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TACTICAL EMPLOYMENT OF MORTARS

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Foreword

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No. 3-01D

Marine Corps Combat Development Command
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Tactical Employment of Mortars

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Preface

ATP 3-21.90/MCTP 3-01D is a multiservice publication that provides Army and United States Marine Corps (USMC) a doctrinal reference for the employment of mortar squads, sections, and platoons. It contains guidance on tactics and techniques that mortar elements use to execute their part of combat operations described in battalion-, squadron-, troop-, and company-level manuals. This publication contains guidance on how a mortar element's fires and displacement are best planned and employed to sustain a commander's intent for fire support.

The target audience for ATP 3-21.90/MCTP 3-01D includes mortar squad, section, and platoon leaders, company and battalion commanders, battalion staff officers, and all others responsible for controlling and coordinating fire support. Training developers use this manual as a source document for combat critical tasks. Combat developers use this manual when refining and revising operational concepts for mortar organizations. This publication serves as the primary reference for both resident and nonresident mortar tactical employment instruction.

Commanders, staffs, and subordinates ensure their decisions and actions comply with applicable United States, international, and in some cases host-nation laws and regulations. Commanders at all levels ensure their Soldiers operate according to the law of war and the rules of engagement (ROE). (See FM 6-27.)

This publication is not intended to be used alone. It is part of a set of doctrinal and training publications that, together, provide the necessary depth and detail to train and employ mortar elements. Users must be familiar with appropriate company and battalion-level maneuver manuals as well as mortar-related drills and collective tasks.

While Army and USMC units use similar tactics and techniques when employing mortars, the differences are few at the battalion level and below. Differences between the Services' terms and definitions are more apparent when introducing or discussing general subjects, such as warfighting functions, tactical operations, and unit organizations. Detailed explanations of these differences are beyond the scope of this manual. They are, however, identified where appropriate and different terms are combined when possible. For example, the terms "sustainment" and "logistics" are used to identify the Army's sustainment and the USMC's logistic functions. Readers refer to their own service's manuals for more detailed explanations.

ATP 3-21.90/MCTP 3-01D uses joint terms where applicable. Selected joint and Army terms and definitions appear in both the glossary and the text. Terms for which ATP 3-21.90/MCTP 3-01D is the proponent publication (the authority) are marked with an asterisk (*) in the glossary. Definitions for which ATP 3-21.90/MCTP 3-01D is the proponent publication are boldfaced in the text and the term in italicized. For other definitions shown in the text, the term is italicized and the number of the proponent publication follows the definition.

ATP 3-21.90/MCTP 3-01D applies to the Active Army, Army National Guard, Army Reserve of the United States, and USMC.

The proponent of this publication is the United States Army Training and Doctrine Command (TRADOC). The preparing agency is the United States Army Maneuver Center of Excellence. Comments and recommendations may be sent by any means—U.S. mail, e-mail, fax, or telephone—using or following the format of DA Form 2028 *(Recommended Changes to Publications and Blank Forms)*.

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Introduction

ATP 3-21.90/MCTP 3-01D has been updated and provided as an ATP according to the 2015 Doctrine Strategy. In addition to doctrine changes, a significant effort has been made to eliminate redundancies with parent doctrinal manuals (for example, ATP 3-09.30).

Chapter 1 discusses the overview of mortar systems, fire direction center systems, and duty positions for a mortar platoon or section in the Armored, Infantry, and Stryker Brigade Combat Team. This chapter discusses the role of mortars with an introduction to the purpose.

Chapter 2 discusses an overview of fires organization and fire support plan and coordination with emphasis on the top-down bottom-up refinement.

Chapter 3 establishes techniques and procedures for mortar platoons or sections in support of platoon, company, and battalion operations.

Chapter 4 provides an overview of mortar platoon and section operations in support of company, troop, and battalion operations.

Chapter 5 provides baseline survivability techniques for mortar platoons and sections in all operating environments.

Chapter 6 covers the sustainment and logistics of mortar elements in support of operations.

Appendix A discusses mortar ammunition utilization and effects on targets to include high explosive, phosphorus smoke, and illumination cartridges.

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Chapter 1
Organization

Mortar platoons and sections provide commanders with organizationally responsive lethal indirect fire that all maneuver units in close combat need to defeat an enemy. Military history has repeatedly demonstrated the effectiveness of mortars in close combat. Their high-angle fires are invaluable against dug-in enemy troops and targets in defilade, which are not vulnerable to attack by direct fires. Commanders coordinate mortar fires with direct fire weapons to defeat enemy forces, suppress their fire, reveal their movements, and obscure their ability to observe. Mortar platoons and sections play a unique and vital role on the battlefield. They provide fires that ease combat tasks of the company, battalion, and brigade combat team (BCT) and regimental combat team commanders by providing agility, mass, and depth to a tactical-level battlefield.

SECTION I – MORTAR ELEMENT CAPABILITIES

1-1. Mortar elements are organic fire support to battalions, squadrons, companies, and troops and are available to a commander when other indirect fire support may not be. Field artillery assets at all levels are limited. For BCT, regimental combat team, and division commanders to concentrate combat power at the critical point, they accept risk elsewhere.

1-2. Some maneuver units have less artillery support than others. At the battalion and company level, mortar elements—

- Destroy or neutralize enemy forces.
- Suppress and isolate enemy forces.
- Support the destruction of enemy armor by forcing them to close hatches and observe through viewing ports, reducing their ability to employ supporting fires, and separating their dismounted infantry from their carriers and accompanying tanks. The battalion's direct antiarmor fires are then more effective against an isolated enemy with limited visibility and supporting fires.
- Penetrate buildings and destroy enemy field fortifications, preparing the way for dismounted assault.
- Enable battalion and company commanders to cover friendly obstacles with planned indirect fire.
- Attack enemy assault units and bases of fire.
- Integrate into a unit's final protective fires (FPFs) to repulse an enemy's dismounted assault.
- Utilize the protection of prepared positions in defilade to continue indirect fire support, even when subjected to counterfire.

Note. Commanders need to ensure the security of mortar elements. Mortar elements have limited ability to provide their own security and are not as responsive or efficient conducting mortar fires if they must do so. This is especially true for company and troop mortar sections because of their small crews and proximity to supported units. Based on a mission, enemy, terrain and weather, troops and support available, time available, and civil considerations (METT-TC) analysis, commanders may attach a small maneuver element, such as a squad or team, to the mortar element to provide local security. Commanders may also require mortar elements remain in reserve or collocate with the maneuver elements to receive direct fire support. Take enemy counter radar and counterfire into consideration if positioning a mortar element with a maneuver element. If enemy counterfire is likely, do not collocate a mortar element with a command post (CP) or any other element that cannot displace immediately after the friendly mortar element fires.

PURPOSE OF INDIRECT FIRE

1-3. Commanders employ mortar fires for several different purposes. Close support fires are targeted against enemy troops, weapons, or positions that are threatening or can threaten the friendly unit during the attack or defense. Providing close support fires is the most common mission given to the mortar platoon or section.

1-4. Platoon-level forward observers (FOs) normally request and adjust close support mortar fires. However, any leader within the chain of command may be initiate and control these fires. Examples of close support fires include illumination, screening, suppressive, marking, preparatory, and FPFs.

TYPES OF INDIRECT FIRE

1-5. Counterfires are used to attack an enemy's indirect fire weapons, their observation posts (OPs), and their ability to control their forces. Counterfire at long range is mainly the responsibility of the field artillery, but mortar elements provide close counterfire, especially against enemy mortars and rockets. Mortar counterfire is an immediate action taken to restore the freedom of action to a maneuver commander before more powerful counterfire weapons can be brought to bear. Mortar smoke rounds can obscure enemy observation, thereby reducing the effectiveness of enemy fire.

1-6. Interdiction fires are used to divert, disrupt, delay, or destroy an enemy's surface military potential before it can be used effectively against friendly forces. Field artillery handles most ground-interdiction fires. Mortar sections and platoons fire limited, specific types of interdiction fires on likely or suspected enemy assault positions or assembly areas, especially those in defilade.

1-7. Harassment fires are used to disturb the rest of enemy troops, curtail movement, and lower morale by the threat of losses. Occasionally, unobserved harassment fires may be used to interdict the enemy, although a commander weighs the cost of ammunition expended and the increased danger of counterfire or collateral damage.

1-8. Deception fires are used to deceive and confuse an enemy. Mortars can fire false preparatory fires on enemy positions or landing zones and create deceptive smoke screens to focus an enemy in one location while friendly forces attack from another.

EFFECTS OF INDIRECT FIRE

1-9. Successful maneuver requires close coordination and effective employment of available fires. Maneuver and fires are inseparable and complementary dynamics of unified land operations. These functions can create conditions that enhance the effective application of the other throughout the commander's area of operations (AO). A battalion, company, or troop commander decides and then clearly states what effects are to be achieved with mortar fire on a particular target. There are several different effects of indirect fire.

1-10. *Destruction,* in the context of the computed effects of field artillery fires, renders a target out of action permanently or ineffective for a long period of time, producing 30-percent casualties or materiel damage (FM 3-09). Mortars can destroy soft targets, such as dismounted enemy troops, unarmored or light armored

wheeled vehicles in the open, and enemy mortars or artillery, but cannot generally destroy enemy armor. The amount of damage needed to render a unit combat-ineffective depends on the type of unit, leadership, discipline, and morale. Precision-guided munitions can minimize the amount of mortar ammunition needed to destroy a target.

1-11. *Neutralization,* in the context of the computed effects of field artillery fires renders a target ineffective for a short period of time, producing 10-percent casualties or materiel damage (FM 3-09). Neutralization with mortar fire can be achieved against softer targets, including dismounted enemy troops or wheeled vehicles in the open, but is difficult to achieve against hardened targets, such as personnel with overhead cover or vehicles in deliberate fighting positions.

