addition, they give the commander an opportunity to evaluate the unit’s overall drivers training program.

1-12. Expert driver badges or certificates presented to qualified drivers give them due recognition. To emphasize the importance of the awards, the commander should present them during a ceremony or formation. AR 600-8-22 covers the requirements for issuing these awards.
Chapter 2
Drivers Training Program

The training events identified in this chapter support AR 600-55 and TC 21-305-2. The training activities discussed in this chapter are the three phases discussed in chapter 4, para 4-3, of AR 600-55. The administration and conduct of drivers training must be conducted according to the phases identified with AR 600-55. The three phases of licensing are Phase I: Initial Operator Training, Phase II: Equipment Training, and Phase II: Training Validation. This publication covers tasks specific to tracked vehicle drivers. Commanders and master drivers must review AR 600-55 to ensure that the drivers training program they are implementing for their personnel is in compliance with current Army policies and regulations. All of the publications discussed are available via the U.S. Army Central Army Website, which can be accessed by following this link https://www.adtdl.army.mil/.

STATE, LOCAL NATION, AND POST LAWS

2-1. The geographic location where the unit conducts drivers training dictates the content of the training content discussed in paragraphs 2-1 and 2-2. Master driver managers develop the content of this portion of the training. Their command reviews and approves the content.

2-2. AR 600-55 requires that unit drivers training include training that discusses federal and state traffic laws and applicable host-nation traffic and environmental laws. Drivers receive training on licensing requirements, specifically what qualifies and disqualifies a driver from receiving and holding an operator’s license. Equipping drivers with knowledge about laws and regulations for the geographic location where they may be operating helps them to avoid making dangerous and costly mistakes while operating their vehicles. A classroom environment utilizing personnel from the installation’s safety office, provost marshal’s office, and post-environmental management division is an excellent method to provide drivers with information regarding host-nation traffic laws, post regulations, and state and federal laws and regulations.

RESPONSIBILITIES AND REGULATIONS

2-3. All Soldiers are responsible for operating both tactical and nontactical vehicles in a safe and prudent manner according to state, federal, and host-nation driving laws, regulations, and procedures. Failure to operate a vehicle in a safe and prudent manner can lead to administrative and military justice consequences such as reprimand, report of survey, an Article 15 of MISC PUB 27-7, or actions that are more serious. Financial liability for damage caused to a driver’s vehicle, another government vehicle, or the operating environment could fall on the driver.

2-4. The responsibility for the maintenance and safe operation of tracked vehicles falls on the federal government, the operator, and the commander. Accidents and property damage caused by Army drivers results in millions of dollars in liability for the government each year. During this portion of training, drivers need to be made aware of their responsibilities as tracked vehicle operators. They should be taught how their role contributes to their crew’s and the unit’s success.

VEHICLE OPERATION AND FAMILIARIZATION

2-5. Basic operations procedures and vehicle familiarization training is required training for new drivers undergoing drivers training. To ensure that tracked vehicle drivers are prepared to operate their vehicles,
units should conduct vehicle operation and familiarization training in a classroom environment reinforced with hands-on training.

2-6. Vehicle familiarization should address the following topics:

- Physical characteristics of the vehicle such as height, width, length, and weight (weight of the vehicle when fully fueled, configured for combat operations, and when fitted with counter-improvised explosive devices and antitank guided missile-defeating equipment).
- Operational range of the vehicle, safe speeds associated with various types of terrain and weather conditions drivers may encounter during operations, and maximum and minimum gradients vehicles can safely negotiate.
- Vehicle crew capacity, location of each crewmember, and each crewmember’s responsibilities on the vehicle.
- Location and operation of the vehicle’s intercom system and actions to take should the intercom system become disabled during operations.
- Terrain features or obstacles that could impede the mobility of the vehicle or cause the vehicle to become immobile due to becoming mired or high centered.
- Vehicle’s capabilities and limitations when conducting fording operations.
- Location of fuel tank and vehicle fuel capacity.
- Location and operation of the vehicle’s fire suppression system.
- Proper and safe ways for the crew to mount and dismount the vehicle, and safe points on the vehicle for the crew to hold onto while mounting, dismounting, or working on top of the vehicle.
- Vehicle engine and drive train characteristics, armaments, ammunition carrying capacity, and the capabilities and limitations of weapon systems associated with the vehicle.
- Basic issue items (BII) assigned to the vehicle, and BII uses and locations for the various pieces of BII for the vehicle.

**VEHICLE INSTRUMENTS, CONTROLS, AND INDICATORS TRAINING**

2-7. A vehicle’s technical manuals and training support packages list and cover the location and function of all instrumentation, controls, and indicators located within the vehicle. The instruments and indicators found in the driver’s station of a tracked vehicle provides the driver and crew with important information concerning the safe operation, maintenance status, and operational condition of the vehicle. The driver is responsible for monitoring these instruments and indicators. The driver reports to the vehicle commander when the instruments and indicators indicate a problem or impending problem, which could affect the operational status of the vehicle.

2-8. Hands-on training covering vehicle instrumentation and controls allows the driver to—

- Identify by name all instruments, controls, and indicators in the driver’s compartment as well as their function.
- Identify how to turn on and off all instruments, controls, and indicators in the driver’s compartment.
- Demonstrate an ability to manipulate or adjust all instruments, controls, and indicators in the driver’s compartment (for example adjusting the brightness of a monitor or operating the controls required to safely raise and lower the ramp on an M2A2 Infantry fighting vehicle).
- Identify the normal operating limits for the vehicle as displayed by the controls and indicators.
- Identify when the vehicle’s instruments and indicators are indicating an impending vehicle malfunction. For example, the driver should be able to recognize without looking at the vehicle’s technical manual (TM) when the vehicle’s oil pressure indicator is signaling that the vehicle’s oil pressure is outside of the safe operating range.

**HAND-AND-ARM SIGNALS**

2-9. Hand-and-arm signals are essential for the safe movement of vehicles within a confined area. At a minimum, the following hand-and-arm signals facilitate safe motor pool operations during maintenance
Drivers Training Program

Placing Vehicles Into Operation

2-10. Placing a tracked combat vehicle into operation requires an established process. In addition to the necessary steps for placing the vehicle into operation as outlined in the vehicle’s TM and any unit SOPs, the driver also performs the following actions:

- Drivers put their combat vehicle crewmember helmet on, turn the vehicle’s intercom system on, and ensure their intercom is operational.
- Drivers announce to the rest of the crew and the personnel on the ground that they are preparing to place the vehicle into operation.
- Drivers ensure personnel are clear of the vehicle before starting the engine or engaging the transmission.
- Drivers whose stations have access panels to the vehicle’s power unit are responsible for ensuring the access panels are closed prior to starting the engine.
- Drivers secure themselves in the driver’s seat with the vehicle’s safety restraints.
- Drivers adjust the seat to place themselves in a position where they can gain and maintain the best view through the driver’s periscopes or driver’s vision enhancer.
- Drivers ensure that the automatic fire extinguishing system is operational.
- Drivers press the horn button.

Note: If tactical situation permits, the horn should be sounded to warn Soldiers that the engine is about to be started. The horn operates in NONCOMBAT mode only.

Nontactical and Tactical Refueling Operations

2-12. When refueling during nontactical operations, the commander assigns each crewmember specific duties and responsibilities during refueling. Drivers normally refuel the vehicle while other crewmembers take care of the remaining petroleum, oil, and lubricant (POL) requirements. Unit SOPs should include the following safety requirements and guidelines governing refueling operations:
Use extreme caution when mounting or dismounting a vehicle.
Any vehicle approaching a refueling point must have two ground guides, one front and one rear.
All vehicles should park on level ground with the parking brake on.
Vehicle’s engine must be off.
Crewmember or fuel handler on the ground has a portable fire extinguisher available.
Vehicles must be grounded while refueling.
No smoking within 15 meters of the vehicle refueling point.
Clean up any fuel on the vehicle prior to moving out.
Secure all POL products stowed on board prior to moving out.
Use drip pans under connections and valves to catch spills and drips.
Ensure proper personal protective equipment is available and used.
Ensure a spill kit is available.
Follow federal, state, host-nation laws and regulations as well as unit SOPs for spill cleanup, reporting, and disposal of waste.

2-13. During tactical operations, the vehicle commander assigns each crewmember specific duties and responsibilities during refueling. During tactical refueling, the driver remains in the driver’s compartment while the crew refuels the vehicle. Refueling under combat or simulated combat conditions should be the same as under usual conditions with the following exceptions:
- The vehicle continues to run.
- The track commander and one crewmember refuels the vehicle while one crewmember maintains security.
- The second crewmember outside the vehicle must maintain positive control of a portable fire extinguisher and be ready to use it in the event a fire starts.
- A fuel handler is on the ground to supervise the refueling operation. The fuel handler should have a fire extinguisher available in case of fire as well.

RESPONSE TO EMERGENCY SITUATIONS

2-14. Emergency stopping procedures in response to the loss of brakes, steering, or engine power is as follows:
- Driver notifies the vehicle commander that the brakes, steering, or engine power have malfunctioned.
- Driver moves the gear select to N (neutral).
- Driver centers the steering column or laterals.
- Driver lets the vehicle coast to a stop.
- Driver sets the parking brake if the vehicle has one.
- Driver shuts down the engine once the vehicle has stopped.
- Vehicle commander notifies the chain of command.

2-15. In the event the driver and the vehicle commander lose communications, the driver immediately brings the vehicle to a halt and does not move the vehicle until communications have been restored.

EMERGENCY OR SUDDEN BRAKING

2-16. The vehicle commander alerts the driver that the vehicle needs to stop suddenly. The vehicle commander cues this action by telling the driver, “STOP, STOP, STOP!” in rapid succession. Upon hearing the cue, the driver executes emergency or sudden braking procedures.

2-17. The driver uses the recommended pumping action to prevent locking the brakes on their vehicle. During drivers training, after stopping the vehicle, the vehicle commander should have the driver reflect on the speed the vehicle was going, the time it took the vehicle to come to a complete stop, and the distance it took the vehicle stop. Having the driver identify the speed, time, and distance involved in an emergency stop provides them with a frame of reference from which to draw.
REACT TO FIRE ON THE VEHICLE

2-18. The first crewmember to identify that a fire has broken out on the vehicle alerts the rest of the crew. The driver and crew execute the actions for responding to a fire in the engine compartment or the crew compartment of the vehicle. Actions in response to a fire on a tracked vehicle can be found in the drivers training support packages for specific vehicles, the individual tasks, and the vehicle’s TMs.

OPERATOR MAINTENANCE RESPONSIBILITIES

2-19. Preventative maintenance checks and services (PMCS) are required on a continuous and regular basis to keep vehicles fully mission capable. PMCS functions are divided into five categories: Before operations, during operations, after operations, weekly, and monthly. Training drivers how to conduct all categories of PMCS is a critical part of an effective drivers training program.

BEFORE

2-20. Before drivers begin operating equipment, they perform the before PMCS. Drivers must pay attention to WARNING and CAUTION statements. A WARNING statement means someone could be hurt. A CAUTION statement means equipment could be damaged.

DURING

2-21. During vehicle operations, the crew conducts PMCS while the vehicle is being operated. During operations, the crew conducts PMCS checks as the tactical situation allows or during halts or breaks in operations. During PMCS, operations are critical to ensuring a vehicle maintains combat ready during operations.

AFTER

2-22. After operations, the crew conducts PMCS procedures when operations are complete and the vehicle is going to be parked and locked. After operations, instructors give the crew time to identify faults and work with unit maintenance assets to order parts and request maintenance support beyond the operator level. After performing operations checks, the crew identifies maintenance issues that may have developed while the vehicle was operating that if not addressed, could cause the vehicle to be non-mission capable for an extended time.

WEEKLY

2-23. Weekly PMCS and before operations PMCS are done in conjunction with each other. Weekly PMCS checks allow the crew to identify maintenance issues that may have taken time to develop. Weekly checks focus on items that do not require as much attention as other parts of the vehicle. Focusing the crew’s efforts where they are needed allows the crew to make the most of the time their units have allotted for maintenance.

MONTHLY

2-24. The crew performs monthly PMCS. If the tank has not been operated in a month, the crew performs after operations PMCS at the same time.

2-25. Hands-on training covering all PMCS tasks listed, in the vehicle’s TM as the driver’s responsibility should be conducted during drivers training. Using the vehicle’s TM is the most effective training method. When instructors are training PMCS, they ensure that all of the vehicle’s TMs are available during training.

2-26. PMCS operations need to be annotated using a DA Form 2404, Equipment Inspection and Maintenance Worksheet, or DA Form 5988-E, Equipment Maintenance and Inspection Worksheet (EGA), according to DA PAM 750-8. Students must learn how to complete and submit a DA Form 2404 and a DA Form 5988-E prior to conducting PMCS operations. Instructors should train students on how to complete a DA Form 2404 and a DA Form 5988-E in a classroom environment.
2-27. Instructors should conduct hands-on training covering the proper use of POL product cleanup and containment equipment (spill kits) as well as reporting procedures for POL spills during PMCS training. Effective cleanup training covers procedures for spills that occur in an environment where POL products have spilled on a concrete or asphalt surface, such as a motor pool. Instructors should discuss cleanup, containment, and reporting requirements for spills that occur in a field environment. When the drivers training program is conducted outside of the United States, instructors should discuss procedures for cleaning up and reporting spills that occur in host nations.