1-12. Suppression limits or prevents an enemy from returning fire, observing, or maneuvering. The effects of suppressive fires are immediate, but they only last as long as the fires continue. Suppression is the key to any successful maneuver assault. A mortar element's high rate of fire and organizational responsiveness make it an excellent means to suppress enemy forces. Suppressive fires play a large role in generating combat power for maneuver forces. The suppressive fires of mortars, along with other weapons, allow the supported element to maneuver and close for a final assault. The more effective the suppressive fires, the less dependent assaulting forces are on stealth, cover, and concealment. Mortar fires can continue to suppress the enemy until the assaulting forces are close enough to use hand-carried weapons for suppression.

1-13. Illumination fires (visible or infrared) are useful in exposing an opponent at night. They allow the commander to confirm or deny the presence of enemy without revealing the location of friendly direct fire weapons. Illumination fires are often coordinated with high explosive (HE) fires to expose and kill or suppress the enemy. Illumination fires may also be used as a deterrent effect through its use as a show of force or for area denial. Mortars have visible and infrared illumination rounds; both can illuminate a designated area and are useful for signaling or marking targets to aid in the identification for other assets. Ground-burst illumination rounds are useful to mark a target or reference point for visible, infrared, and thermal optics, though only for a short duration.

1-14. Obscuration hampers an enemy's ability to observe and acquire targets and conceals friendly movement and activities. Obscuration fires do not neutralize or suppress an enemy, since they can still employ weapons, but they reduce the effectiveness of enemy fire and laser targeting systems. Mortars can fire phosphorus rounds that provide smoke directly on an enemy position to both suppress and obscure, or they can fire phosphorus rounds between friendly forces and the enemy position to obscure observation. Mortar obscuration is effective for immediate response missions of limited scope and for short periods. The 81-millimeter (mm) and the 120-mm mortars have effective obscuration rounds.

WARNING

There are no high concentrated smoke rounds for any mortar system. All mortar smoke is from the chemical reaction of phosphorus (red and white), which burns at over 5,000 degrees Fahrenheit. Unless absolutely essential to mission success, dismounted Soldiers do not move through the impact area until the smoke has dissipated, indicating the phosphorus has completed its burn. Exposure to phosphorus can create friendly casualties. Additionally, wheeled vehicle tires may melt and become inoperable when vehicles are driven through the impact area while phosphorus is still burning. The actual smoke produced by phosphorus rounds does not itself burn; therefore shifting winds blowing mortar smoke toward friendly troops does not force those troops to move position.

1-15. A *tactical mission task* is a specific activity performed by a unit while executing a form of tactical operation or form of maneuver. It may be expressed in terms of actions by the friendly force or effects on an enemy force (FM 3-90-1). Successful mortars are commonly employed for the effects on an enemy force during tactical mission operations.

1-16. *Block* is a tactical mission task that denies the enemy access to an area or prevents their advance in a direction or along an avenue of approach. Block is also an obstacle effect that integrates fire planning and obstacle effort to stop an attacker along a specific avenue of approach or to prevent the attacking force from passing through an engagement area (FM 3-90-1). A blocking task normally requires the friendly force to block the enemy force for a certain time or until a specific event has occurred. Preplanned linear mortar targets within an engagement area may be used to block dismounted enemy soldiers and unarmored or light armored vehicles, but mortars cannot generally block enemy armor. Block as a tactical mission differs from the tactical mission of fix because a blocked enemy force can move in any direction other than the obstructed one, while a fixed enemy force cannot move in any direction.

1-17. *Canalize* is a tactical mission task in which the commander restricts enemy movement to a narrow zone by exploiting terrain coupled with obstacles, fires, or friendly maneuver (FM 3-90-1). Massing fires of preplanned targets on choke points and key terrain are examples of how mortars can canalize the enemy.

1-18. *Disrupt* is a tactical mission task in which a commander integrates direct and indirect fires, terrain, and obstacles to upset an enemy's formation or tempo, interrupt their timetable, or cause enemy forces to commit prematurely or attack in piecemeal fashion (FM 3-90-1). Firing preplanned targets along likely enemy avenues of approach and withdrawal routes; on suspected or confirmed enemy mortars, OPs, assault positions, and rally points; and firing mortars to isolate all or part of an objective are examples of how mortars can disrupt the enemy.

1-19. *Fix* is a tactical mission task where a commander prevents the enemy from moving any part of their force from a specific location for a specific period. Fix is also an obstacle effect that focuses fire planning and obstacle effort to slow an attacker's movement within a specified area, normally an engagement area (FM 3-90-1). The primary use of this effect is to give the friendly unit time to acquire, target, and destroy the attacking enemy with direct and indirect fires throughout the depth of the engagement area or avenue of approach. Preplanned mortar smoke used to visually separate enemy forces in the engagement area in conjunction with mortar HE fired on enemy elements in direct fire contact are examples of how mortars can degrade enemy command and control and help fix the enemy.

1-20. *Isolate* is a tactical mission task that requires a unit to seal off (physically and psychologically) an enemy from sources of support, deny the enemy freedom of movement, and prevent the isolated enemy force from having contact with other enemy forces (FM 3-90-1). A commander does not allow an isolated enemy force sanctuary within its present position but continues to conduct offensive actions against the enemy force. The same mortar methods used to fix the enemy can be used to isolate the enemy.

1-21. *Turn* is a tactical mission task that involves forcing an enemy force from one avenue of approach or mobility corridor to another. Turn is also a tactical obstacle effect that integrates fire planning and obstacle effort to divert an enemy formation from one avenue of approach to an adjacent avenue of approach or into an engagement area (FM 3-90-1)The commander relates obstacles, fires, and terrain to improve the friendly tactical situation while degrading the enemy's situation.. Firing preplanned targets along the flanks of an engagement area or firing mortars into the leading edge of an attacking enemy element to allow a friendly force to conduct a counterattack into the enemy's flank are examples of how mortars can help turn the enemy.

ROLE OF MORTAR ELEMENTS

1-22. The primary role of mortar elements is to provide a maneuver commander with immediately available, responsive, and both lethal and nonlethal indirect fires in support of company, troop, battalion, and squadron maneuver. They serve to reinforce direct fires during close combat. Mortar elements are assigned to—

- Combined arms battalions.
- Infantry battalions and companies.
- Ranger battalions.
- Cavalry squadrons and troops.
- United States Marine Corps (USMC) light armored reconnaissance battalions.
- USMC Infantry companies.

1-23. Mortar sections and platoons provide a commander with—

- Organic indirect fire capability that is always present and responsive to the maneuver commander regardless of the changing demands placed on any supporting field artillery.
- Supporting fire that is immediately at hand from units close to the company and battalion fight. Because a mortar element is aware of the local situation, it is able to respond quickly without lengthy coordination.
- Plunging fires that complement the heavier fires of supporting field artillery, helicopter close combat attack, close air support, and naval gunfire.
- Weapons whose high rate of fire and lethality fill the gap between the time field artillery fires shift to deeper targets and the assault elements close onto an objective.
- Base of fire upon which to anchor the maneuver to the critical point of enemy weakness.
- Dense and lethal defensive fires that suppress, disrupt, and destroy enemy attackers.
- For reconnaissance units, the ability to immediately suppress an enemy and allow a unit to disengage. Without revealing their locations, scouts can engage targets with indirect fire.

SECTION II – MORTAR ELEMENT COMPOSITION AND EQUIPMENT

1-24. The accurate and rapid delivery of indirect fires is a team effort. Effective communication is vital to the successful coordination of an indirect fire team's efforts. When firing mortars, an indirect fire team determines and applies the required data and coordinates the fires with the concept of the operation. This team comprises a fire support officer (FSO), the mortar squads, the fire direction center (FDC), and the FO.

1-25. This section discusses mortar systems and Army and USMC mortar element organizations, equipment, and target acquisition assets. References throughout this document to FSO refer not only to the FSO but also to whoever is responsible by duty position for coordinating fires for that element.

MORTAR WEAPON SYSTEMS

1-26. All Army mortar cannons are smooth bore and fire fin-stabilized projectiles. Reference the corresponding technical manuals or training circulars for the weapon systems that are organic to the unit's modified table of organization and equipment for planning and functionality.

1-27. Table 1-1 on page 1-6 provides general characteristics on all U.S. mortar systems, regardless of organization.

Table 1-1. United States Army mortar systems

Type	*Crew*	*TM Number*	**Range (meters)*	
			Min	*Max*
M224A1 (Ground) 60-mm	3	9-1010-233-10	70 Conv 70 HH	3490 Conv 1340 HH
M252A1 (Ground) 81-mm	4 (Army) 6 (USMC)	9-1015-257-10	80	5790
M120 (Ground) M121 (Carrier – Track) 120-mm	4	9-1015-250-10	200	7200
M120A1 (Ground – Towed) 120-mm	4	9-1015-256-13&P	200	7200
RMS6-L (Carrier – Stryker M1129A1 MCV) RMS6-L (Carrier – Stryker M1252 MCVV) 120-mm	5	9-2355-311-10-3 9-2355-364-10 (Volumes 1 to 4)	200	6570
Legend: Conv – conventional mode, HH – handheld mode, MAX – maximum; MCV – mortar carrier vehicle; MCVV – mortar carrier vehicle, double-V hull; MFCS-D – Mortar Fire Control System—Dismounted; MIN – minimum, mm – millimeters, TM – technical manual, USMC – United States Marine Corps				
Note. All ranges are for HE and are approximate; ranges vary depending on which nomenclature of mortar round is fired, the altitude difference between the mortar system and the target, and meteorological conditions. Refer to the firing table associated with your unit's mortar system and specific round combination for exact information.				

LIGHT MORTAR

1-28. The M224A1 60-mm mortar system provides Infantry, Stryker brigade combat teams (SBCTs), Ranger, and USMC rifle companies with an effective, efficient, and flexible weapon. Careful planning and a thorough knowledge of the system's capabilities can maximize its advantages (lightweight and small crew) while minimizing its limitations (such as its short-range and small-explosive charge). The M224A1 can be fired in two modes. Each mode requires different equipment and procedures. Each round weighs approximately 4 pounds.

Conventional Mode

1-29. In this mode, the weapon functions as a conventional mortar system. A sight unit is used to lay the mortar, and support is provided by a mortar mount (bipod) and a baseplate (M7A1 or M8A1). The bipod also allows deflection and elevation changes and cross leveling. The M7A1 baseplate allows 6400-milliradian (mil) traverse while the M8A1 baseplate only allows a traverse of 800 mils left and 800 mils right of center for a sector coverage of 1600 mils traverse. In conventional mode, the M224A1 weighs approximately 37 pounds with the M7A1 baseplate and approximately 33 pounds with the M8A1 baseplate.

Note. Firing charge 4 is authorized when using the M8A1 baseplate in conventional mode.

Handheld Mode

1-30. No sight unit is used in this mode. The range indicator assembly is used to position the cannon to the estimated target range. The M8 or M8A1 baseplate supports the cannon base. The mortar gunner supports the cannon since no bipod is used. The M8 and M8A1 both allow for a limited traverse of 800 mils left and 800 mils right of center for a sector coverage of 1600 mils. In handheld mode, the M224A1 weighs approximately 17 pounds.

Note. Handheld mode is authorized for firing charge 0 and charge 1 only, regardless of which baseplate is used.

MEDIUM MORTAR

1-31. The M252A1 81-mm mortar is the current U.S. medium mortar. The M252A1 offers a compromise between the light and heavy mortars. Its range and explosive power are greater than the M224A1; yet it is still light enough to be man-packed over long distances. The M252A1 weighs approximately 78 pounds with an integrated blast attenuator device or approximately 82 pounds with a removable blast attenuator device.

1-32. The M252A1 system components break down into several smaller loads for easier carrying: M253 81-mm cannon with integrated blast attenuator device is 30.5 pounds, or M253 81-mm cannon with removable blast attenuator device is 35 pounds; M177A1 mortar mount, also known as the bipod, is 21.3 pounds; M3A2 baseplate is 23 pounds; and the M67 mortar sight unit is 2.9 pounds. Rounds for this mortar weigh approximately 12 pounds each.

Note. When man-packing the M252A1 over long distances during continuous operations, the commander considers the hazard to Soldiers for an increased risk of injury and limited element maneuverability due to the weight of the system and ammunition. The commander must consider the attachment of a security element when enemy contact is possible.

HEAVY MORTAR

1-33. The 120-mm mortar is the current U.S. heavy mortar. The three vehicle-mounted variants of the 120-mm mortar are—

- M120A1 for Infantry brigade combat team (IBCT).
- M121 for armored brigade combat team (ABCT).
- Recoil Mortar System 6-Light (known as RMS6-L) for SBCT.

1-34. The M120A1 is a ground-mounted mortar system transported by the M326 mortar stowage kit hydraulic lifting and lowering system, which is mounted onto an M1101 trailer that is towed by a prime mover, such as a high mobility multipurpose wheeled vehicle (HMMWV).

1-35. The M121 is primarily a carrier mounted mortar system but does have ground-mounted capability. The M121 is designed to be fired when mounted into the M1064A3, or XM1287 tracked mortar carrier. Before the M121 is fired ground-mounted, the pointing device must be removed from the cannon.

1-36. The RMS6-L is designed to be fired only when mounted onto the M1129 or M1252 Stryker mortar carrier vehicle. The RMS6-L incorporates the 120-mm, M298 mortar mounted in a recoiling mechanism that reduces the mortar recoil forces to about one-quarter of the recoil forces that would otherwise be generated. The RMS6-L must remain mounted in the recoiling mechanism to fire and cannot be ground-mounted.

1-37. Although heavy mortars require trucks, tracked mortar carriers, or wheeled mortar carriers to move them, they are still much lighter than field artillery pieces. They outrange light and medium mortars, and the explosive power is much greater. The M120A1 and M121 each weigh approximately 320 pounds. Rounds for the 120-mm mortar weigh approximately 33 pounds, each.

Note. For more information on the mortar systems, refer to TC 3-22.90 or the appropriate technical manual for that system. For more information on mortar fire direction equipment, refer to TC 3-22.91 or the appropriate technical manual for that system. Technical manuals can be accessed at the Logistics Data Analysis Center website.

MORTAR FIRE DIRECTION SYSTEMS

1-38. There are analog and digital instruments used to compute mortar fire direction. All mortar leaders and all FDC personnel must maintain proficiency in computing firing data with both analog and digital systems.

1-39. When using digital fire control systems the mortar element must have the appropriate analog fire control system on hand as a backup to its digital mortar fire control. The unit must maintain both analog and digital systems.

ANALOG FIRE CONTROL SYSTEMS

1-40. The mortar analog fire control system consists of a plotting board and tabular firing tables or graphical firing scales. Mortar analog fire control systems operate in all weather conditions and terrain and do not require any power source or batteries.

Plotting Board

1-41. The plotting board is the primary analog fire control instrument used to compute deflection, range, and azimuth for indirect firing of the mortar. There are two separate plotting boards in the Army inventory: the M16 plotting board and the M19 plotting board.

1-42. The M16 plotting board is the analog instrument of mortar fire control for all medium and heavy mortars. It has a grid system scale of 1:12,500 printed on the base, making each small square 50 meters by 50 meters and each large square 500 meters by 500 meters. The M16 plotting board weighs 3 pounds, 13 ounces. It has a length of 22 inches and a width of 21.5 inches.

1-43. The M19 plotting board is the analog instrument of mortar fire control for all light mortars. It has a grid system scale of 1:25,000 printed on the base, making each small square 100 meters by 100 meters and each large scale 1000 meters by 1000 meters. The M19 plotting board weighs 2 pounds, 8 ounces. It has a length of 14 inches and a width of 13 inches.

1-44. The computational procedures for both the M16 and M19 plotting boards are the same. The primary tactical difference is that the M19 plotting board is physically smaller and is designed to be packed on foot during dismounted operations with zero or limited vehicle support. The larger scale on the M19 plotting board produces slightly less accurate data than the M16 plotting board. The difference in accuracy of data between the M16 and M19 plotting boards is mitigated by the shorter maximum range and smaller probable error of the 60-mm mortar system. See figure 1-1 and refer to TM 9-1220-243-13&P for more information.

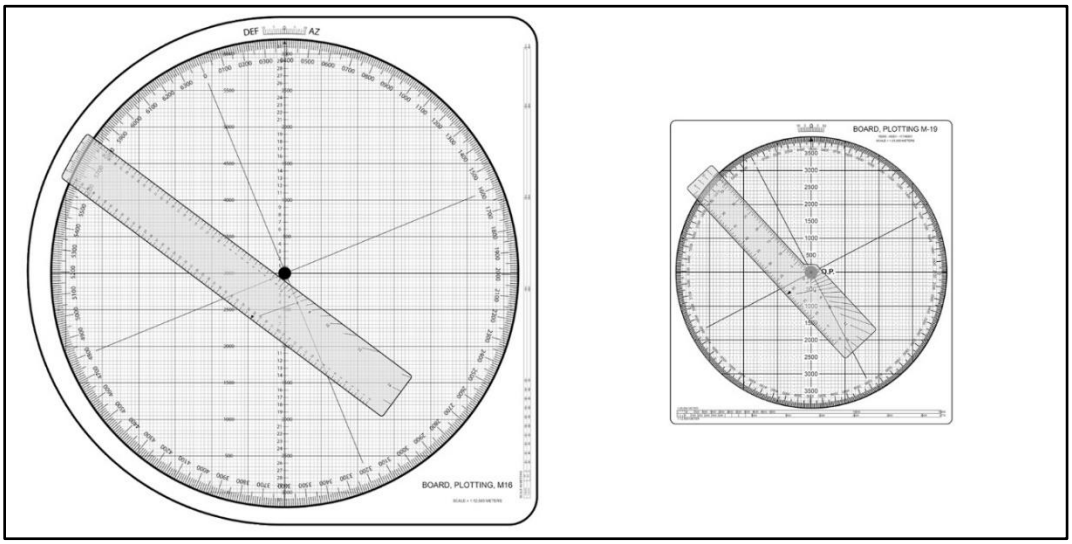


Figure 1-1. M16 and M19 plotting boards

Tabular Firing Table and Graphical Firing Scale

1-45. The tabular firing table, simply referred to as "a firing table," is an analog instrument in manual format used to compute mortar sight elevation scale data based upon the range from the mortar system to the target in standard and nonstandard meteorological conditions (see figure 1-2). The firing table is used when conducting analog mortar fire control procedures. Firing tables are also used when firing the mortar without the requirement to compute deflection, such as direct lay or direct alignment.