Note: Do not release actual POL products during this training.

USE OF ARMY PUBLICATIONS AND DD/DA/SF FORMS

2-28. TMs are divided into work packets, known as WPs. Each WP is an individual, stand-alone unit of information identified by a four-digit sequence number. WPs are in sequential order (for example 0001, 0002, 0003, and so forth). Each WP is page numbered consecutively after the sequence number at the bottom of each page (for example 0001-1, 0001-2, 0001-3, and so forth). A WP may contain as many as 30 pages.

2-29. Electronic technical manuals (ETMs) are digital TMs, which are available through the U.S. Army Logistics Data Analysis Center (LDAC) website. To access ETMs through LDAC the user must first request system access through the LDAC website. Requests require the approval of the requestor’s supervisor and unit security manager. Tracked vehicle driving students and instructors must have all of the appropriate TMs available during drivers training, when operating the vehicle, and when conducting vehicle PMCS procedures.

2-30. During this portion of drivers training, the following forms should be covered:

- DA Form 5987-E, Motor Equipment Dispatch.
- DA Form 5988-E, Equipment Maintenance and Inspection Worksheet.
- DA Form 2404, Equipment Maintenance and Inspection Worksheet.
- DA Form 2408-14, Uncorrected Fault Record.
- DD Form 518, Accident-Identification Card.

CONVOY OPERATION AND TACTICAL FORMATIONS

2-31. The planning and coordination involved in convoy operations require aggressive staff action. ATP 4-11 describes convoy operations, discusses planning procedures, organizing, and controlling them. ATP 4-11 provides additional information for training individual drivers.

2-32. Elements in a column of any length may simultaneously encounter many different types of terrain features, obstacles, or traffic conditions. As a result, different parts of the column tend to move at varying speeds at the same time. To increase safety and reduce column whipping, leadership needs to provide vehicle commanders with the column’s speed of march, vehicle interval, and maximum catch-up speed. Vehicle crews must receive this information prior to the start of a columns movement.

2-33. If a vehicle becomes disabled, the crew should do everything possible not to obstruct traffic or create conditions that might cause an accident by warning approaching vehicles using flares, warning triangles, flashlights, and wearing reflective vests. Each vehicle should carry at least two warning triangles. To alert traffic to a disabled vehicle, the crew should place the triangles on the shoulder of the road 100 meters behind the vehicle.

2-34. In an extended convoy, vehicles should maintain a distance of twice the normal interval or as specified in a unit’s SOP during dusty conditions to allow the dust to dissipate. When driving on extremely dusty roads or trails, use a staggered column formation if traffic conditions permit. The convoy commander should adjust the convoy's speed if any vehicles in the convoy become engulfed in dust. Vehicle commanders engulfed in dust should alert the convoy commander by radio, move to the right side of the road, and stop to allow the dust to dissipate. Do not back up vehicles while engulfed in dust. Exercise extreme caution to ensure
oncoming vehicles are not jeopardized. If vehicles encounter traffic, the lead vehicle must warn following vehicles to move into a column formation if another formation is being used.

2-35. A wheeled vehicle with rotating amber warning lights, known as RAWLs, should precede a tracked vehicle or column of tracked vehicles traveling on a road if the tactical situation permits. On high-speed roads (such as an interstate or autobahn), when contact with the enemy is not imminent and traffic is normal, escort vehicles equipped with RAWLs and any required convoy signs or flags should be positioned in the front and rear of the convoy according to local command policy.

2-36. Tactical formation training is critical to the battlefield success of tracked vehicle crews. The ability of a tracked vehicle driver to recognize and anticipate tactical formations during combat operations increases crew survivability and crew lethality. Having an understanding of the hand-and-arm signals that dictate a formation’s actions during convoys or tactical operations is a critical skill for all crewmembers. Mounted forces frequently use the following formations during tactical maneuvers (TC 3-21.60 discusses information concerning visual signals):

- Herring bone.
- Coil.
- Staggered column.
- Echelon left and right.
- Wedge.
- Vee.
- Line.
- Column.
- Traveling overwatch.
- Bounding overwatch.

UNUSUAL AND USUAL CONDITIONS

2-37. Tracked vehicle drivers face a variety of complex situations when they are operating their vehicles during training and combat operations. Exposing drivers to the challenges they are likely to encounter during operations is a key factor for successful tracked, combat vehicle crews. The following section discusses the challenges faced by drivers under usual and unusual conditions.

ROUGH TERRAIN (UNUSUAL CONDITIONS)

2-38. Tracked vehicles travel easily and quickly over rough terrain, which may give drivers false confidence in their driving abilities. Many accidents occur when a tracked vehicle is moving tactically cross-country, and the driver underestimates terrain conditions or obstacles, such as rises or ditches. These miscalculations can result in broken or thrown track, loss of vehicle control, mechanical failure, or injuries to the vehicle crew. It is critical that drivers and crews are aware of the limitations specific to their vehicle when negotiating certain terrain features. Specific limitations concerning crossing gaps, ditches, crossing berms, or fording water obstacles are located in the vehicle’s TMs. In many instances, if the tactical situation permits it, it is advisable for a crewmember to dismount the vehicle and inspect an obstacle before the crew commits to negotiating it.

2-39. Terrain and obstacles that drivers commonly encounter in an unusual environment are—

- Gaps or ditches.
- Raised terrain features such as berms.
- Water obstacles.
- Loose or wet soil or gravel that could affect track stability and traction.
- Uneven slopes in the vehicle’s path.

2-40. Tracked vehicle drivers and commanders must observe the following rules when negotiating rough terrain:

- Alert crewmembers when approaching rough or unstable terrain.
Scan the area ahead of the vehicle to detect obstacles or hazards as early as possible.
Increase or decrease the vehicle’s speed according to the limits defined as safe within the vehicle’s TM when negotiating obstacles and uneven terrain.
Ensure all equipment inside the vehicle is secured before negotiating rough or unstable terrain.
Ensure all hatches are in the locked position before encountering rough terrain. Have crewmembers periodically inspect open hatches to ensure they stay in the locked positions. Safety pins must be in place.

2-41. Unit commanders and tracked vehicle commanders must remember that the urgency of tactical maneuvering does not outweigh the safety of the crew and vehicle. The tracked vehicle commander is responsible for ensuring that the driver operates the vehicle at safe speeds to maintain control of the vehicle at all times. Terrain and weather conditions directly affect safe vehicle operation.

**Urban Operations (Usual Conditions)**

2-42. Tracked combat vehicle drivers often find themselves having to operate their vehicles in urban environments. Maneuvering heavily armored combat vehicles in an urban environment can be a difficult task for a driver. There are many obstacles unique to the urban environment that the driver and crew do not have to negotiate in a field environment. The potential for drivers and crews to cause injuries to themselves and the civilian population, or damaging their vehicle and causing damage to the surrounding civilian infrastructure is high. Successful drivers training programs train drivers to expect and react appropriately to the following:
- Encountering low-hanging electrical or telephone wires.
- Encountering bridges and overpasses.
- Emergency braking.

2-43. The conditions described in the unusual or usual operating environments can and often do contribute to vehicle drivers losing control of their vehicles. Listed below are factors that commonly contribute to a driver’s loss of vehicle control:
- Loss of steering or brakes due to vehicle malfunction.
- Damaged or thrown track.
- Excess speed.
- Oversteering.
- Improper braking and downshifting.
- Adverse weather conditions.
- Faulty roadbeds.

**Operations During Periods of Limited Visibility**

2-44. Drivers frequently conduct operations during periods of limited visibility. Training to perform their duties safely and with confidence requires training in a controlled environment. Leaders conduct specific steps and training events to license drivers to operate tracked, combat vehicles using night vision devices (NVDs). The following paragraphs discuss the licensing requirements and resources outlining those requirements.

**Limited Visibility**

2-45. Night driving operations demand extraordinary precautions by the driver and tracked vehicle commander. They must adjust the speed of the vehicle to ensure the safety of the crew and vehicle. Limited visibility causes drivers to lose sight of emerging terrain, obstacles, or oncoming traffic. Drivers should not look directly into oncoming headlights because this may cause temporary blindness. The driver should watch the right edge of the road until the oncoming vehicle has passed. Once night vision is lost, it takes several minutes to regain it. TC 21-305-2 contains specific guidance and recommendations for training and licensing drivers to operate vehicles using night vision equipment.
2-46. If a life-threatening situation occurs in a training environment during limited visibility, the vehicle's service driving lights and interior white lights should be turned on (subject to the unit commander’s policies). Commanders should specify in the unit SOP that crews use blackout markers or blackout drive as a minimum during all night maneuvers.

2-47. During normal operations, tracked vehicle crews can ensure the safety of dismounted personnel and crewmembers by following the guidelines listed below. When operating during limited visibility in nontactical situations, service drive lights should be turned on. During limited visibility or blackout operations, the unit commander and tracked vehicle crew make sure that—

- Before moving a vehicle in an assembly area, a crewmember walks completely around the vehicle to ensure that moving the vehicle does not endanger anyone (if not operating in a tactical environment). The tracked vehicle commander gives the command CLEAR to indicate it is safe to start and move the vehicle.
- During combined operations, maintain a safe distance between dismounted troops and moving vehicles.
- Personnel assigned dismounted tasks during blackout conditions are given ample time to complete their tasks. If possible, conduct a detailed daytime reconnaissance of the terrain.
- Individuals who are assigned dismounted tasks are authorized to halt an exercise to correct a hazardous situation, to adjust speed to conditions, or to maintain proper interval during convoy operations.
- If the driver's vision is blocked or the tracked vehicle commander's vision devices become obscured, the vehicle is halted.
- The driver's night vision viewers are properly adjusted for maximum resolution.

2-48. Night vision devices (NVDs) and night tactical operations increase the challenges facing drivers and vehicle commanders. NVDs give the driver a limited field of view and distorted depth perception; as a result the pace of vehicle operations at night is slower than during the day. The vehicle commander must use NVDs to help the driver negotiate terrain and identify obstacles. During practice sessions, it is recommended that a maximum vehicle speed of 22 kilometers per hour or 14 miles per hour be maintained until drivers have night vision driving experience. NVD skills deteriorate without use so they must be practiced and maintained.

2-49. During periods of reduced visibility, such as at night during severe weather (especially during heavy rain, frequent lightning flashes, or heavy overcast conditions), the night vision viewer cannot be relied upon for safe vehicle operations. Unit SOPs should specify when to slow down or stop field exercises when severe environmental hazards exist.

**DUST AND SMOKE**

2-50. During normal operations, dust can be a concern when driving in any formation; dust usually presents a problem during field training exercises. Drivers and vehicle commanders can prevent injuries and accidents by observing the following rules when traveling through dust or smoke:

2-51. Regardless of visibility conditions, wear goggles when driving in an open-hatch position. Wear clear-lensed goggles at night unless NVDs are used. Wear a bandanna or surgical mask over your nose and mouth to avoid breathing heavy dust or smoke.

2-52. While driving in a line formation, vehicles should maintain their horizontal distance and adjust speed to negate the hazards caused by dust or smoke conditions. If dust or smoke becomes so thick that total disorientation or vertigo should occur, the platoon leader or platoon sergeant should radio to halt the formation. Do not back up vehicles while engulfed in dust or smoke.

**FORDING OPERATIONS (CLOSED COURSE)**

2-53. A preoperational plan with an emphasis on safety is the key to reducing unnecessary risks. Leaders and armored vehicle crewmembers should consult their vehicle’s TM to ensure they have properly prepared their vehicle to conduct fording operations. Following are important considerations concerning fording operations that should be incorporated into unit SOPs:
• Ensure the fording site has adequate entrance and exit points and a firm bottom.
• Ensure the water depth at the fording site is below the vehicle fording limits and the site is clear of submerged obstacles.
• Ensure dismounted troops crossing the fording site are attached to a safety line.
• Do not cross more than one tracked vehicle at the same time and do not cross a tracked vehicle beside dismounted troops.
• Ensure drivers and crewmembers wear life vests if the water is more than 1.5 meters deep during training exercises.
• Ensure all vehicle fording and swimming instructions are followed according to the vehicle TM.
• Do not wear load-bearing equipment during fording or swimming operations. It could snag on vehicle components and prevent crewmembers from evacuating through the top hatches during emergencies.
• Turn tank turrets over their left or right side in case the driver needs to evacuate the driver’s station. This also provides a platform for the crew to stand on if they need to exit the vehicle.
• Leave the top hatches open in case the crew needs to evacuate.
• Store sensitive items, such as chemical alarms, muzzle boresight devices, and small arms inside the vehicle. If the vehicle sinks, these items can be recovered easily.

VEHICLE SELF-RECOVERY OPERATIONS TRAINING (CLOSED COURSE)

2-54. Vehicle recovery is difficult and time consuming. ATP 4-31 explains in detail the various techniques and methods of vehicle recovery. Vehicle self-recovery is a critical and perishable skill. All drivers and crews should practice vehicle self-recovery on a regular basis to maintain proficiency. It is important to recognize that vehicle recovery consists of three categories: Self-recovery (in which a vehicle recovers itself under its own power using available equipment), like-vehicle recovery (where a like vehicle is used for recovery), and dedicated recovery (where unit recovery assets are utilized for the recovery effort).