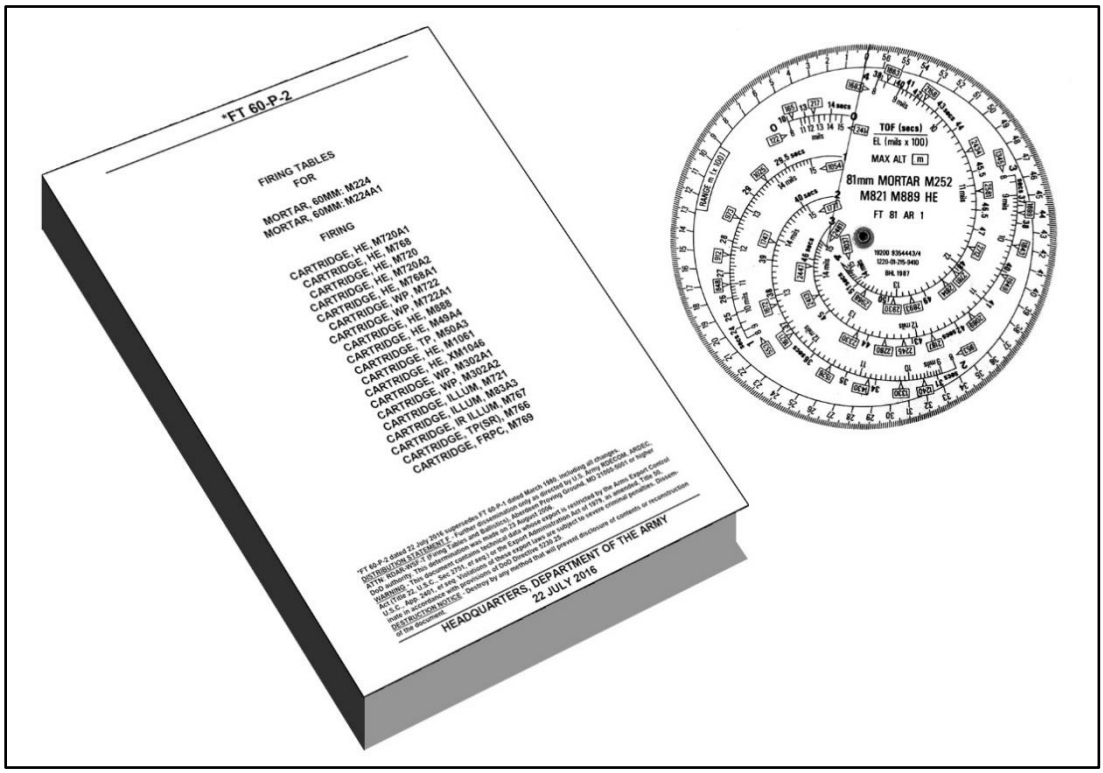


Figure 1-2. Firing table and graphical firing scale

1-46. The graphical firing scale is a small, circular scale (NSN 1220-01-519-8007) based upon the firing table but only for a specific mortar system and ammunition combination (for example, an M252A1 81-mm mortar system with M821 HE mortar ammunition). The graphical firing scale is only based on standard atmospheric conditions and cannot compute nonstandard meteorological conditions. The graphical firing scale may be used when conducting analog mortar fire control procedures. Graphical firing scales may also be used when firing the mortar without the requirement to compute deflection, such as direct lay or direct alignment. Mortar leaders ensure the use of the appropriate graphical firing scale that matches the mortar system and ammunition fired.

1-47. When firing the M224 or M224A1 60-mm mortar system in handheld mode (charge 0 and charge 1 only) the range indicator assembly is used to position the mortar cannon to the estimated target range. In this mode, firing tables or graphical firing scales are not used.

DIGITAL FIRE CONTROL SYSTEMS

1-48. Mortar digital fire control systems consist of the lightweight handheld mortar ballistic computer, known as LHMBC, or the mortar fire control system, known as MFCS. Both mortar digital fire control systems require a power source or batteries to operate.

Lightweight Handheld Mortar Ballistic Computer

1-49. The M32 LHMBC is a ruggedized personal digital assistant that runs mortar fire control software. The LHMBC is the primary digital fire control system for all IBCT and SBCT light and medium mortars in the battalion mortar platoon and the company and dismounted troop mortar sections.

1-50. The LHMBC is also used for IBCT heavy mortar ground-mounted operations where the MFCS cannot be used (for example, an air assault operation with a requirement for heavy mortars but without vehicle support). The M32 equipped with an expansion pack is capable of digital communications with multiple field artillery fire support devices used by FOs. (See figure 1-3.) Refer to Army TM 9-1220-257-13&P/Marine Corps TM 11042B-13&P/1B for more information.

Note. The M32A1 replaces the M32 through equipment attrition. Refer to TM 9-1220-258-13&P for the M32A1. Do not conduct a hard reset on the M32A1; the fire control software is not operator-loadable.

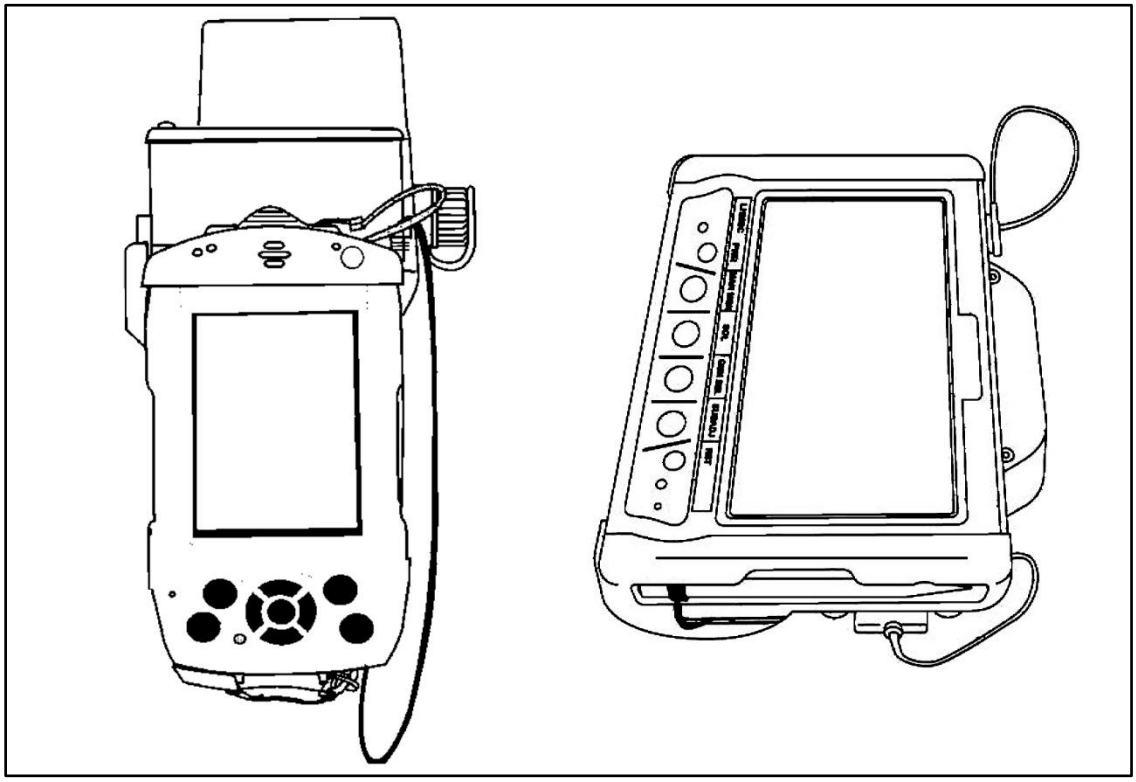


Figure 1-3. M32 with expansion pack and M32A1

Mortar Fire Control Systems

1-51. The MFCS provides a complete, fully integrated digital on-board fire control system for vehicle-mounted mortars. The MFCS is the primary digital fire control system for all ABCT and SBCT heavy mortars. The MFCS components work in concert with a Defense Advanced Global Positioning System (GPS) receiver and vehicle motion sensors to compute targeting solutions, direct movement of the vehicle into position, allow real-time gun orientation, and present visual and audio gun orders to the mortar gunner. When used to its full potential, the system can eliminate the primary use of the M67 aiming sight and M16 aiming posts. Aiming sight and posts are still used as auxiliary methods in case of an MFCS system failure (see figure 1-4).

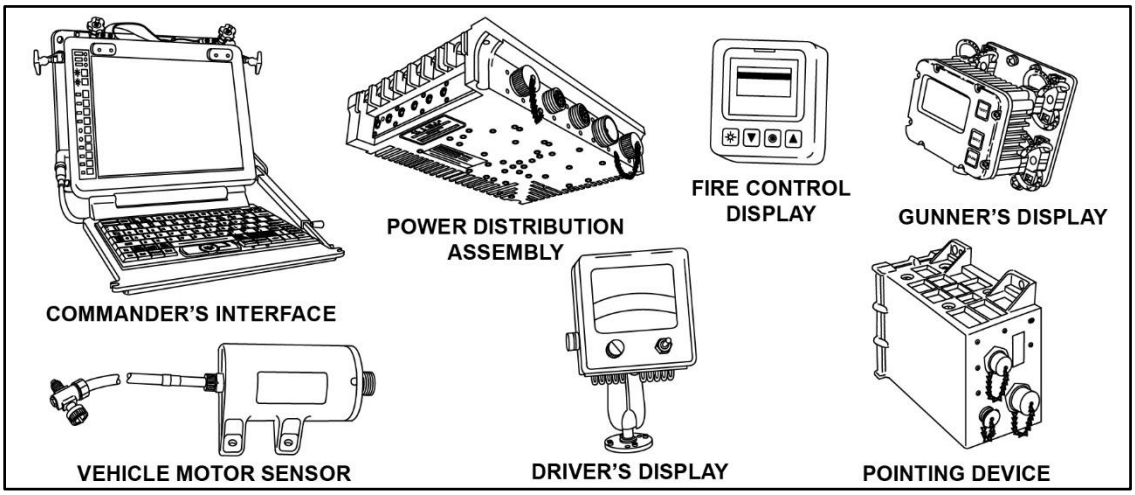


Figure 1-4. M95 mortar fire control system components

1-52. The M95 MFCS is the mortar carrier variant that is mounted to the carrier vehicle and mortar system. The major components of the M95 and its uses are—

- The pointing device, which aligns the mortar and maintains alignment with accuracy within 3-mils azimuth and 1-mil elevation in all conditions.
- The commander's interface manages information flow between the mortar gun and FDC, provides interface between other MFCS components and the radios, computes technical fire control solution for weapons operations, and provides text and graphics using an interface system. It is operated using the integrated keyboard.
- The universal display has two configurations: gunner's display and driver's display. When used as a gunner's display, it provides information for the gunner to aim and fire the mortar, giving directional indicators using arrows and mils. It presents fire commands and receives check fire orders. When used as a driver's display, it provides the driver with the information necessary to orient vehicle emplacement and assist in driving to the next commanded coordinates, provides steering directions and compass orientation in graphical form, and provides distance and heading in numeric form.
- The power distribution assembly accepts vehicle direct-current or alternating-current power, filters vehicle power through a direct current to direct-current power system that isolates MFCS components from fluctuations in vehicle power, and provides protection against reverse polarity surges to MFCS components. Each toggle switch acts as a circuit breaker. To reset a tripped circuit, move toggle switch to the OFF and ON positions.

1-53. The M96 MFCS is the FDC variant of the MFCS located in the command variant mortar carrier without any of the gun system components. For more information on the M95 and M96 MFCS, refer to TM 9-1230-205-10.

1-54. The Mortar Fire Control System–Dismounted (known as MFCS-D) provides a complete, fully integrated digital fire control system that can be installed on M326 equipped trailers, mounted in a vehicle, or operated on the ground. The MFCS-D is the primary digital fire control system for IBCT heavy mortars. The MFCS-D runs the same fire control software as the M95 and M96 and has the same mortar fire control capabilities. The MFCS-D does not have vehicle motion sensors. Navigation instructions are calculated and sent to the fire control computer through inputs from the pointing device and the Defense Advanced GPS receiver (see figure 1-5 on page 1-12).

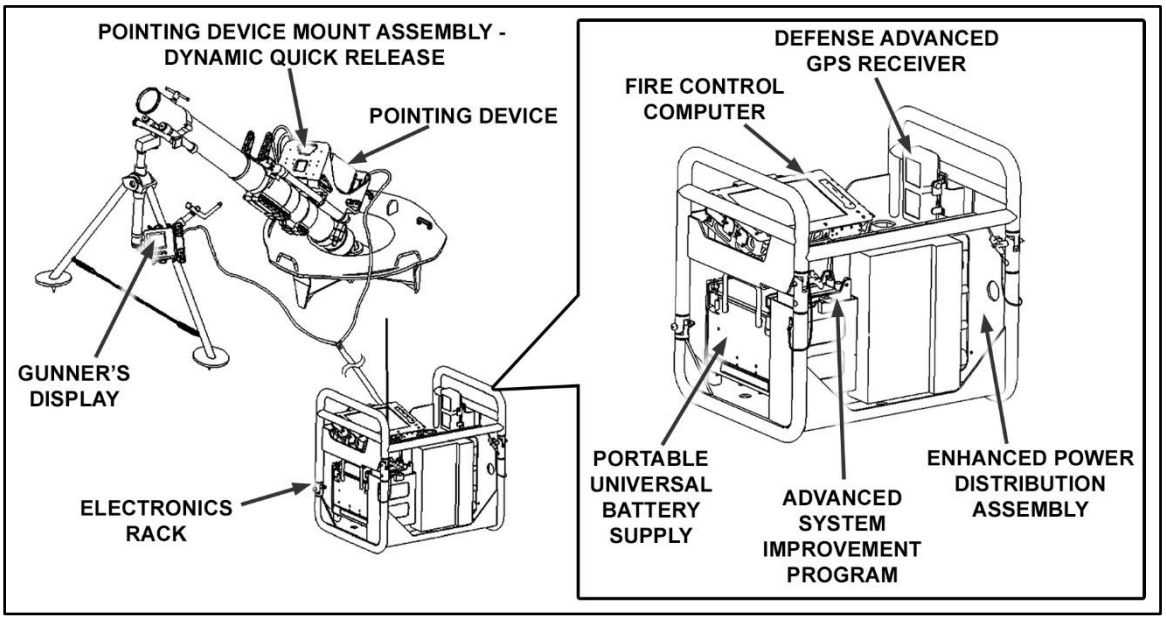


Figure 1-5. Mortar Fire Control System–Dismounted

1-55. The M150 MFCS-D is the ground-mounted heavy-mortar gun system variant. The major components of the M150 and its uses are—

- The pointing device mount assembly-dynamic quick release is mounted on the mortar tube during firing operations and stowed on the right side of the trailer during mobility mode. The pointing device mount assembly-dynamic quick release maintains the orientation of the pointing device with a quick release feature to allow the removal and reattachment of the pointing device mount assembly-dynamic quick release to the tube while in the field without using tools. It isolates the pointing device from gun firing, shock, vibration, and temperature.
- The pointing device is secured in the pointing device mount assembly-dynamic quick release. The pointing device aligns the M120A1 mortar and maintains system alignment within 4-mils azimuth and 3-mils elevation in all conditions.
- The fire control computer is installed in the prime mover during moving operations or the electronics rack during firing operations. It manages information flow between the gun, FDC, and battalion or other digital subscribers; provides interface between other MFCS-D components and the radio; computes technical fire control solutions for weapons operations; and provides text and graphics using an interface system. When using the navigation function, the fire control computer provides the vehicle commander with information necessary to orient vehicle emplacement and assist in driving to the next commanded coordinates, provides steering directions and compass orientation in graphical form, and provides distance and heading in numeric form. The fire control computer of the MFCS-D is primarily operated with a stylus on the integrated touchscreen.
- The universal display for the M150 is only used as a gunner's display. It is mounted on the mortar bipod for firing operations and stowed on the trailer during moving configuration. It receives azimuth and elevation orders from the fire control computer and provides necessary information for the gunner to aim and fire the M120A1 mortar. It presents fire commands and receives check fire orders.
- The electronics rack is designed to house and provide a safe and secure location for the fire control computer, Defense Advanced GPS receiver, enhanced power distribution assembly, Advanced System Improvement Program radio, and portable universal battery supply for the MFCS-D.

- The portable universal battery supply is mounted in the electronics rack. Rechargeable batteries receive a continuous charge from the prime mover either directly or through the M326 junction box. It is the primary power source for the MFCS-D for approximately 16 hours. The reserve battery provides reverse power for approximately 90 minutes of operation.
- The enhanced power distribution assembly is mounted in the electronics rack. It receives direct-current power from an external source, provides conditioned direct-current power to the MFCS-D components, and has internal circuit breakers that provide protection for each MFCS-D component.

1-56. The M151 MFCS-D is the FDC-only variant and is comprised of a fire control computer, which is secured to the fire control computer HMMWV mount inside the vehicle and without any of the mortar gun system components. When connected to the radio, the M151 is capable of sending and receiving digital messages, receiving digital fire messages, computing digital fire control solutions for weapons, and sending digital mortar firing data across the battlefield.

MORTAR UNIT ORGANIZATION

1-57. The organization and equipment of mortar sections and platoons is based on approved or a modified table of organization and equipment. The table and figures depicting mortar unit organization and equipment are current as of the date of this publication. (See table 1-2 and figure 1-6 on page 1-14, figure 1-7 on page 1-16 and figure 1-8 on pages 1-17 through 1-19 for details.)

Note. To verify the current approved organization and equipment, readers refer to the U.S. Army Directorate of Force Management Force Management System website for their particular unit.

Table 1-2. Number and type of mortars in the United States Army and Marine Corps

	Maneuver Battalion			***Rifle Company***			***Reconnaissance Troop***		
Army	Heavy	Medium	Light	Heavy	Medium	Light	Heavy	Medium	Light
ABCT	4						2		
IBCT	4	4				2	2*		2*
SBCT	4	4		2		2	2		
Ranger	4	4	12						
USMC	Heavy	Medium	Light	Heavy	Medium	Light	Heavy	Medium	Light
Battalion		8				3			
LAR		8							

Legend:

ABCT – armored brigade combat team, IBCT – Infantry brigade combat team, LAR – light-armored reconnaissance, SBCT – Stryker brigade combat team, USMC – United States Marine Corps

Note. Each IBCT mounted reconnaissance troop has two heavy mortars. Each IBCT dismounted reconnaissance troop has two light mortars.

UNITED STATES MARINE CORPS MORTAR UNITS

1-58. USMC 81-mm and 60-mm mortar units are organized into squads, sections, and platoons. Figure 1-6 on page 1-14 displays USMC Infantry battalion, company, and light armored reconnaissance battalion mortar units.

1-59. Each mortar squad operates one mortar. Each USMC Infantry company has, as part of the weapons platoon, a mortar section of three squads. Each USMC Infantry battalion has, as part of the weapons company, a mortar platoon with two FDCs and two sections each with four mortar squads, for a total of eight M252A1 81-mm mortars. A mortar platoon can, therefore, operate from two locations, each with a complete FDC and a four-mortar section.