2-55. Self-recovery is a skill in which tracked vehicle crews need to be proficient because of the limited amounts of dedicated recovery assets assigned to units. If environmental factors cause a vehicle to become immobilized, for example mired in wet, loose soil or high centered (bellied) on a rock or stump, the crew can assess the situation and determine if self-recovery is possible. When considering self-recovery operations, crews must consider the tactical situation and whether or not self-recovery can be completed safely. Despite the fact that most tracked vehicles lack winching equipment, self-recovery of tracked vehicles can still be accomplished using the methods described in ATP 4-31. Vehicle self-recovery training, when incorporated into unit drivers training programs, allows units to maximize the limited recovery assets organic to armored formations by giving crews the skills needed to self-recover.

2-56. Self-recovery starts at the location where the equipment becomes mired or disabled. The operator or crew uses the BII and additional authorized list or on-vehicle equipment items to perform self-recovery.

2-57. When the equipment has a mechanical failure, the operator or crew uses the equipment’s TM to perform troubleshooting procedures with the tools available in the BII and additional authorized list or on-vehicle equipment. When self-recovery fails, the operator or crew can request assistance from available like vehicles.

2-58. To recover a mired vehicle, obtain a log long enough to span the width of the vehicle and of sufficient diameter to support the vehicle weight (see figure 2-1) and do the following:

• Place the log against both tracks.
• Place a tow cable so that one end of the cable goes under the log and through the tracks from the inside.
• Place the other end of the tow cable underneath the log and connect the ends of the cable together with a tow hook on the outside of the track to make disconnecting easier.
• Follow the same procedure to attach the log to the track on the opposite side of the vehicle. Take up the slack in the tow cable by gradually applying power to the tracks. This pulls the log
underneath the tracks until it meets the obstacle, thereby anchoring the tracks and causing the vehicle to move.

Figure 2-1. Log used to anchor tracks

![Figure 2-1. Log used to anchor tracks](image)

**CAUTION**

To prevent damage to the fenders and tow cables, stop the vehicles before the log reaches the fenders or the cable reaches the drive sprocket.

2-59. For a bellied disablement (other than mire), anchor the tracks using two tow cables. Connect the tow cables together with a tow hook. Attach the cables to both tracks by passing the ends of the cables through the tracks from the outside and attaching them to the standing parts of the cables with tow hooks. When power is applied to the tracks, the cable contacts the obstacle and anchors the tracks (see figure 2-2).

Figure 2-2. Cables used to anchor track

![Figure 2-2. Cables used to anchor track](image)

**NIGHT VISION DEVICE ACADEMICS**

2-60. During NVD qualification, the operator receives instruction in academic subjects according to chapter 8 and appendix I of AR 600-55. The operator must pass a written examination (see TC 21-305-2).
2-61. The operator receives hands-on instruction to demonstrate proficiency while driving with the use of NVDs (see AR 600-55 for task list). An NVD-equipped instructor is in the vehicle during night driver training.

2-62. Care and security of the NVD. Trainers should use TC 21–305–2, as well as the TM for the NVD device used for training, to supplement NVD qualification and refresher training for tracked vehicle drivers. AR 600-55 requires that NVD academics cover the following topics:

- An introduction to NVDs (specify type or model the driver must use).
- Awareness of the device’s diminished effectiveness in rain, fog, snow, or smoke, and the debilitating effects of any bright light (such as vehicle headlights or flares).
- Depth perception, visual acuity, and field of vision in relation to NVDs.
- Illumination requirements.
- Speed limitations.
- Night vision scanning techniques.
- Emergency procedures while driving with NVDs.
- Driver or assistant driver responsibilities and crew coordination.
- Self-imposed stresses (for example, smoking, alcohol, or driver or crew fatigue).

2-63. To be qualified and licensed on NVDs, motor vehicle operators must successfully complete an NVD driver performance test given by an NVD instructor. The testing of one vehicle utilizing NVDs does not qualify an individual for all other vehicles. The driver must complete a performance test for each model of vehicle and equipment to be driven. The operator must be licensed and current on the vehicle in which they receive NVD training and complete the academic and driving requirements outlined in paragraphs 2-58 and 2-59.

2-64. The driver performs the following tasks in the sequence shown and under the supervision of a qualified NVD instructor:

- Phase I task. Drive the vehicle without the device over a known range during daylight conditions; become comfortable with the actual road and terrain.
- Phase II task. Using headlights drive the vehicle without the NVD over the same range at night.
- Phase III tasks are listed below:
  - Perform pre-operational NVD system checks.
  - Focus the device.
  - Refocus the NVD immediately prior to phase IV.
- Phase IV tasks are listed below:
  - With all external and internal lights off, drive the vehicle over the same range while wearing the NVD. Pay particular attention to the distance between the vehicle and familiar objects in front.
  - Identify road signs.
  - Detect route markers, if any.
  - Identify and negotiate ditches or other rough road conditions.
  - Judge distances to road junctions.
  - Identify the edge of the road.
  - Distinguish shadows from other features (for example water puddles).
- Phase V tasks are listed below:
  - Perform post-operation NVD system checks.
  - Conduct an after-action report.

**CREW COORDINATION, DRIVER GUNNERY SKILLS**

2-65. For units to have lethal, proficient, and qualified crews capable of executing collective training, it is critical that drivers complete all drivers training and licensing requirements. The successful completion of
the qualification table validates the crew’s completion of the training gate, which certifies it to move on to the next gate in the training program (see table 2-1, page 2-14). Instructors can maximize training time by including crewmember evacuation drills, fire drills, rollover drills, and other critical drivers training tasks as part of gunnery activities. Units should remember that when executing the fundamental table sets, several key drivers training requirements are met. Units should consider the amount of driving any learner’s permit Soldier conducts during the day and night as well as any associated maintenance days that directly support the drivers training program. TC 3-20.31 and TC 3-20.21-1 assists commanders with integrating their drivers training program with unit gunnery skills test activities.

2-66. Vehicle commander commands issued to the driver facilitate vehicle movement before, during, and after an engagement. Driver action terms are not a requirement, but are used as necessary. While the actions terms are not required during crew engagements, ensuring that the driver is aware of these commands and their meanings increases crew lethality. The vehicle commander should precede all commands to the driver by announcing, DRIVER. They include, but are not limited to—

- DRIVER – MOVE UP.
- DRIVER – BACK UP.
- DRIVER – STOP.
- DRIVER – SEEK ENFILADE.
- DRIVER – SEEK DEFILADE.
- DRIVER – MOVE OUT.

2-67. Vehicle commanders and gunners can utilize drivers in armored vehicles during combat operations to assist with identifying threats. If the vehicle is in a position that gives the driver the ability to scan a sector, then the vehicle commander should assign the driver a sector. Drivers and crews should train in the processes and methods concerning coordinated scanning methods for vehicle crews, which can be found in TC 3-20.31-4. When trained to properly scan for and identify threats, and learning effective methods for relaying the description, distance, and direction of threats, drivers can increase a crew’s ability to identify and engage threats.
### Table 2-1. Gunnery table drivers training task alignment chart

<table>
<thead>
<tr>
<th>Training Setting/ Gunnery Table</th>
<th>Lesson</th>
<th>Supporting Publications/Resources</th>
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<tbody>
<tr>
<td>Classroom - Table I</td>
<td>Driver Responsibilities and Government Liability</td>
<td>State, local, host nation and federal regulations relevant to the driver’s geographic location</td>
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<tr>
<td></td>
<td>Use of Army Publications and Forms</td>
<td>AR 600-55, The Army Driver and Operator Standardization Program (Selection, Training, Testing, and Licensing), 1 May 2017</td>
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<td></td>
<td>Convoy Operations and Tactical Formations</td>
<td>AR 190-5 Motor Vehicle Traffic Supervision, 22 May 2006</td>
</tr>
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<td></td>
<td>Operations Conducted During Periods of Limited Visibility</td>
<td>TC 3-21.60, Visual Signals, 17 March 2017</td>
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<td></td>
<td>Fording Operations</td>
<td>TC 3-20.31, Training and Qualification Crew, 17 March 2015</td>
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<tr>
<td></td>
<td>Response to emergency Situations and Vehicle Malfunctions</td>
<td>Vehicle and NVD technical manuals</td>
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<td></td>
<td>Tactical Formations and Overview of Crew Coordination (Moving into and out of Fighting Positions and so forth.)</td>
<td>DA form 5988-E, Equipment Maintenance and Inspection Worksheet</td>
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<tr>
<td></td>
<td>Vehicle Self-recovery Operations Training</td>
<td>DA Form 2404, Equipment Inspection and Maintenance Worksheet</td>
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<tr>
<td></td>
<td>Operator PMCS Procedures and Responsibilities</td>
<td>DA Form 5987-E, Motor Equipment Dispatch (EGA)</td>
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### Table 2-1. Gunnery table drivers training task alignment chart (continued)

<table>
<thead>
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<th>Training Setting/ Gunnery Table</th>
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<th>Supporting Publications/Resources</th>
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<tr>
<td>Refueling Operations</td>
<td>DA Form 2408–14, Equipment Inspection List</td>
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<td>Standard Form (SF) 91, Motor Vehicle Accident Report</td>
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<td></td>
<td>ATP 4-31, Recovery and Battle Damage Assessment and Repair (BDAR), 27 August 2014.</td>
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<td>Motor Pool - Table I</td>
<td>Introduction to Specific Vehicles and their Characteristics</td>
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<td></td>
<td>Refueling Operations</td>
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<td></td>
<td>Operator PMCS Procedures and Responsibilities</td>
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<td>Simulations - Table II</td>
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<td></td>
<td>Convoy Operations</td>
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<td>Operations Conducted During Periods of Limited Visibility</td>
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<td>Fording Operations</td>
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<td></td>
<td>Usual (On-road) and Unusual (Off-road) Conditions</td>
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<td>Response to Emergency Situations; Vehicle Malfunctions</td>
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<td></td>
<td>Tactical Formations and Crew Coordination (Moving into and out of Fighting Positions)</td>
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<td>Range/Drivers Course</td>
<td>Tactical Refueling Operations</td>
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<td>Table III</td>
<td>Night Vision Device (Practical Application of NVD Academics)</td>
<td>AR 600-55, The Army Driver and Operator Standardization Program (Selection, Training, Testing, and Licensing)</td>
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<td>Convoy Operations</td>
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<td>TC 3-20.31, Training and Qualification, Crew</td>
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**Legend:** NVD – night vision device; PMCS – preventative maintenance checks and services
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Chapter 3
Safety Awareness and Environmental Risk Management

This chapter discusses safety and common causes of vehicle accidents, as well as the actions drivers, crews, and leaders should take to prevent accidents. A training program emphasizing safety prevents loss of life, damage to property and equipment, and personal injury. Commanders and trainers should read this chapter, review vehicle training support packages, and where appropriate, supplement safety and environmental instruction for their unit’s driver training programs. Training drivers how to recognize and react to the safety hazards found in this chapter is conducted during phases I and II of the drivers training and licensing process. Use the information in this TC in conjunction with AR 600-55 to train drivers on safety related topics. Protection of natural resources is an ever-increasing concern to the Army. All unit leaders are responsible for decreasing, and if possible, eliminating damage to the environment when conducting training operations.

FORCE PROTECTION

3-1. Safety is a component of force protection. Commanders, leaders, and Soldiers use risk assessment and management to tie force protection into the mission. Risk management assigns responsibility, institutionalizes commander’s review of operational safety, and leads to decision making at a level of command appropriate to the risk. The objective of safety is to help units protect combat power through accident prevention, which enables units to fight rapidly and decisively with minimum losses. Safety is an integral part of all combat operations. Safety begins with readiness, which determines a unit’s ability to perform its METL to standard.

3-2. Safety demands total chain of command involvement in planning, preparing, executing, and evaluating training. The chain of command’s responsibilities include:

- Commanders who—
  - Seek optimum, not adequate, performance.
  - Specify the risk they will accept to accomplish the mission.
  - Select the risk reductions provided by the staff.
  - Accept or reject residual risk, based on the benefit to be derived.
  - Train and motivate leaders at all levels to use risk management concepts.

- Staff who—
  - Assist the commander in assessing risks and develops risk-reduction options for training.
  - Integrate risk controls in plans, orders, METL standards, and performance measures.
  - Eliminate unnecessary safety restrictions that diminish training effectiveness.
  - Assess safety performance during training.
  - Evaluate safety performance during after-action reviews.

- Subordinate leaders who—
  - Apply effective risk management concepts and methods consistently to operations they lead.
  - Enforce risk management according to the commander’s guidance and intent.
  - Report risk issues beyond their control or authority to their superiors.
Chapter 3

- Individual Soldiers who—
  - Take responsibility for personal safety.
  - Work as team members.
  - Modify individual risk behavior.

3-3. Risk management is a five-step cyclic process that is easily integrated into the decision-making process outlined in ATP 5-19. The five steps are—

- Step 1, identify hazards. Identify hazards to the force. Consider all aspects of current and future situations, the environment, and known historical problems.
- Step 2, assess hazards. Assess hazards using the risk assessment matrix in table 3-1. Assess the conditions listed in each category to derive a numeric value where two conditions intersect. Next, add the numeric value of each category to determine the risk value. This number represents the level of risk for the operation assessed.

<table>
<thead>
<tr>
<th>Severity</th>
<th>Probability</th>
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<tr>
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<td>Frequent A</td>
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<td>Catastrophic</td>
<td>I</td>
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<tr>
<td>Critical</td>
<td>II</td>
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<tr>
<td>Marginal</td>
<td>III</td>
</tr>
<tr>
<td>Negligible</td>
<td>IV</td>
</tr>
</tbody>
</table>

Legend: E – extremely high, H – high, M – moderate, L – low

- Step 3, develop controls and make risk decisions. Develop controls that eliminate the hazard or reduce its risk. As control measures are developed, risks are re-evaluated until all risks are reduced to a level where benefits outweigh potential costs. Accept no unnecessary risks and make any residual risk decisions at the proper level of command.
- Step 4, implement controls. Put controls in place to eliminate the hazards or reduce their risk.
- Step 5, supervise and evaluate. Enforce standards and controls. Evaluate the effectiveness of controls and adjust or update them as necessary.

Note: ATP 5-19 should be used to train personnel on the five-step risk management process and the risk assessment matrix. To obtain a risk management training support package, contact the U.S. Army Combat Readiness Center.

GENERAL SAFETY GUIDELINES

3-4. Everyone in the chain of command should strictly supervise drivers training for tracked vehicle drivers. During training, student drivers are required to have an OF 346, U.S. Government Motor Vehicle Operator’s Identification Card, stamped LEARNER (a learner’s permit). A licensed instructor must accompany a student driver with a learner’s permit when they drive. Students cannot operate tracked vehicles without supervision. The following guidelines have proven to be effective when integrated into unit drivers training programs.

- Conduct a complete and thorough safety briefing before the start of all training sessions.
- Never allow a student to operate a tracked vehicle without proper supervision.
- Use caution when driving through towns and villages. Sometimes streets are narrow and difficult to negotiate. If the driver is in doubt, the track commander can and should dismount as a ground guide. Pay attention to pedestrians and be aware that tracked vehicles draw curious people who have no idea how dangerous the vehicles can be.
Be aware of vehicle height when entering tunnels, underpasses, and building overhangs close to roadways.

Beware of icy spots on roadways, especially overpasses and bridges, which ice over quickly.

Be alert to the presence of overhead power lines. Before driving on roadways, tie down antennas to make sure they do not encounter overhead power lines.

Be aware of steep or excessively rough terrain.

Be aware of potential soft soil conditions and soil erosion.

Be aware of and understand all road signs and traffic signals. Despite their size, tracked vehicles do not always have the right of way on roadways.

Be aware of bridges and overpasses. Before crossing any bridge or overpass, identify the bridge load classification and the height and width limitations of underpasses. If the vehicle exceeds the classification, it cannot cross.

HEARING PROTECTION

3-5. Hearing loss among armor crewmembers can occur due to improper fit, wear, and maintenance of combat vehicle crewmember, known as CVC, helmets. All crewmembers wear CVC helmets; passengers wear earplugs and helmets when the vehicle is operating. When the CVC helmet is worn, ensure that the chinstrap is fastened. The CVC helmet does not reduce sound properly unless it is fastened.

COMMUNICATION

3-6. Do not move a tracked vehicle until intercommunications have been established among all crewmembers. If communications are lost, the vehicle must halt immediately. The crew should troubleshoot the system and notify organizational maintenance if assistance is required. For safety, the unit commander can authorize the movement or removal of the disabled vehicle.

SHOP AND MOTOR POOL

3-7. Crewmembers must take certain precautions in a maintenance shop or motor pool. Oil, water, and antifreeze spills can cause serious injury. To prevent injuries, all spills must be cleaned up immediately and the work area should be kept clean at all times. Injuries often result from using the wrong tools and equipment. Trainers must instruct all personnel to properly use the tools and BII associated with their vehicle. To prevent severe injuries to fingers, wrists, and limbs, crewmembers must remove all jewelry before mounting, dismounting, or performing operator maintenance on a vehicle. Vehicle chock blocks must be used when the vehicle is parked on inclines and whenever maintenance is performed.

HATCH COVERS

3-8. Injuries caused by unsecured hatch covers are common. All crewmembers must check the hatches before operating the vehicle to make sure they are serviceable and locked in the proper position. Many vehicles are equipped with chains to secure the hatches. If the vehicles are equipped with chains, they must be used.

RIDING POSITION

3-9. Crewmembers in a tracked combat vehicle must wear CVC helmets and ride with only their heads and shoulders extended (nametag defilade) out of the hatches. When a tracked vehicle is involved in a collision or overturns, injuries are usually the result of crewmembers being thrown around inside the vehicle. To prevent injuries during rollovers or collisions, crewmembers must wear the proper restraints, if available, during vehicle operations.
MOUNTING AND DISMOUNTING TRacked COmbat VEHICLES

3-10. Commanders and crewmembers must ensure everyone observes the following rules for mounting and dismounting tracked vehicles:

- Use extreme caution when mounting or dismounting a vehicle.
- Never climb in front of a weapon to mount the vehicle. Tracked vehicle commanders must ensure that all weapon systems are clear and positioned to allow safe access.
- When mounting or dismounting a vehicle with the engine running, ensure the driver is aware of personnel mounting and dismounting. On moving firing ranges, personnel should mount vehicles over the right front fender, except for tanks. Personnel always mount tanks over the right rear sprocket. Ensure the driver is aware of a crewmember’s intention to mount.
- Always maintain three points of contact (one hand and two feet or two hands and one foot) with the vehicle when mounting, dismounting, or moving around on the vehicle.
- Never mount or dismount a moving vehicle. Drivers must bring the vehicle to a complete halt before allowing anyone to mount or dismount.
- Never dismount a vehicle by jumping from it.

CREW EVACUATION DRILLS

3-11. Instructors often overlook crew evacuation drills during training. The probability of injuries is reduced significantly if crews practice proper evacuation techniques in different conditions. Vehicle TMs and training support packages provide emergency evacuation procedures, which should be incorporated into driver and crew training programs.

3-12. The safest place for a crew during a rollover is inside the vehicle. If a tracked vehicle is about to rollover, the driver must alert the crewmembers so the crewmembers can drop inside the vehicle and assume a safe position by bracing themselves inside the vehicle. The drivers must lower the seat and brace themselves inside the vehicle. Crews must practice rollover procedures.

SLAVE STARTING

3-13. When slave starting a vehicle, crewmembers must observe the following safety guidelines:

- Drivers always position the live vehicle alongside the dead vehicle.
- Drivers never position the vehicles nose-to-nose.
- Crewmembers must not stand between the moving vehicle and the dead vehicle; serious injury or death could result.
- Drivers and crews must consult their vehicle’s TM to ensure they are performing vehicle slave starting procedures correctly for their specific model of vehicle.

TRACKED VEHICLE ACCIDENT CAUSES AND PREVENTATIVE MEASURES

3-14. Fatigue and sleep loss are often factors in vehicle accidents. To minimize the effects of sleep loss, commanders must develop and follow a sleep plan based on the following considerations:

- At least five hours of sleep are required to enable an individual to maintain optimal performance; humans do not adapt well to shortened sleep cycles.
- Physical strength remains unimpaired until extreme levels of sleep deprivation are reached.
- Sleep-deprived personnel have difficulty performing tasks requiring swift decisions or complex planning.
- Sleep loss typically causes errors of omission.
- Prolonged heat exposure, confinement, noise, and vibration (all of which are present in armored vehicles) degrade performance and the ability to cope with sleep loss.
- Drivers should be checked for symptoms of fatigue or use of controlled substances. Personnel taking prescription drugs that may cause drowsiness should not drive.
SITUATIONAL AWARENESS

3-15. To avoid situations conducive to accidental injury or to minimize the possibility of injury in situations that cannot be avoided, drivers and crewmembers must be alert at all times. Crewmembers must take extra precautions when the vehicle’s metal decks are wet, muddy, or snow covered. Likewise, drivers and crewmembers should remain alert to the position of guns, gun mounts, hatches, and other metal projections. Accidental contact with these or any other protruding objects can result in serious injury.

BLIND SPOTS

3-16. Most tracked vehicles have blind spots where the turret or hull blocks the forward or peripheral vision of the driver preventing them from seeing objects on the ground. The vehicle commander and other crewmembers should help the driver identify objects in the driver’s blind spot. The driver should anticipate objects that may fall into their blind spot as they are approached. When in doubt, the vehicle commander should use a ground guide to assist the driver.

LOSS OF CONTROL

3-17. Driving too fast for the road conditions is the main cause for loss of control in tracked vehicles. If the driver loses control of their vehicle, they must take immediate steps to regain control of the vehicle. The driver must release the accelerator, avoid applying the brakes, and let the vehicle coast to a stop. If the vehicle is sliding, the driver must steer in the direction of the skid to regain control of the vehicle.

ACCIDENT PREVENTION

3-18. To prevent accidents, drivers must—

- Adjust their speed and interval to allow for wet road surfaces.
- Notify the vehicle commander when a lack of sleep or fatigue is becoming a danger.
- Employ the proper techniques to prevent or recover from a skid.
- Rotate frequently.
- Slow down after dropping off the edge of the roadway before pulling back on the pavement.
- Ensure vehicles have been safety inspected and maintained.
- Use the recommended pumping action in emergencies instead of locking the brakes.
- Allow for the added force of the weight of the vehicle when quick stops are necessary.
- Come to a complete stop and downshift at the crest of hills or steep grades to use the engine as a braking action to control speed.
- Know the distance required for braking at various speeds to make emergency stops safely. This is especially important for vehicles towing or moving heavy loads.
- React and brake when the brake lights of the vehicle ahead go on. The driver ahead has already reacted to something and the follow-on vehicles must slow down or stop in the remaining distance.
- Inspect beneath vehicles for sleeping personnel after rest stops.
- Use tow bars rather than cables to move disabled vehicles on roads. If tow cables are used, use a third tracked vehicle of equal weight or heavier as a braking vehicle.
- Inspect personnel heaters to avoid carbon monoxide poisoning.
- Refer to the vehicle’s TM for specific instructions or safety measures concerning the recovery and towing of a tracked combat vehicle.

FIRE PREVENTION

3-19. All crewmembers must be aware of the danger of fire when operating tracked vehicles. Flammables and miscellaneous items should not be stored in the vehicle. Leaders should establish simple rules or an SOP to help prevent fires on vehicles.

3-20. Clean up all gasoline and diesel fuel spills immediately. Use only authorized cleaning agents. Leaders must brief vehicle crews on the type and locations of the spill kits provided to their unit.
3-21. All tracked combat vehicles are equipped with fire extinguishers, both fixed and portable. Crewmembers must know how and when to use them. To ensure fire extinguishers are ready for instant use, periodically weigh or check them to determine operability and replace them if necessary.

3-22. Fixed fire extinguishers that require only the action of a trip handle or sensor to operate are installed on vehicles to cover areas where fires are most likely to start. They must be inspected during preventive maintenance checks and services. Do not start the engine of the tracked vehicle if the fixed fire extinguishers are inoperable or if they have been removed for maintenance.

3-23. Portable extinguishers must be manned whenever the vehicle is being refueled. Portable fire extinguishers are inspected during the preventive maintenance checks and services. If they are inoperable, they should be replaced or refilled before the vehicle is started.