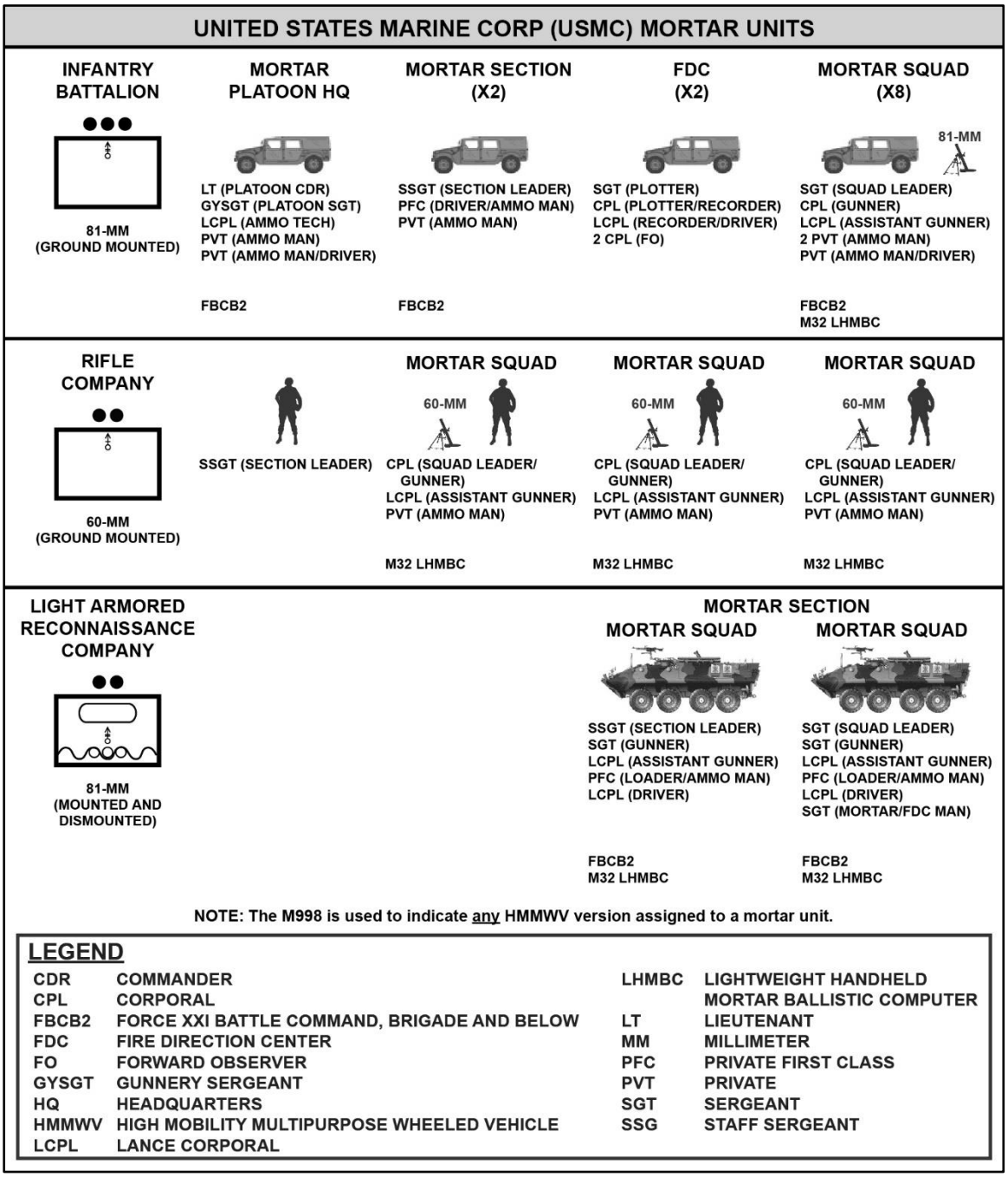


Figure 1-6. United States Marine Corps mortar units

Infantry Battalion

1-60. 81-mm mortar platoons are located in the battalion's weapons company. Besides a platoon commander and a platoon sergeant, a USMC mortar platoon headquarters has one ammunition technician and two ammunition barriers. A platoon comprises two FDCs and two mortar sections, each with four mortar squads.

1-61. Each FDC is led by a sergeant, who is the plotter, and comprises two other FDC personnel and two FOs. Battalion mortar squads, led by a sergeant, operate the medium mortar.

1-62. Mortar sections are located in the Infantry company's weapons platoon. They consist of a section leader with the rank of staff sergeant and three mortar squads each operating a light mortar. Mortar squads are led by a corporal, who is the squad leader and performs duties as the gunner, and have two other crewmen.

Light Armored Reconnaissance Battalion

1-63. Light armored reconnaissance battalions have 81-mm mortars in the company. Each of the four line companies in the light armored reconnaissance battalion has a two-gun mortar section.

1-64. The light armored reconnaissance company mortar section is equipped with two light armored vehicle mortar variants, each with a M252A1 81-mm mortar system mounted in the vehicle. The USMC M252A1 mortar systems are capable of firing from the vehicle or when ground-mounted.

ARMY MORTAR UNITS

1-65. Army mortar units are organized into squads, sections, and platoons. The basic unit is a squad with one mortar. Each mortar section has two squads and each mortar platoon has two sections. All IBCT Infantry companies and all reconnaissance troops have mortar sections. All Infantry battalions and combined arms battalions have mortar platoons. Ranger units have all mortar systems located at the battalion level with mortar elements habitually attached to companies. Some sections and platoons can operate another type of mortar depending on the mission. All mortar elements can be attached to subordinate or other units with fires integrated into the unit's fire control system.

Note: Army personnel operating mortar systems are required to train, qualify, and maintain proficiency as described in TC 3-20.33.

1-66. Mortar platoons are located in the battalion's headquarters and headquarters' company. Commissioned officers lead mortar platoons, and noncommissioned officers (NCOs) lead mortar sections. All mortar platoons have an FDC section with personnel dedicated to operate the platoon's digital and analog fire control systems.

1-67. Mortar sections in the Infantry, SBCT, Ranger companies, and Cavalry troops do not have dedicated FDC personnel. In these units, the mortar section leader and mortar squad leaders operate the section's digital and analog fire control systems.

Armored Brigade Combat Team

1-68. An ABCT combined arms battalion has one organic mortar platoon that is equipped with four M121 120-mm mortar systems, each mounted into and fired from an armored tracked mortar carrier vehicle with M95 MFCS installed. The mortar platoon FDC personnel operate out of an armored tracked command post vehicle with M96 MFCS installed.

1-69. ABCT Cavalry squadron troops each have a mortar section organic to their troop, equipped with two M121 120-mm mortar systems mounted into and fired from an armored tracked mortar carrier vehicle with M95 MFCS installed. The section leader operates out of a HMMWV. (See figure 1-7, page 1-16).

1-70. Armored tracked vehicles offer protection from small-arms fire and shell fragments. They have a heavy machine gun mounted for survivability during limited direct fire contact with enemy light vehicles or dismounted troops. The M121 mortar system may be ground mounted as long as the pointing device is removed from the cannon prior to firing.

Note. There are no organic mortar sections within an armor company or mechanized Infantry company.

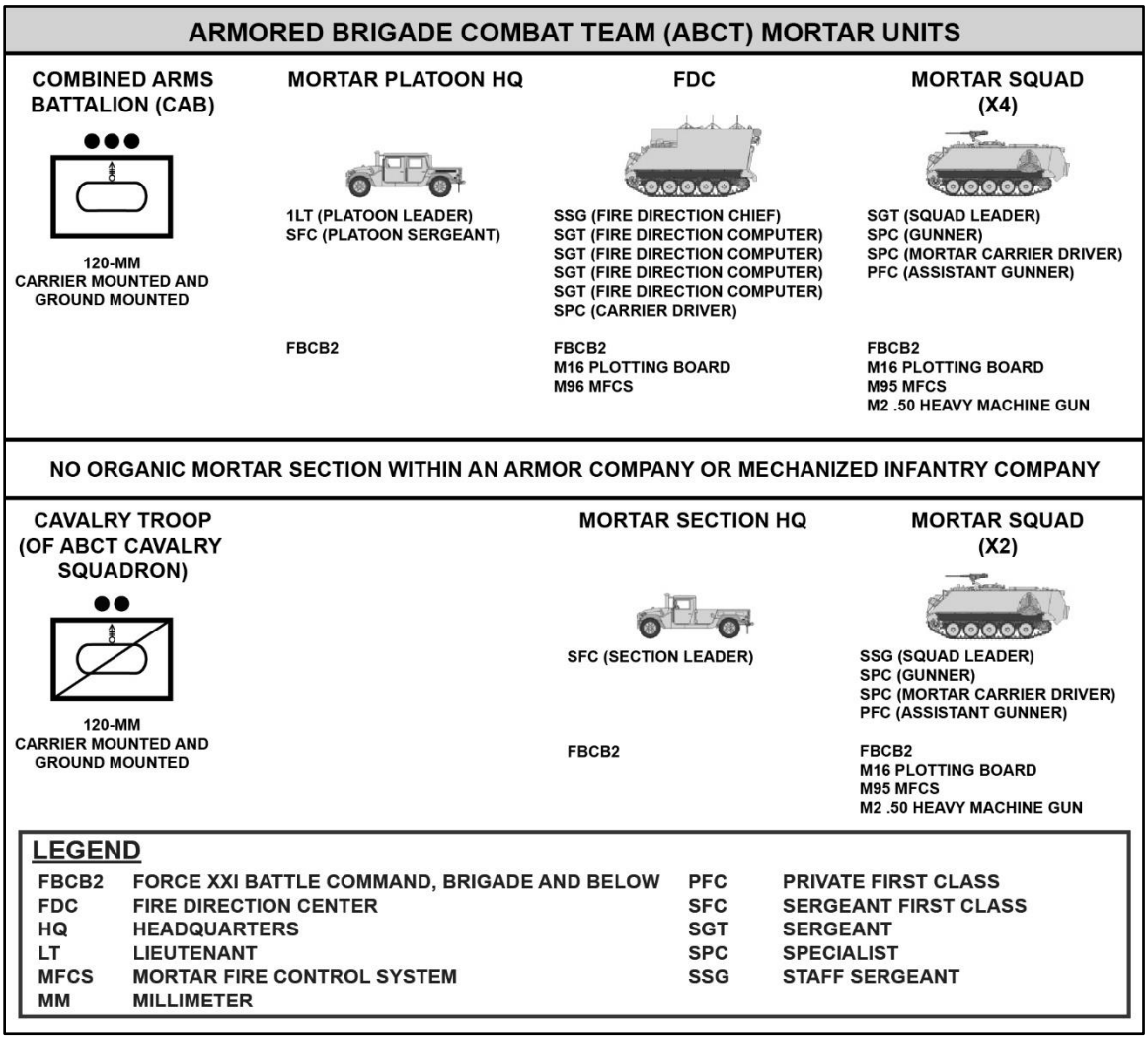


Figure 1-7. Armored brigade combat team battalion and Cavalry troop mortar units

Infantry Brigade Combat Team

1-71. The IBCT Infantry battalion mortar platoon is equipped with four M120A1 120-mm mortar systems with M150 MFCS-D installed, that are each mounted into a trailer and towed by a prime mover, such as an HMMWV. The mortar platoon FDC personnel operate out of an HMMWV with M151 MFCS-D installed. The IBCT Infantry battalion mortar platoon is also equipped with four M252A1 81-mm mortar systems to support operations in terrain that limits vehicle access, or airborne and air assault operations. During these operations, the LHMBC is their primary digital fire control system.

1-72. IBCT Cavalry squadron mounted troop mortar sections are each equipped with two M120A1 120-mm mortar systems with M150 MFCS-D installed, that are each mounted into a trailer and towed by a prime mover, such as an HMMWV. The section leader operates out of a family of medium tactical vehicle with winch and medium tactical vehicle trailer allowing increased mortar section ammunition capacity and resupply commensurate with cavalry operations.

1-73. The IBCT Infantry battalion company mortar sections and Cavalry squadron dismounted troop mortar sections are equipped with two M224A1 60-mm mortar systems each. The LHMBC is their primary digital fire control system. (See figure 1-8.)