GROUND GUIDE PROCEDURES

3-24. Ground guides are required for tracked vehicles to be moved safely. Leaders must ensure all crewmembers and drivers can recognize standard hand-and-arm and flashlight signals before guiding or driving tracked vehicles. Drivers and ground guides must know and observe the following rules:

- Ground guides are required when a tracked vehicle is moving in a confined or congested area, during limited visibility, or if the driver is in doubt about adequate clearance; for example, on narrow bridges or in passages with low overhead clearances.
- Ground guides should never stand in front of a vehicle when the engine is running. The ground guide should stand beside the right or left fender when talking to or directing the driver.
- Ground guides must be used in cantonments, bivouac sites, and parking areas.
- Ground guides must never run in front of vehicles or walk backwards while guiding vehicles.
- Ground guides should use flashlights with colored filters when moving vehicles at night.
- Ground guides should walk approximately nine meters in front of and to the left of the vehicle’s left track to observe traffic to the front and rear of the vehicle. The ground guide is the correct distance from the tracked vehicle when the driver can see the ground guide’s feet.
- Two ground guides must be used any time a tracked vehicle is being moved in reverse. The rear ground guide must always be visible to the front ground guide.
- Should the driver lose sight of the signal, or if there is any question about the signal from the ground guide, the driver stops until the signal is visible or the confusion is eliminated.
- The front ground guide immediately signals the driver to stop if the front ground guide is unable to see or identify the signals coming from the rear ground guide.
- When a vehicle arrives at a night parking area (other than the occupation of an assembly area as a part of a tactical operation), a ground guide dismounts and establishes contact with the guard on duty. The guide and the driver must understand where the sleeping area is and where to park the vehicle. The ground guide must search the area for people sleeping on the ground where the vehicle is to park before moving the vehicle into the parking area. As a minimum, blackout drive must be used and the service drive turned on if conditions permit.
- All tactical sleeping areas must be marked with a chemical light or flashlight and have a guard equipped with night vision goggles. The guard must hand carry a flashlight or chemical light to signal or guide vehicles. Guards must be briefed on their duties and on what actions should be taken when a vehicle drives into the bivouac or assembly area. The guard must carry a loud, distinct, immediately audible warning device or be accessible in case a vehicle enters the designated sleeping area. Troops designated to sleep in the area must be briefed on what device is being used and what action they should take. (The unit SOP must specify the same information.) The guard’s first priority is to warn sleeping personnel; then attempts are made to gain the attention of the ground guide, vehicle driver, or the vehicle commander without endangering themselves.
- All road accesses into the bivouac or assembly area must have a guard posted to warn vehicle crews that there are troops on the ground. The guard should help the ground guide guide the vehicle to its destination ensuring that, as a minimum, blackout drive is used. If conditions permit, use service drive.
RAILHEAD OPERATIONS

3-25. Leaders must conduct a safety briefing before railhead operations. The briefing should include the following:

- Only licensed drivers should drive vehicles on and off railcars during railhead operations.
- Do not smoke during loading operations. A smoking area should be designated at least 15 meters away from the nearest vehicle.
- Wear protective headgear until clear of the railcars.
- Be alert for hazards that could cause electrocution. All antennas and equipment stored on the outside of the vehicle should be removed or secured before moving onto the railcar.
- Do not stand on top of vehicles.
- Secure all gun tubes, M88 booms, and M578 cranes in travel lock before loading them onto the railcar.
- Do not stand on moving flatcars.
- Ensure guide vehicles are at least a one-car interval away from the vehicle that ground guides are guiding onto the flatcar. Ground guides never guide from the railcars onto which their vehicles are loading.
- Do not walk backward while ground guiding tracked vehicles.
- Secure all hatches when the rail master has inspected the train and released it for movement.
- Loading is complete when the rail master has inspected the train and released it for movement.

ENVIRONMENTAL RISK MANAGEMENT

3-26. Reconnoitering the drivers training area helps commanders to develop plans to minimize damage to vegetation and waterways. Quantify the risk to the environment resulting from the operation using ATP 5-19 as a guide. The environmental risk impact value should be determined conservatively. Consult with the installation’s environmental management division for other local requirements relating to wildlife and natural vegetation. Brief the chain of command (to include the installation environmental office, if applicable) on proposed plans and pertinent high-risk environmental effects. Risk decisions are made at a level of command that corresponds to the degree of risk. Gather the appropriate land-use and digging permits prior to the start of any drivers training activities according to state and federal laws as well as installation policies. To prevent damage to the environment, the steps listed below can be used to mitigate the risk of damage to the environment:

- Step 1. Identify hazards. Identify potential sources for environmental degradation during an analysis of mission, enemy, terrain and weather, troops, time available and civilian consideration factors. This requires an identification of environmental hazards. An environmental hazard is a condition with the potential for polluting air, soil, water, or destroying significant natural or cultural resources.
- Step 2. Assess hazards. Analyze the potential severity of environmental degradation. The severity of environmental degradation must be considered when determining the potential effect an operation has on the environment. The risk impact value is defined as an indicator of the severity of environmental degradation.
- Step 3. Make risk decisions. Make decisions by analyzing the environmental risk. Determine if alternate actions protect the environment while still accomplishing the mission. Determine if the commander needs to adjust the mission.
- Step 4. Implement controls. Implement environmental protection measures by integrating them into plans, orders, packing lists, SOPs, training performance standards, and rehearsals.
- Step 5. Supervise. Supervise and enforce environmental protection standards.

Note. Each U.S. installation is subject to local and state environmental regulations in addition to federal legislation. For information specific to the activity, contact the installation environmental office. If personnel are overseas or on deployment, contact the higher battalion or brigade operations staff officer (S-3) or the assistant chief of staff, operations (known as the (G-3)).
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Appendix A

Tracked Combat Vehicle Characteristics

This appendix discusses the M1 Abrams main battle tank (known as MBT) series, Bradley fighting vehicle (known as BFV), series, and the armored multi-purpose vehicle (known as AMPV). The Abrams MBT variations that the U.S. armored forces currently utilize are the M1A1, M1A2 Systems Enhancement Package (SEP), and the M1A2 SEP V2. The BFVs that the U.S. armored forces currently utilize includes the M2A2, M3A2, M3A3, and the M2A3. The AMPV is the newest tracked combat vehicle that the force utilizes and is designed to replace the M113 armored personnel carrier currently being utilized in the armored force. Knowing the specific capabilities and limitations associated with their vehicle allows drivers to determine when their vehicle has met its operational limits or is in danger of exceeding the vehicle’s safe operating limits.

ABRAMS MAIN BATTLE TANK

A-1. Figure A-1 illustrates the characteristics of the Abrams’ main battle tank side view. The Abrams main battle tank operational capabilities are listed in table A-1, pages A-2 and A-3.

Figure A-1. Abrams main battle tank (side profile)
Table A-1. M1A1 Abrams main battle tank

<table>
<thead>
<tr>
<th>Operational</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Forward speed, maximum (paved level surface)</td>
<td>41.5 mph (67 km/h)</td>
</tr>
<tr>
<td>Reverse speed, maximum (paved level surface)</td>
<td>25 mph (40.2 km/h)</td>
</tr>
<tr>
<td>Range, constant 25 mph (dry, level secondary roads without refueling)</td>
<td>273-298 mi (439-480 km)</td>
</tr>
<tr>
<td>Vertical obstacle vehicle can climb (forward)</td>
<td>49 in. (124 cm)</td>
</tr>
<tr>
<td>Maximum width of ditch vehicle can cross (forward)</td>
<td>108 in. (274 cm)</td>
</tr>
<tr>
<td>Fording depth Without kit</td>
<td>48 in. (122 cm)</td>
</tr>
<tr>
<td>Fording depth With kit</td>
<td>Turret roof</td>
</tr>
<tr>
<td>Grade ascending ability, sustained speed at 5 mph (8.0 km/h)</td>
<td>60% (31°)</td>
</tr>
<tr>
<td>Grade descending ability (max)</td>
<td>60% (31°)</td>
</tr>
<tr>
<td>Side slope (maximum)</td>
<td>40% (31°)</td>
</tr>
<tr>
<td>Weight: Combat-loaded (less kits)</td>
<td>With T-156 track 66.2 tons</td>
</tr>
<tr>
<td></td>
<td>With T-158 track 67.6 tons</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Dimensions</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Length (overall, main gun rearward)</td>
<td>355.6 in. (903.2 cm)</td>
</tr>
<tr>
<td>Length (gun forward)</td>
<td>386.9 in. (982.7 cm)</td>
</tr>
<tr>
<td>Height (ground to turret roof)</td>
<td>96 in. (243.8 cm)</td>
</tr>
<tr>
<td>Height (maximum overall)</td>
<td>113.6 in. (288.5 cm)</td>
</tr>
<tr>
<td>Width</td>
<td>143.75 in. ± 0.54 in. (365.3 cm ± 1.4 cm)</td>
</tr>
<tr>
<td>Width (less skirts)</td>
<td>136 in. (345 cm)</td>
</tr>
<tr>
<td>Ground clearance T-156 track (center portion of hull structure)</td>
<td>19.0 in. (48.3 cm)</td>
</tr>
<tr>
<td>Ground clearance T-156 track (other portion of hull structure)</td>
<td>17.0 in. (43.2 cm)</td>
</tr>
<tr>
<td>Ground clearance T-158 track (center portion of hull structure)</td>
<td>18.5 in. (47.0 cm)</td>
</tr>
<tr>
<td>Ground clearance T-158 track (other portion of hull structure)</td>
<td>16.5 in. (41.9 cm)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Fuel Capacities</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Fuel tanks, left front</td>
<td>106.6 gal. (403.5 L)</td>
</tr>
<tr>
<td>Right front</td>
<td>149.8 gal. (567.0 L)</td>
</tr>
<tr>
<td>Rear left engine</td>
<td>86.9 gal. (328.9 L)</td>
</tr>
<tr>
<td>Right engine</td>
<td>57.1 gal. (216.1 L)</td>
</tr>
<tr>
<td>Left sponson</td>
<td>59.0 gal. (223.3 L)</td>
</tr>
<tr>
<td>Right sponson</td>
<td>45.0 gal. (170.3 L)</td>
</tr>
<tr>
<td>Total in rear tank</td>
<td>248.0 gal. (938.7 L)</td>
</tr>
<tr>
<td>Total in all tanks</td>
<td>504.4 gal. (1909.2 L)</td>
</tr>
</tbody>
</table>
Table A-1. M1A1 Abrams main battle tank (continued)

<table>
<thead>
<tr>
<th>Fuel Capacities</th>
<th>CONUS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fuel, diesel</td>
<td>20 °F (−7 °C) to 115 °F (46 °C) ....... DF-2 or JP8</td>
</tr>
<tr>
<td></td>
<td>−25 °F (−32 °C) to 20 °F (−6 °C)..... DF-1 or ASTM D 975 Grade 1-D</td>
</tr>
<tr>
<td></td>
<td>Below −25 °F (32 °C) Jet A-1 or VV-F-800 Grade DF-A</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>OCONUS</td>
<td>20 °F (−7 °C) to 115 °F (46 °C) ....... DF-2 or JP8</td>
</tr>
<tr>
<td></td>
<td>−10 °F (−23 °C) to 20 °F (−6 °C)</td>
</tr>
<tr>
<td></td>
<td>Blend half-and-half NATO F-54 and F-34, or F-35, F-44, F-58 or</td>
</tr>
<tr>
<td></td>
<td>ASTM D1655 Grade Jet-A-1</td>
</tr>
<tr>
<td></td>
<td>If blending is not possible, use NATO F-34 or F-35, F-44, F-58 or</td>
</tr>
<tr>
<td></td>
<td>ASTM D1655 Grade Jet-A-1</td>
</tr>
<tr>
<td></td>
<td>Between −10 °F (−23 °C) and -25 °F (−32 °C) NATO F-34 or F-35, F-44</td>
</tr>
<tr>
<td></td>
<td>or ASTM D1655 Grade Jet-A-1</td>
</tr>
<tr>
<td></td>
<td>Below -25° F (−32° C) ASTM D1655 Grade Jet-A-1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Controls</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Brakes</td>
<td>Hydraulic, mechanical service brake (foot)</td>
</tr>
<tr>
<td>Steering</td>
<td>Hydraulic, mechanical steering control</td>
</tr>
<tr>
<td>Turning capability</td>
<td>360-degree pivot</td>
</tr>
<tr>
<td>Brakes</td>
<td>Hydraulic, mechanical service brake (foot)</td>
</tr>
</tbody>
</table>

**Legend:** ° – degrees; % – percent; C – Celsius; cm – centimeters; F – Fahrenheit; gal – gallon; L – liter; in – inches; km – kilometers; km/h – kilometers/hour; mi – miles; mph – miles per hour
A-2. Figure A-2 illustrates the characteristics of the Abrams SEP side view. The Abrams SEP operational capabilities are listed in table A-2.

![Figure A-2. Abrams SEP main battle tank (side profile)](image)

**Table A-2. M1A2 Abrams SEP**

<table>
<thead>
<tr>
<th>Operational Characteristics</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Forward speed, maximum (paved level surface)</td>
<td>41.5 mph (67 km/h)</td>
</tr>
<tr>
<td>Reverse speed, maximum (paved level surface)</td>
<td>25 mph (40.2 km/h)</td>
</tr>
<tr>
<td>Range, constant 25 mph</td>
<td>AGT1500: 210 to 220 mi (338 to 354 km)</td>
</tr>
<tr>
<td>Vertical obstacle vehicle can climb (forward)</td>
<td>42 in (107 cm)</td>
</tr>
<tr>
<td>Maximum width of ditch vehicle can cross (forward)</td>
<td>108 in (274 cm)</td>
</tr>
<tr>
<td>Fording depth</td>
<td>Without kit 48 in (122 cm)</td>
</tr>
<tr>
<td></td>
<td>With kit Turret roof</td>
</tr>
<tr>
<td>Grade ascending ability sustained speed at 5 mph (8.0 km/h)</td>
<td>60% (31°)</td>
</tr>
<tr>
<td>Grade descending ability (max)</td>
<td>60% (31°)</td>
</tr>
<tr>
<td>Side slope (maximum)</td>
<td>40% (22°)</td>
</tr>
<tr>
<td>Weight: Combat loaded (less kits)</td>
<td>68.7 tons (69.8 Mg)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Dimensions</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Length (overall, main gun rearward)</td>
<td>355.6 in (903.2 cm)</td>
</tr>
<tr>
<td>Length (gun forward)</td>
<td>386.9 in (982.7 cm)</td>
</tr>
<tr>
<td>Height (ground to turret roof)</td>
<td>96 in (243.8 cm)</td>
</tr>
<tr>
<td>Height (maximum overall)</td>
<td>121.7 in (309.1 cm)</td>
</tr>
<tr>
<td>Width</td>
<td>143.75 in ± 0.54 in (365.3 cm ± 1.4 cm)</td>
</tr>
<tr>
<td>Width (less skirts)</td>
<td>136 in. (345 cm)</td>
</tr>
<tr>
<td>Ground clearance T-156 track</td>
<td>(center portion of hull structure) 18.5 in. (47.0 cm)</td>
</tr>
<tr>
<td></td>
<td>(other portion of hull structure) 16.5 in. (41.9 cm)</td>
</tr>
<tr>
<td>Ground clearance T-158 track</td>
<td>(center portion of hull structure) 18.5 in. (47.0 cm)</td>
</tr>
<tr>
<td></td>
<td>(other portion of hull structure) 16.5 in. (41.9 cm)</td>
</tr>
</tbody>
</table>
Table A-2. M1A2 Abrams SEP (continued)

<table>
<thead>
<tr>
<th>Fuel Capacities</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Fuel tanks, left front</td>
<td>106.6 gal (403.5 L)</td>
</tr>
<tr>
<td>Right front</td>
<td>149.8 gal (567.0 L)</td>
</tr>
<tr>
<td>Rear left engine</td>
<td>86.9 gal (328.9 L)</td>
</tr>
<tr>
<td>Right engine</td>
<td>57.1 gal (216.1 L)</td>
</tr>
<tr>
<td>Right rear sponson</td>
<td>45.0 gal (170.3 L)</td>
</tr>
<tr>
<td>Total in rear tank</td>
<td>189.0 gal (715.5 L)</td>
</tr>
<tr>
<td>Total in all tanks</td>
<td>634.4 gal (2401.3 L)</td>
</tr>
</tbody>
</table>

**Fuel, diesel**

- **CONUS**
  - 20 °F (−6 °C) to 115 °F (45 °C) ....... DF-2 or JP8
  - −25 °F (−32 °C) to 20 °F (−6 °C) ....... DF-1 or ASTM D 975 Grade 1-D
  - Below −25 °F (−32 °C) Jet A-1 or VV-F-800 Grade DF-A

- **OCONUS**
  - 20° F (−6 °C) to 115 °F (45 °C) ....... DF-2 or JP8
  - −10 °F (−23 °C) to 20 °F (−6 °C)
  - Blend half-and-half NATO F-54 and F-34, or F-35, F-44, F-58 or ASTM D1655 Grade Jet A-1.
  - If blending is not possible, use NATO F-34 or F-35, F-44, F-58 or ASTM D1655 Grade Jet A-1.
  - Between −10 °F (−23 °C) and −25 °F (−32 °C) NATO F-34 or F-35, F-44, or ASTM D1655 Grade Jet A-1
  - Below −25 °F (−32 °C) – ASTM D1655 Grade Jet-A-1

**Controls**

<table>
<thead>
<tr>
<th>Brakes</th>
<th>Hydraulic-mechanical service brake (foot)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Steering</td>
<td>Hydraulic-mechanical steering control</td>
</tr>
<tr>
<td>Turning capability</td>
<td>360-degree pivot</td>
</tr>
</tbody>
</table>

**Legend:** ° degrees; % – percent; C – Celsius; cm – centimeters; F – Fahrenheit; g – gallon; in – inches; L – liter; km kilometers; km/h kilometers/hour; mi – miles; mph – miles per hour
BRADLEY FIGHT VEHICLE

A-3. Figure A-3 illustrates the characteristics of the M2A2’s side view. The M2A2’s operational capabilities are listed in table A-3.

Figure A-3. M2A2 Infantry fighting vehicle (side profile)

Table A-3. M2A2, Infantry fighting vehicle

<table>
<thead>
<tr>
<th>Operational Characteristics</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Speed on land</td>
<td>35 mph (56 km/h) min</td>
</tr>
<tr>
<td>Cruising range</td>
<td>250 miles (402 km)</td>
</tr>
<tr>
<td>Vertical wall climbing</td>
<td>30 in (762 mm)</td>
</tr>
<tr>
<td>Trench crossing</td>
<td>84 in (2134 mm)</td>
</tr>
<tr>
<td>Fording depth</td>
<td>more than 1 1/2 ft (.46 m) deep and less than 3 1/2 ft (1.07 m) deep</td>
</tr>
<tr>
<td>Slope</td>
<td>60%</td>
</tr>
<tr>
<td>Side slope</td>
<td>no steeper than 40% (22 degrees)</td>
</tr>
<tr>
<td>Weight (combat loaded)</td>
<td>66,000 lb (29,937 kg)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Dimensions</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Length</td>
<td>258 in/6.5 m</td>
</tr>
<tr>
<td>Width</td>
<td>129 in/3.2 m</td>
</tr>
<tr>
<td>Height</td>
<td>119 in/3.0 m</td>
</tr>
<tr>
<td>Ground clearance</td>
<td>18 in/0.4 m</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Fuel Capacities</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Fuel capacities</td>
<td>175 gal (662 liters)</td>
</tr>
<tr>
<td></td>
<td>155 gal (586 liters) with bladder lining</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Controls</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Brakes</td>
<td>Multidisc, oil-cooled</td>
</tr>
<tr>
<td>Steering</td>
<td>Hydrostatic</td>
</tr>
<tr>
<td>Turning capability</td>
<td>360-degree pivot</td>
</tr>
</tbody>
</table>

Legend: % – percent; cm – centimeters; gal – gallons; in – inches; kg – kilograms; km – kilometers; km/h – kilometers/hour; lbs – pounds; m – meters; min – minimum; mm – millimeters; mph – miles per hour
A-4. Figure A-4 illustrates the characteristics of the M2A3/M3A3’s side view. The M2A3/M3A3’s operational capabilities are listed in table A-4.

![Figure A-4. M2A3/M3A3](image)

**Table A-4. M2A3/M3A3 Operational Characteristics**

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Speed on land</td>
<td>38 mph (61 km/h)</td>
</tr>
<tr>
<td>Cruising range</td>
<td>250 miles (402 km)</td>
</tr>
<tr>
<td>Vertical wall climbing</td>
<td>36 in/0.9 m</td>
</tr>
<tr>
<td>Trench crossing</td>
<td>100 in/2.5 m</td>
</tr>
<tr>
<td>Fording depth</td>
<td>more than 1 1/2 ft (.46 m) deep and less than 3 1/2 ft (1.07 m) deep</td>
</tr>
<tr>
<td>Slope</td>
<td>60%</td>
</tr>
<tr>
<td>Side slope</td>
<td>no steeper than 40% (22 degrees)</td>
</tr>
<tr>
<td>Weight (combat loaded)</td>
<td>74,400 lb (33,747 kg)</td>
</tr>
</tbody>
</table>

**Dimensions**

<table>
<thead>
<tr>
<th>Dimensions</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Length</td>
<td>258 in/6.5 m</td>
</tr>
<tr>
<td>Width</td>
<td>129 in/3.2 m</td>
</tr>
<tr>
<td>Height (with low tension wire guard included)</td>
<td>130 in/3.3 m</td>
</tr>
<tr>
<td>Ground clearance</td>
<td>15 in/0.3 m</td>
</tr>
</tbody>
</table>

**Fuel Capacities**

<table>
<thead>
<tr>
<th>Fuel capacities</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>175 gal (662 liters)</td>
</tr>
<tr>
<td></td>
<td>155 gal (586 liters) with bladder lining</td>
</tr>
</tbody>
</table>

**Controls**

<table>
<thead>
<tr>
<th>Controls</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brakes</td>
<td>Multidisc, oil-cooled</td>
</tr>
<tr>
<td>Steering</td>
<td>Hydrostatic</td>
</tr>
<tr>
<td>Turning capability</td>
<td>360-degree pivot</td>
</tr>
</tbody>
</table>

**Legend**: % – percent; ft – feet; gal – gallons; in – inches; kg – kilograms; km – kilometers; km/h – kilometers/hour; L – liters; lbs – pounds; m – meters; mm – millimeters; mph – miles per hour
ARMORED MULTI-PURPOSE VEHICLE

A-5. Table A-5 covers the operational characteristics of the armored multi-purpose vehicle. Currently, there are no images available for inclusion in this TC. The information in table A-5 is important information, which improves drivers training for drivers who are assigned to the AMPV.

Table A-5. Armored multi-purpose vehicle

<table>
<thead>
<tr>
<th>Operational Characteristics</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Forward speed, maximum (paved level surface)</td>
<td>38 mph (61 km/h)</td>
</tr>
<tr>
<td>Acceleration from 0–30 mph (0–48 km/h)</td>
<td>24 seconds</td>
</tr>
<tr>
<td>Cruising range (Max) at 30 mph (48 km/h)</td>
<td>225 mi (362 km)</td>
</tr>
<tr>
<td>Vertical obstacle vehicle can climb (forward)</td>
<td>24 in (61 cm)</td>
</tr>
<tr>
<td>Maximum width of ditch vehicle can cross (forward)</td>
<td>67 in (170 cm)</td>
</tr>
<tr>
<td>Fording depth</td>
<td>36 in (91 cm)</td>
</tr>
<tr>
<td>Grade ascending ability, sustained speed at 5 mph (8.0 km/h)</td>
<td>60% (31°)</td>
</tr>
<tr>
<td>Grade descending ability (max)</td>
<td>60% (31°)</td>
</tr>
<tr>
<td>Side slope (maximum)</td>
<td>40% (22°)</td>
</tr>
<tr>
<td>Weight: Combat loaded (less kits)</td>
<td>80,203 lb (36,379.47 kg)</td>
</tr>
</tbody>
</table>

| Dimensions                                                                                   |       |
| Length                                                                                      | 313.7 in (796.79 cm) |
| Width                                                                                       | 123.1 in (312.7 cm) |
| Height (with low tension wire guard included)                                               | 171.8 in (436.37 cm) |
| Width (Body)                                                                                | 144.9 in (368.04 cm) |
| Width (Track)                                                                               | 115 in (292 cm) |

| Fuel Capacities                                                                             |       |
| Fuel capacities                                                                             | 200 gal (757 L) 155 gal |

| Controls                                                                                     |       |
| Brakes                                                                                      | Multidisc, oil-cooled |
| Steering                                                                                    | Hydrostatic |
| Turning capability                                                                          | 360-degree pivot |

**Legend:** ° – degrees; % – percent; cm – centimeters; ft – feet; gal – gallons; in – inches; kg – kilograms; km – kilometers; km/h – kilometers/hour; L – liters; lbs – pounds; m – miles; mi – miles; mph – miles per hour
Appendix B
Training Support Materials

This appendix lists training support packages and individual tasks for tracked combat vehicles. Training support packages and individual tasks are located on the CAR website.

TRAINING SUPPORT PACKAGES
B-1. Instructor familiarity with the following training support packages is essential when conducting tracked combat vehicle training:
TSP 171-B-1002M1A1 V.2, M1 Series Tank Driver Training Support Package.
TSP 071-W-BFVS V.2, Bradley Fighting Vehicle (Currently Under Development).

INDIVIDUAL TASKS
B-2. The individual tasks listed below are recommended for tracked combat vehicle training:
171-19K-1020, Drive an M1A2 SEP Tank.
171-19K-1045, Install the Driver's Vision Enhancer (DVE) on an M1 Series Tank.
171-19K-1001, Operate the Engine on an M1A1 Tank.
171-19K-1025, Operate the Engine on an M1A2 SEP Tank.
171-19K-1046, Remove the Driver's Vision Enhancer (DVE) from an M1 Series Tank.
171-19K-1040, Secure the Driver's Station on an M1-Series Tank.
171-151-0009, Maintain the AN/VAS-5B Driver's Vision Enhancer (DVE).
071-710-0003, Maintain the Driver's Night Viewer, AN/VVS-2, on a Bradley Fighting Vehicle (BFV).
171-19K-1120, Perform Built-In Tests (BIT) on the Improved Driver's Integrated Display (iDID) on an M1A2 SEP Tank.
171-19K-1121, Perform Diagnostics Mode Maintenance on the Improved Driver's Integrated Display (iDID) on an M1A2 SEP Tank.
171-19K-1152, Troubleshoot the Driver's Vision Enhancer (DVE) on an M1 Series Tank.
171-19K-1003, Prepare the Driver's Station for Operation on an M1A1 Tank.
171-19K-1023, Prepare the Driver's Station for Operation on an M1A2 SEP Tank.
171-19K-1101, Slave Start an M1A1 Tank.
171-19K-1124, Slave Start an M1A2 SEP Tank.
071-324-6025, Start a Bradley Fighting Vehicle (BFV) Using Auxiliary Power.
071-326-3001, Direct a Driver over a Terrain Route.
071-324-6001, Drive a Bradley Fighting Vehicle (BFV).
171-19K-1002, Drive an M1A1 Tank.
171-126-1009, Operate the AN-VS-2 Night Vision Viewer in Driver's Hatch on an M1A1 Tank.
171-126-1232, Operate the AN-VVS-2 Night Vision Viewer in Driver's Hatch on an M1A2 SEP Tank.
071-710-0002, Operate the Driver's Night Viewer, AN/VVS-2, on a Bradley Fighting Vehicle (BFV).
171-19K-1041, Operate the Driver's Vision Enhancer (DVE) on an M1 Series Tank.
071-024-0016, Perform the Duties of a Driver on a Bradley Fighting Vehicle (BFV).
171-19K-1005, Extinguish a Fire on an M1A1 Tank.
171-19K-1021, Extinguish a Fire on an M1A2 SEP Tank.
071-324-6022, Extinguish a Fire on an M2A2 or M3A2 Bradley Fighting Vehicle (BFV).
071-324-6027, Extinguish a Fire on an M2A3 or M3A3 Bradley Fighting Vehicle (BFV).
Appendix C
Examination Sample

Appendix C provides the trainer with a sample drivers training examination. Personnel developing examination materials for the drivers training exams should ensure that the reference materials and technical manuals they are using are current and available on the Army Publishing Directorate website.