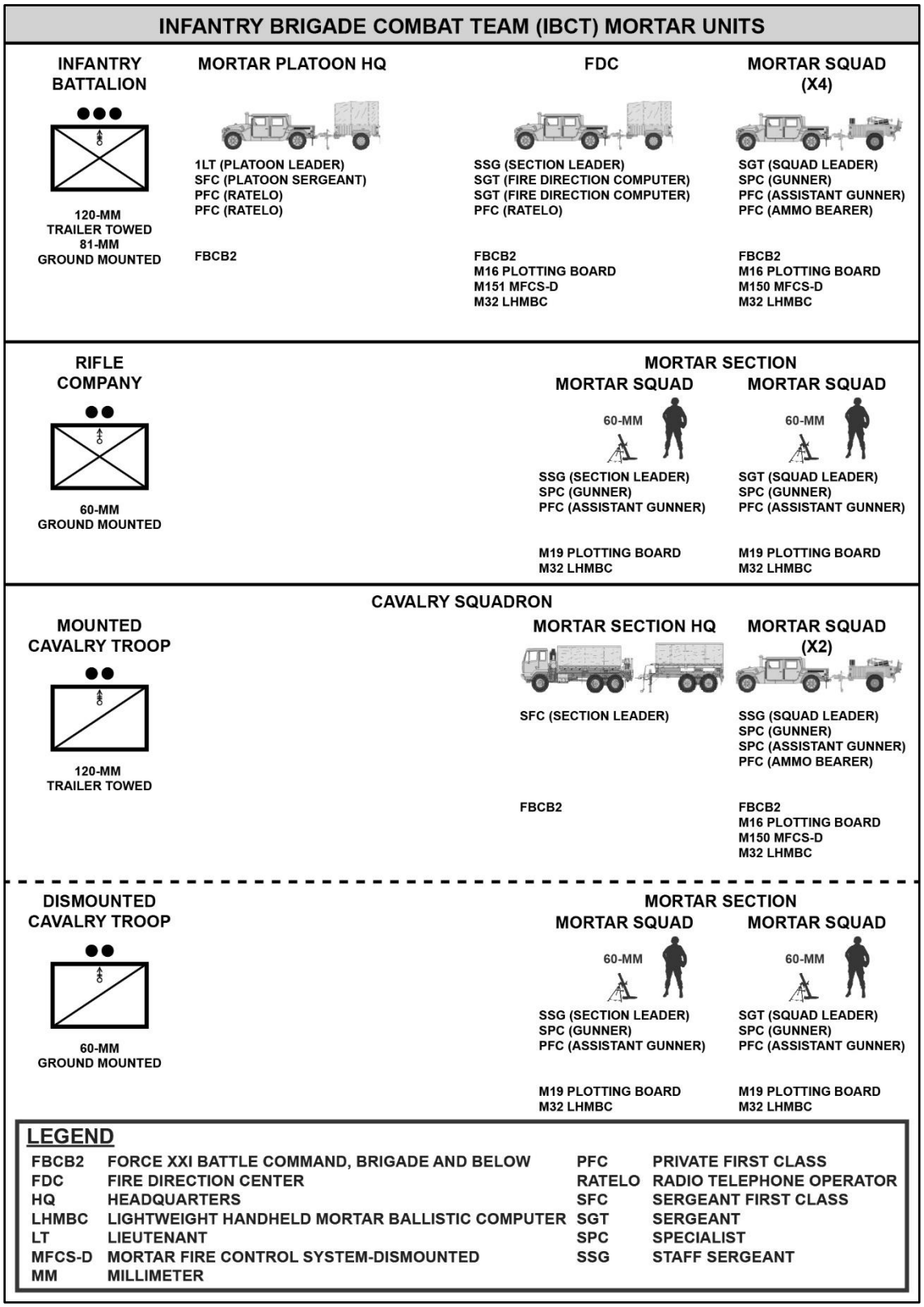


Figure 1-8. Infantry brigade combat team, Infantry battalion, and Cavalry troop mortar units

Stryker Brigade Combat Team

1-74. The SBCT Infantry battalion mortar platoon is equipped with four RMS6-L 120-mm mortar systems, each mounted into and fired from a Stryker mortar carrier vehicle with M95 MFCS installed. The mortar platoon FDC personnel operate out of an HMMWV with M151 MFCS-D installed. The SBCT Infantry battalion mortar platoon is also equipped with four M252A1 81-mm mortar systems to support operations in terrain that limits vehicle access, or air assault operations. During these operations, the LHMBC is their primary digital fire control system.

1-75. SBCT Cavalry squadron troop mortar sections are equipped with two RMS6-L 120-mm mortar systems, each mounted into and fired from a Stryker mortar carrier vehicle with M95 MFCS installed. The section leader operates out of a family of medium tactical vehicle with winch and medium tactical vehicle trailer allowing increased mortar section ammunition capacity and resupply commensurate with cavalry operations.

1-76. The SBCT Infantry battalion company mortar sections are equipped with two RMS6-L 120-mm mortar systems, each mounted into and fired from a Stryker mortar carrier vehicle with M95 MFCS installed. The SBCT Infantry battalion company mortar sections are also equipped with two M224A1 60-mm mortar systems each to support operations in terrain that limits vehicle access, or air assault operations. During these operations, the LHMBC is their primary digital fire control system. (See figure 1-9).

1-77. Stryker mortar carrier vehicles offer protection from medium caliber fire and shell fragments. They have a medium machine gun mounted for survivability during limited direct fire contact with enemy dismounted troops.

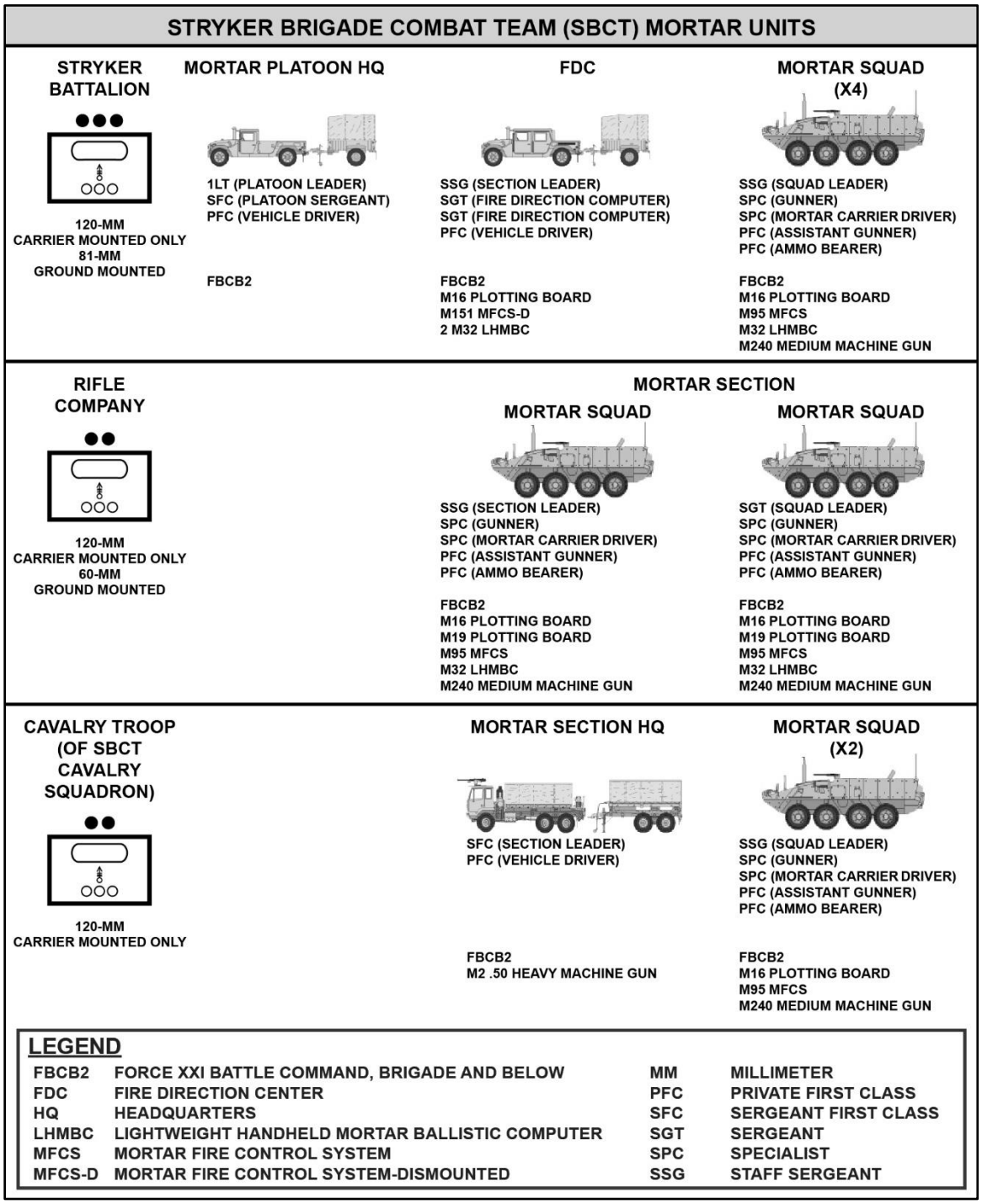


Figure 1-9. Stryker brigade combat team, Infantry battalion and company, and Cavalry troop mortar units

BATTALION MORTAR PLATOON LEADERSHIP

1-78. The battalion mortar platoon leadership consists of the platoon leader, platoon sergeant, fire direction chief or section leader, and squad leaders. The fire direction computers, though not members of the platoon leadership, are critical to the effective operation of the mortar platoon, and are listed below.

PLATOON LEADER

1-79. The mortar platoon leader leads Soldiers by personal example and is responsible for all the platoon does or fails to do, having complete authority over subordinates. This centralized authority enables the platoon leader to maintain unit discipline and unity and to act decisively. The mortar platoon leader must be prepared to exercise initiative within the battalion commander's intent and without specific guidance for every situation. Platoon leaders know their Soldiers, how to employ the platoon, its weapons, and its systems. Relying on the expertise of the platoon sergeant, the platoon leader regularly consults with the platoon sergeant on all platoon matters. The mortar platoon leader is the principal advisor to the battalion commander and battalion FSO on the tactical employment of mortars and the integration of mortars into the fire plan. The mortar platoon leader is identified with an additional skill identifier of 3Z (Infantry Mortar Leader Course graduate). The platoon leader and the platoon sergeant work together to ensure the platoon is trained and prepared and to execute the mortar platoon's mission. The platoon leader is ultimately responsible for the mortar platoon's mission accomplishment.