Written Evaluation
(SAMPLE)
M1A2 SEP Driver Training

DRIVERS PERFORM BEFORE OPERATION CHECKS AND SERVICES ON AN M1A2 SEP TANK.

Situation: You are performing before operations preventive maintenance checks and services and notice a leakage of fluid large enough to form drops, but not large enough to cause drops to drip from the item being checked or inspected.

1. Which class of leak is described above?
   a. I.
   b. II.
   c. III.
   d. IV.

2. Based on the classification of the leak described above would equipment operation still be permissible?
   a. Yes.
   b. No.

Situation: You continue with the before operation checks and services and are ready to perform a parking brake check. You have started the engine.

3. How long should you warm up the engine before performing the parking brake check to prevent engine or transmission damage?
   a. 30 seconds.
   b. 1 minute.
   c. 90 seconds.
   d. 2 minutes.

Situation: You are now ready to begin checking the steer-throttle control.

4. The steer-throttle control should be checked for which of the following?
   a. The throttle grips do not return to the forward position.
   b. The throttle grips do not go into Position 3.
   c. The steer-throttle control can be easily removed for cleaning.
   d. The steer-throttle control has freedom of movement.
PREPARE THE DRIVER’S STATION FOR OPERATION ON AN M1A2 SEP TANK.

**Situation:** You are the driver of a M1A2 SEP tank and have been ordered to prepare your tank for operation. You entered the tank through the loader’s hatch and you are ready to enter the driver’s station.

5. What is the first thing you will check or do when entering the driver’s station?
   a. Make sure headrest is in the UP position. If not, move it to the UP position.
   b. Make sure parking brake is set by pressing parking brake pedal with foot.
   c. Set the dome light to the OFF position.
   d. Turn on the MASTER POWER switch.

REACT TO A FIRE ON AN M1A2 SEP TANK.

**Situation:** The tank’s engine compartment has caught fire and the crew has been unable to extinguish the fire.

6. According to the M1A2 SEP TM what is the guidance given for the distance and direction of the tank crews assembly area once the tank commander has determined the fire cannot be extinguished?
   a. 50 meters to the rear of the tank.
   b. 75 meters to the front of the tank.
   c. 80 meters to the front of the tank.
   d. 100 meters to the rear of the tank.

**Situation:** You are the driver of an M1A2 SEP tank and a fire has started in the tank’s engine compartment.

7. The turret and gun tube should immediately be positioned in which direction?
   a. Over either side of the tank.
   b. Over the rear of the back deck.
   c. The position of the turret and gun tube does not matter.
   d. Over the second and third road wheel on the tank commander’s side of the vehicle.

START/STOP THE ENGINE ON AN M1A2 SEP TANK.

**Situation:** You are the driver of an M1A2 SEP tank and have been ordered to prepare your tank for operation. You have pressed the MASTER POWER pushbutton on the improved driver’s integrated display (known as iDID).

8. How long after pressing the MASTER POWER button should you give the main menu to appear on the iDID before executing troubleshooting procedures on the iDID?
   a. 20 seconds.
   b. 35 seconds.
   c. 60 seconds.
   d. 90 seconds.
DESCRIBE SAFE PRACTICES AND ACCIDENT AVOIDANCE PROCEDURES WHILE DRIVING THE M1-SERIES TANK.

**Situation:** The tank commander has told you to begin driving and that you are scheduled to drive for the next five hours.

9. As a driver how often are you required to take a 15-minute break?
   a. Every two to three hours of driving or every 175 to 225 kilometers (100 to 150 miles).
   b. Every three to four hours of driving or every 150 to 200 kilometers (93 to 124 miles).
   c. Every one to two hours of driving or every 200 kilometers (124 miles).
   d. Every four to five hours of driving or every 200 to 250 kilometers (124 to 155 miles).

10. Sleeping in a parked vehicle with the engine or __________running is prohibited.
    a. Night vision device.
    b. Nuclear, biological, and chemical system.
    c. Heater.
    d. Vehicle service drive lights on.

**USE VISUAL SIGNALING TECHNIQUES**

**Situation:** You are following the directions of a ground guide.

11. See figure C-1. What is the ground guide in the picture signaling the driver to do?
    a. Move forward.
    b. Neutral steer, right.
    c. Turn left.
    d. Turn right.
Appendix C

12. See figure C-2. What is the ground guide in the picture signaling the driver to do?
   a. Move forward.
   b. Stop.
   c. Move in reverse.
   d. Dismount.

![Figure C-2. Question No. 12 illustration](image)

DRIVE AN M1A2 SEP TANK

Situation: You are the driver on an M1A2 SEP tank. The engine is running and the tank commander gives you the command to move out.

13. Before moving out, the RPM indicator must indicate the following:
    (normal ___ - ___ RPM, tactical idle ___ - ___).
    a. Normal 800 - 900 RPM, tactical idle 1200 - 1400 RPM.
    b. Normal 850 - 950 RPM, tactical idle 1200 - 1400 RPM.
    c. Normal 850 - 950 RPM, tactical idle 1100 - 1150 RPM.
    d. Normal 700 - 750 RPM, tactical idle 1420 - 1500 RPM.
**Situation:** You have been driving over even terrain when you notice the path ahead begins to slope to the side on the tank commander’s side of the vehicle.

14. What is the maximum side slope the vehicle can safely negotiate before the vehicle could lose traction and begin to slide?
   a. 32 degrees.
   b. 22 degrees.
   c. 31 degrees.
   d. 15 degrees.

**OPERATE THE AN/VVS-2 NIGHT VISION VIEWER IN THE DRIVER’S HATCH ON AN M1A2 SEP TANK**

**Situation:** The tank commander has ordered you to prepare the vehicle for night driving.

15. What must you remove and stow from the night vision viewer before connecting the power cable?
   a. The driver’s periscope.
   b. The infrared lenses on the headlights.
   c. The night vision device (NVD) batteries.
   d. The NVD battery cable.

**APPLY NIGHT VISION PRINCIPLES TO TRACKED VEHICLE DRIVING**

**Situation:** You are the driver of an M1A2 SEP tank conducting a night mission and you are using an NVD.

16. To provide the best view possible, the driver's seat should be adjusted so that the viewing distance (eye to viewing lens) is how many inches?
   a. 6-10 inches.
   b. 4-5 inches.
   c. 12-15 inches.
   d. 15-20 inches.

**DESCRIBE SAFE DRIVING PRACTICES AND ACCIDENT AVOIDANCE PROCEDURES WHILE DRIVING THE M-1 SERIES TANK**

**Situation:** While driving your tank at night, you begin to feel the vehicle skidding off the road.

17. If your vehicle starts to slide, what is the first thing you should do?
   a. Put the engine in reverse.
   b. Steer in the opposite direction of the skid.
   c. Reduce engine speed to idle.
   d. Shut down the MASTER POWER switch.
SLAVE START AN M1A2 SEP TANK

Situation: You tried to start the engine; it failed to start due to dead batteries. You secure assistance from a second live tank and two crewmembers. You must slave start your tank.

18. Which direction should the turret and main gun be facing during slave start operations?
   a. Forward over the driver’s hatch.
   b. Facing the opposite direction of the live tank.
   c. Over the back deck.
   d. The orientation of the gun and turret does not matter.

19. How long should the live tank idle to charge the batteries on the dead tank?
   a. 15 minutes.
   b. 30 minutes.
   c. 10 minutes.
   d. 60 minutes.

SECURE THE DRIVER’S STATION ON AN M1A2 SEP TANK.

Situation: The tank commander is in the turret. The driver’s hatch is closed and you have been told to secure the driver’s station.

20. If the advisory, "ENGINE SHOULD BE SHUT DOWN PRIOR TO MASTER POWER DOWN. DAMAGE MAY OCCUR," is displayed, what should you do?
   a. Shut down the main engine.
   b. Press the reset button.
   c. Shut down the external auxiliary power unit.
   d. Call unit maintenance.

21. What position should the driver’s seat be in before closing the hatch?
   a. Head rest in the down (stowed) position.
   b. Seat locked up and head rest down.
   c. Upper seat back raised.
   d. Seat lowered.

END OF EVALUATION
Appendix D

Drivers Training Road Testing

Appendix D provides recommendations for the physical standards and design of the drivers training course. There are two types of courses discussed in this appendix. One course is designed for training under unusual (off-road) conditions and the other is designed for usual (urban or road) conditions. Commanders may modify or alter the recommended designs and obstacles to suit their unit’s drivers training program or available facilities and resources.

OVERVIEW

D-1. Incorporating situations simulating what drivers encounter while assigned as tracked combat vehicle drivers improves their ability to operate and maneuver their vehicles and prepares them to command these vehicles later in their careers. Encountering terrain features requiring the driver to decide whether their vehicle can negotiate obstacles encountered in a field environment gives them valuable knowledge of the capabilities and limitations of their vehicles. Drivers should encounter and negotiate various urban terrain obstacles as well, for instance a bridge (simulated) the vehicle has to cross and an overpass or wire they may have to go under (simulated). Gaining this knowledge reduces accidents or injuries during future operations in real-world environments. Instructors should conduct these two courses and the tasks associated with them during the day as well as during periods of limited visibility using night vision devices.

DRIVERS TRAINING COURSES (USUAL CONDITIONS)

D-2. The tasks listed and discussed below correspond to the tasks identified on the example drivers training course layout for usual conditions (see figure D-1, page D-3). The tasks are the same tasks identified as part of a drivers training program. Commanders and master drivers can use the template and the information associated with the tasks identified on the template to guide them in the development of their drivers training course.

1. Start/finish.
   This is where the driving portion of the student drivers road test training begins and ends.

2. Low-hanging wires, bridge, or overpass obstacle.
   This section of the drivers training requires that the driver pass under a simulated, low bridge, overpass, or electrical lines. This is simulated by providing the driver with a visual representation of an overhead obstacle prompting them to determine whether their vehicle can safely pass. This obstacle should be designed so that it can be easily and quickly reset for follow-on students. Materials that do not damage the vehicles, are inexpensive, and are replaced easily should be used.

   In this portion of the training course, drivers encounter a mock bridge and have to determine whether the vehicle can safely cross the bridge based on the information provided by the marker. The drivers training track does not have to have a bridge incorporated into it to execute this task. Utilize signs and markings currently in use on domestic and international roadways for this portion of training.
4. Sudden loss of brakes, steering, or engine power.

The driver performs the following actions to demonstrate that they know how to stop their vehicle in the event the vehicle loses power, steering, or brakes:

- Move the gear select to N (neutral).
- Center the steering column or laterals.
- Let the vehicle coast to a stop.
- Set the parking brake if the vehicle has one.
- Shut down the engine once the vehicle has stopped.

5. Sudden loss of internal communication among the crew (loss of intercom system).

The tank commander gives the following cue to the driver, “Communications between you and the TC have been lost.” The tank commander does not do anything to actually cut communications between themselves and the driver, but the driver upon hearing the cue should execute the following action:

The driver immediately brings the vehicle to a halt and does not move the vehicle until communication has been restored.

6. Emergency or sudden braking.

Drivers observe the time and distance it takes for a large, tracked combat vehicle to stop to give them an idea of how much time is required to stop safely.

The tank commander alerts the driver that the vehicle needs to stop suddenly. The tank commander cues this action by telling the driver, “STOP, STOP, STOP!” in rapid succession. Upon hearing the cue, the driver executes emergency or sudden braking procedures by doing the following:

The driver uses the recommended pumping action to prevent locking the brakes on their vehicle. (After stopping the vehicle, the tank commander ensures the driver noted the speed the vehicle was going, the time it took the vehicle to come to a complete stop, and the distance the vehicle traveled before coming to a complete stop).

7. React to fire on the vehicle.

The tank commander alerts the driver and crew that a fire has broken out on the vehicle while it is moving. The driver and crew respond by simulating the actions necessary for responding to a fire in the engine compartment or the crew compartment of the vehicle. The following individual task lessons, which are available on the CAR website, list the steps for individual actions for tracked vehicle personnel,

- 171-19K-1005, Extinguish a Fire on an M1A1 Tank.
- 171-19K-1021, Extinguish a Fire on an M1A2 SEP Tank.
- 071-324-6022, Extinguish a Fire on an M2A2 or M3A2 Bradley Fighting Vehicle (BFV).
- 071-324-6027, Extinguish a Fire on an M2A3 or M3A3 Bradley Fighting Vehicle (BFV).

8. Poor visibility because of dust or smoke.

The driver enters a portion of the training course where their ability to view the road ahead of them is obscured from their view because of smoke. This exercise allows the driver to demonstrate the appropriate actions they would take when they encounter conditions that hinder their ability to see. Trainers can use a smoke-generating device or smoke grenades for this portion of the course. The drivers take their commands from the tank commander when they enter the area of obscuration.
DRIVERS TRAINING COURSE (UNUSUAL CONDITIONS)

D-3. The tasks listed below correspond to the tasks identified on the example drivers training course layout for unusual conditions (figure D-2). The tasks listed and discussed below are the same tasks identified as part of a drivers training program, commanders and master drivers can use the template and the information associated with the tasks identified on the template to guide them in the development of their drivers training course.

1. Start/Finish.
   This is where the driving portion of the student drivers training begins and ends.

2. Negotiate a ditch or gap.
   - The driver and crew encounters a ditch or gap in the vehicle’s path. The driver has to determine whether their vehicle can negotiate the obstacle in their path. If the driver can safely negotiate the obstacle in front of the vehicle, they take the appropriate actions for negotiating the obstacle based on the width and depth of the gap or ditch. Additional guidance for crossing a gap or ditch is in a vehicle’s TM.
   - Instructions for M1A1 and M1A2 ditch crossing:
     - Alert crew that ditch will be crossed.
     - Make sure main gun is elevated to clear obstacles.
     - Slow down tank and set shift control to L.

Figure D-1. Drivers training course (usual conditions)
Drive tank slowly to meet ditch with both tracks at edge of opening.
Drive slowly into ditch.
When front of tracks touch far side of ditch, increase speed.

**CAUTION**
Tanks can cross a ditch that is up to nine feet (2.8 meters) wide if the edges of the ditch are firm. If the edges are soft or sandy, the width of a ditch that can be crossed will be less.

- Instructions for M2A2/3 Bradley ditch crossing:
  - Drive up to ditch or gap straight on.
  - Move gear selector to LOW.
  - Center steering yoke and drive slowly over trench.
  - Accelerate when vehicle clears trench.

**WARNING**
Ground can give way if a vehicle is driven too close to the edge of a road or drop-off. A vehicle can roll if the ground gives way.
Avoid driving next to the edges of roads or drop-offs that can give way.

**CAUTION**
Vehicles can be stuck in trenches wider than eight feet (2.5 meters). Do not cross trenches wider than eight feet (2.5 meters).

**CROSSING WATER OBSTACLES (FORDING OPERATIONS)**
3. Crossing water obstacles is an extremely dangerous and complex task for armor crews to conduct safely. Each crewmember has a critical part to play to ensure that the crew and vehicle cross water obstacles safely and without damaging their vehicle. Normally, armor crews avoid water obstacles, but during combat operations, the tactical situation may force an armor crew to conduct fording operations. Due to the complexity and danger involved with fording operations, training drivers to execute water obstacle tasks is an important part of drivers training. The steps listed below focus on the driver’s responsibilities during fording operations. It is important to note that there are more steps than those listed below and that fording operations requires a crew effort. Further guidance concerning crew responsibilities and the steps necessary to prepare a vehicle to conduct fording operations can be found in the vehicle’s TM.
- **M2A2/3:**
  - Close front, hull drain plug.
  - Confirm that rear drain hole plug is closed with another crewmember. If it is not closed, ensure that the drain hole plug is closed before proceeding on to the next step.
  - Check that two final drive hull drain plugs are in place and secured.
  - Check that four upper hull drain plugs are in place and secured.
- Check the bilge pump's operation.
- Raise the ramp (if not already raised).
- Open the driver's hatch to FULL open.
- Prior to fording, ensure the driver's passageway to the troop compartment is clear of all equipment.
- Lower the driver's seat back.
- Start engine (if engine is not already started).
- Move the FWD and FWD BILGE PUMPS switches to ON.
- Center the steering yoke.
- Ford the water.
- Exit the water.
- After the bilges empty, move the FWD and REAR BILGE PUMPS switches to OFF.

**Note.** Use this task when fording more water more than 1 1/2 feet (.46 meters) deep and less than 3 1/2 feet (1.07 meters) deep.

---

**CAUTION**

Do not enter water faster than two miles per hour (three kilometers per hour) or a fast walking pace. Crawl a vehicle into water. Water can get into an air intake system and damage the engine. A vehicle can be swamped or stranded if underwater obstructions do not support both tracks. Be prepared to stop the vehicle quickly.

---

**Note.** Only one vehicle should be in the fording area at a time. Ensure the fording area is clear of vehicles and personnel prior to a vehicle entering the water.

---

- **M1A1 and M1A2 SEP:**
  - Stop the tank at the edge of the water.
  - Open all the vehicle hatches.
  - Ensure the tank commander has placed the tank’s turret over the left or right side of the vehicle to facilitate the driver’s escape in the event the vehicle begins to sink.
  - Set the TACTICAL IDLE switch to ON.
  - Make sure the drain valves are closed.
  - Release the service brake pedal.
  - Drive the tank slowly into the water.
  - Operate bilge pump if water starts coming into the tank.
  - Drive the tank at 3-4 miles per hour (5-6 kilometers an hour) or less through the water.
- If the tank fords more than one foot (30.5 centimeters) of water and is not under combat after leaving the water, do the following:
  - Shut down the engine.
  - Open the left and right No. 1 skirts.
  - Check the idler wheels and road wheel hubs for water in oil (milky look). If water is in the oil, notify field maintenance.
  - Close the left and right No. 1 skirts.
WARNING

Do not ford water unless the depth is known. Water deeper than four feet (1.2 meters) can enter a tank, injure crewmembers, and damage the engine.

CAUTION

Do not stop the engine if the tank is in water deeper than the bottom of the hull. Water could enter the engine compartment through the hull drains and enter the bottom of the engine through the combustor drains. If this occurs, the engine could be damaged.

4. The mobility of tracked vehicles on and off road allows armor crews to traverse difficult terrain that may be inaccessible to other vehicles available to commanders. While tracked vehicles are highly mobile, they do have limitations regarding the size of an obstacle they can negotiate. Crews need to observe precautions and processes when tracked vehicles negotiate raised obstacles. Raised obstacles can be encountered in urban and field environments. Raised obstacles in urban environments can include obstacles such as walls, rubble from damaged or destroyed buildings, and obstacles emplaced by enemy forces such as concrete barriers. Raised obstacles in field environments can include fallen timber, manmade berms, and rocks or boulders. A quality drivers training program incorporates training which familiarizes drivers with how to identify and negotiate a raised obstacle in a vehicle’s path as follows:

- M2A2/3 Bradley fight vehicle:
  - Drive the vehicle up to the obstacle straight on.
  - Move the gear selector to LOW.
  - Slowly drive the vehicle over the obstacle or berm.

CAUTION

Obstacles higher than 36 inches (914 millimeters) can damage the vehicle drive sprocket. Do not drive over obstacles higher than 36 inches (914 millimeters).

- M1A1 and M1A2 SEP Abrams tank:
  - Alert crew that the obstacle will be crossed.
  - Make sure the main gun is elevated all the way.
  - Slow down the tank and set the shift control to L.
  - Drive the tank slowly to meet the forward edge of the obstacle.
  - Increase speed and drive up the obstacle.
  - Slow down the tank as it gets to the balance point.
  - Drive forward slowly to ease the tank forward from the balance point.
  - Drive off the obstacle slowly using the service brakes to control speed.
  - When the tracks touch the ground increase speed.
  - When the rear of the tank is off the obstacle, continue normal driving.
5. Encounter and negotiate unstable or loose soil conditions (steps for both platforms are the same) as follows:
   - Allow as much distance as possible between vehicles in convoys. Flying dust and sand damages optics and clogs air filters.
   - Drive on sand is at night or early morning when sand is damp as this is the best time to drive on sand. Damp sand allows for better traction.
   - Do not make pivot turns in sand or loose dirt or a thrown track may result.
   - Do not make sharp turns at high speeds. Turn vehicle with a series of gradual turning motions to avoid throwing a track or overturning the vehicle.
   - Do not slide the vehicle sideways into loose dirt or sand; a thrown track could be the result.
   - Do not straddle a sand dune or drive on the sides of two sand dunes. A sand dune can be an unstable overhanging ridge and give way under the weight of the vehicle.
   - If the vehicle starts to skid on loose sand, the driver takes their foot off the accelerator. The driver steers in the direction of the skid until the vehicle stops skidding. The driver slowly accelerates and steers the vehicle on a straight course.
   - If a track-popping sound is heard while driving in loose sand, drive the vehicle in a straight line until the track-popping sound stops. If the track-popping sound continues, stop the vehicle and set the hand brake. Check the track and suspension for a buildup of sand. If sand has built up on the suspension, move the vehicle backward and forward two or three times to clear the suspension.
   - Ensure track tension is set properly on a daily basis. Driving in sand or loose dirt may cause the track to stretch.

6. Conduct self-recovery operations as follows (steps for the M2A2/3 Bradley and M1 Abrams series of main battle tanks are the same) (see figure D-2, page D-8):
   - Self-recovery procedures for mired tracked vehicles:
     - Driver shuts down the engine, dismounts the vehicle, and assists the rest of the crew in the recovery effort.
     - Crew obtains a log long enough to span the width of the vehicle and of sufficient diameter to support the vehicle weight.
     - Crew places the log against both tracks.
     - Crew places a tow cable so that one end of the cable goes under the log and through the tracks from the inside.
     - Crew places the other end of the tow cable underneath the log and connects the ends of the cable together with a tow hook on the outside of the track to make disconnecting easier.
     - Crew follows the same procedure to attach the log to the track on the opposite side of the vehicle.
     - Driver remounts the vehicle and starts the engine.
     - Ground guides move to the front and rear of the vehicle.
     - Tank commander instructs the driver when to apply power to the tracks. This pulls the log underneath the tracks until it meets the obstacle, thereby anchoring the tracks and causing the vehicle to move.
     - Driver takes directions from the grounds guides as to when to stop the vehicle before the log reaches the fenders or the cable reaches the drive sprocket to prevent damage to the fenders and tow cables.
Self-recovery procedures for high centered (bellied) tracked vehicles:
- Driver shuts down the vehicle and dismounts the vehicle.
- Crew anchors the tracks by using two tow cables.
- Crew connects the tow cables together with a tow hook.
- Crew attaches the cables to both tracks by passing the ends of the cables through the tracks from the outside and attaching them to the standing parts of the cables with tow hooks.
- Driver remounts the vehicle and starts the engine.
- Ground guides move to the front and rear of the vehicle.
- Tank commander directs the driver to apply power to the tracks and take directions from the ground guides.
- Driver applies power to the tracks until the cable makes contact with the obstacle and the vehicle moves off the obstacle.
- Ground guides ensure that the driver stops applying power before the tow cables cycle up to a point where they meet the hull of the vehicle to prevent equipment damage.

Figure D-2. Drivers training course (unusual conditions)
Glossary

The glossary lists acronyms and terms with Army or joint definitions. Where Army and joint definitions differ, (Army) precedes the definition. Terms for which TC 21-306 is the proponent are marked with an asterisk (*). The proponent manual for other terms is listed in parentheses after the definition.

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<tr>
<td>ATP</td>
<td>Army technical publication</td>
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<tr>
<td>BII</td>
<td>base information infrastructure</td>
</tr>
<tr>
<td>CAR</td>
<td>Central Army Registry</td>
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<tr>
<td>DA</td>
<td>Department of the Army</td>
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<tr>
<td>DA PAM</td>
<td>Department of the Army pamphlet</td>
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<td>DD</td>
<td>Department of Defense</td>
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<td>ETM</td>
<td>electronic technical manuals</td>
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<td>FM</td>
<td>field manual</td>
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<tr>
<td>LDAC</td>
<td>Logistics Data Analysis Center</td>
</tr>
<tr>
<td>METL</td>
<td>mission-essential task list</td>
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<tr>
<td>NVD</td>
<td>night vision device</td>
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<tr>
<td>OF</td>
<td>optional form</td>
</tr>
<tr>
<td>PMCS</td>
<td>preventative maintenance checks and services</td>
</tr>
<tr>
<td>POL</td>
<td>petroleum, oil, and lubricant</td>
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<tr>
<td>SF</td>
<td>standard form</td>
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<td>SOP</td>
<td>standard operating procedure</td>
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<td>TC</td>
<td>training circular</td>
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<td>TM</td>
<td>technical manual</td>
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None.
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References

URLs accessed 10 June 2019.

REQUIRED PUBLICATIONS

RELATED PUBLICATIONS
These documents contain relevant supplemental information.
Most Army doctrinal publications and regulations are available at https://armypubs.army.mil.

JOINT PUBLICATIONS
This section contains no entries.

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OTHER PUBLICATIONS

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PRESCRIBED FORMS

This section contains no entries.

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Unless otherwise indicated, DA and DD Forms are available on the Army Publishing Directorate (APD) website (https://armypubs.army.mil).

DA Form 348, Equipment Operator’s Qualification Record (Except Aircraft).

DA Form 2028, Recommended Changes to Publications and Blank Forms.

DA Form 2404, Equipment Inspection and Maintenance Worksheet.

DA Form 2408-14, Uncorrected Fault Record.

DA Form 5984-E, Operator’s Permit Record (EGA).

DA Form 5987-E, Motor Equipment Dispatch (EGA).

DA Form 5988-E, Equipment Maintenance and Inspection Worksheet (EGA).


SF 91, Motor Vehicle Accident Report.


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