1-80. A mortar platoon leader conducts the following intelligence and mission command warfighting function tasks:

- Recommends task organization, employment techniques, and positioning of the mortars to support the scheme of maneuver.
- Informs the commander, operations staff officer, and FSO of all significant range or ammunition limitations.
- Assigns missions and issues instructions and orders to subordinate leaders.
- Supervises the execution of orders, ensures priority targets are covered at all times, and establishes the amount and type of ammunition set aside for priority targets.
- Coordinates the fires and displacement of the mortar platoon with the action of other units and directs mortar section and platoon displacement.
- Leads and controls the execution of the mortar platoon portion of the battalion fire support plan and coordinates the fires and displacements of the mortar sections.
- Relays information and intelligence, shelling reports, mortar bombing reports, and spot reports to the intelligence staff officer.
- Holds responsibility for the training of the platoon to ensure technical and tactical proficiency to include ensuring sufficient Soldiers are trained and certified in combat lifesaving, field sanitation, and other skills that are trained outside of the platoon and company.
- Holds responsibility for the cross-training of personnel within the platoon on key tasks to ensure continuous operations.
- Provides input to the appropriate sections of the battalion tactical standard operating procedure (known as TACSOP) and establishes an internal unit TACSOP that adheres to the battalion's TACSOP, while addressing all issues of special concern to the unit.

1-81. A mortar platoon leader conducts the following movement and maneuver warfighting function tasks:

- Exercises tactical fire control through the mortar section leaders and the FDC.
- Assists in developing the fire support plan in conjunction with the company or battalion FSO and determines the appropriate type and amount of mortar ammunition to fire.
- Attends and advises the commander of the mortar platoon fires plan during the fires rehearsal.
- Designates reconnaissance and advance parties.
- Selects and reconnoiters new positions and routes for the platoon; controls the movements of all elements of the platoon not attached or under the operational control (OPCON) of other units.
- Informs the commander of any factors that may reduce the unit's capability.

- Lays mortars for firing and verifies the direction of fire selected by the FDC, when required.
- Performs map spot and hasty survey operations.
- Coordinates through the FSO with supporting artillery units for survey support, when required.

PLATOON SERGEANT

1-82. The platoon sergeant is the senior NCO in the mortar platoon and serves as the primary advisor to the mortar platoon leader. The platoon sergeant assists the platoon leader in all matters of training and operations of the platoon. The platoon sergeant serves as the primary resource coordinator for the mortar platoon to ensure the platoon has the required resources it needs to achieve mission accomplishment. The platoon sergeant assumes the platoon leader's duty in the leader's absence. In the absence of the fire direction chief, the platoon sergeant assumes all duties and responsibilities of the fire direction chief, unless otherwise directed. The platoon sergeant is required to be an Infantry Mortar Leader Course graduate (additional skill identifier B1).

Note. Refer to ADP 3-0 for more information about warfighting functions.

1-83. A mortar platoon sergeant conducts the following intelligence and mission command warfighting function tasks:

- Inspects and supervises to ensure execution of the platoon leader's orders.
- Leads the reconnaissance party and conducts reconnaissance of routes and positions, when required.
- Ensures maintenance of situation maps in the FDC.
- Ensures establishment of communication nets and proper use of radiotelephone operating procedures by personnel.
- Ensures platoon training of personnel in their primary job assignments and cross-training to perform key functions within the FDC.
- Assists in the preparation of paragraph four of the platoon operation order (OPORD).

1-84. The mortar platoon sergeant conducts the following fires and movement and maneuver warfighting function tasks:

- Supervises movements, when necessary. (When the platoon is operating in two sections, normally, the mortar platoon sergeant directly supervises one.)
- Lays the mortars for firing, when required.
- Ensures application of available meteorological data to firing data, when appropriate.
- Conducts hasty crater analysis and submits shelling reports and mortar bombing reports.
- Performs responsibilities related to the FDC, mounted fire direction systems, and Force XXI Battle Command, brigade and below (FBCB2).

1-85. The mortar platoon sergeant conducts the following tasks that support the protection and sustainment warfighting function tasks:

- Supervises the preparation of the platoon ground defense.
- Supervises the test firing and zeroing of weapons and boresighting of mortars.
- Ensures that aiming circles are declinated properly.
- Supervises camouflage, field hygiene, and sanitation.
- Supervises the platoon's security and sleep plans.
- Ensures the availability of the required basic load for all weapons and platoon equipment.
- Monitors ammunition expenditures and ensures maintenance of ammunition records.
- Submits timely ammunition resupply requests.
- Supervises ammunition prestock, when used.
- Ensures active supervision of maintenance by subordinate leaders.
- Coordinates and supervises petroleum, oils, and lubricants resupply and maintenance support.

- Coordinates and supervises vehicle recovery.
- Requests fortification materials.
- Coordinates resupply needs.
- Adjusts personnel as needed and cross-levels personnel within mortar squads to maintain maximum firepower.
- Ensures performance and recording of all necessary safety, borescope, and pullover gauge inspections.
- Coordinates casualty evacuation.

FIRE DIRECTION CHIEF OR PLATOON SECTION LEADER

1-86. The fire direction chief duty position is titled section leader in the IBCT and SBCT mortar platoons. The fire direction chief is the third in command of the platoon and is responsible for the execution of all mortar analog and digital fire control procedures. (See TC 3-22.91 for more information.) The fire direction chief ensures the safety of all ballistic and computer calculations for any call for fire. The fire direction chief serves as the primary advisor to the platoon leader for all fires plans and conduct of indirect fire operations. The fire direction chief is also a subject matter expert on the weapons, mortar analog and digital fire control equipment, and communication equipment in the platoon. The fire direction chief assumes all duties and responsibilities of the platoon sergeant in the platoon sergeant's absence. The fire direction chief is required to be an Infantry Mortar Leader Course graduate (additional skill identifier B1).

1-87. A fire direction chief conducts the following intelligence and mission command warfighting function tasks:

- Leads the reconnaissance or advance party, when directed.
- Assists in vehicle placement.
- Establishes and maintains situation maps; marks all restrictive fire control measures on the map, onto the plotting boards, and loads into whichever digital fire direction systems are used (MFCS, LHMBC, or both).
- Continuously tracks friendly unit locations using analog methods (map over corkboard with pins, map with map marker, or modified observed fire chart on the plotting board) and digital methods (FBCB2) when digital is available.
- Relays information to the battalion FSO and platoon leader.
- Issues the FDC order.
- Assumes control of a section during split-section operations.
- Supervises the laying of communications wire in the mortar position when warranted.
- Ensures proper use of radiotelephone operating procedures by FDC personnel.
- Trains FDC personnel in FDC procedures; assists and trains squad leaders in FDC procedures.

1-88. The fire direction chief conducts the following fires and movement and maneuver warfighting function tasks:

- Advises of necessary displacements because of range limitations.
- Controls FDC personnel; ensures use of safe procedures in computing firing data and validates the computer safety check before issuing the FDC order.
- Supervises all fire missions; examines target location, location of friendly units, fire control measures, and reference points. Based on the nature of the target, ammunition available, and command guidance, the chief decides if the mission is fired, the number of mortars to fire, and the amount and type of ammunition to expend.
- Lays mortars for firing, when directed.
- Checks the accuracy of fire direction system operations, computer operators, and FDC records; ensures fires are correctly plotted.
- Recommends necessary conduct of re-registration.

- Determines and applies meteorological corrections for firing data.
- Ensures the accomplishment of technical aspects related to the mortar fire direction systems and FBCB2.

1-89. The fire direction chief conducts the following tasks that support the protection and sustainment warfighting function tasks:

- Informs the platoon leader and platoon sergeant of ammunition status and of changes in the tactical situation.
- Maintains ammunition records.
- Reports ammunition status.
- Supervises the FDC sleep plan to ensure 24-hour continuous and sustained operations.
- Ensures understanding of FDC and mortar crew personnel roles in defending the platoon position.
- Ensures FDC and section vehicles are effectively camouflaged.
- Supervises the maintenance of vehicles and equipment.
- Consolidates and submits FBCB2 chemical, biological, radiological, and nuclear (CBRN) reports 1, 3, and 4.
- Supervises section and FDC CBRN protective and decontamination measures.
- Designates and ensures alertness of the duty mortar crew during continuous operations.

PLATOON SQUAD LEADER

1-90. Each mortar squad has a minimum of one mortar system and vehicle organic to the squad. The squad leader is responsible for the emplacement, operation, and maintenance of all squad equipment and the management, development, mentorship, and welfare of squad personnel. The squad leader is the primary trainer of all individual critical tasks within the squad and squad echelon collective drills. The squad leader supervises the safe firing of the mortar system, crew served weapons, and all actions of the squad members. Any squad leader conducting mortar operations outside the control of a dedicated fire direction computer is required to be an Infantry Mortar Leader Course graduate (additional skill identifier B1).

1-91. A squad leader conducts the following tasks that support the intelligence and mission command warfighting function tasks:

- Controls squad movement.
- Places squad into position.
- Briefs squad on the platoon or section leader's orders.
- Keeps squad aware of the current situation.
- Ensures communications are maintained with the FDC.
- Ensures proper use of radiotelephone operating procedures by the squad.

1-92. A squad leader conducts the following fires and movement and maneuver warfighting function tasks:

- Ensures properly laid mortar.
- Checks mask and overhead clearance.
- Ensures indexing of proper deflection and elevation on the mortar sight.
- Conducts emergency fire missions without an FDC, when required.
- Plots fires and determines firing data when operating separately from the section.
- Fulfills responsibilities related to the fire direction systems and FBCB2.

1-93. A squad leader conducts the following protection and sustainment warfighting function tasks:

- Ensures effective camouflage of the mortar position.
- Ensures proper preparation of ammunition for firing and reports any ammunition discrepancies to the FDC.
- Supervises the preparation and manning of squad fighting positions.
- Implements the squad sleep and security plans.
- Supervises the maintenance of personal weapons and squad equipment.

- Supervises weapons test firing and mortar boresighting.
- Ensures proper storage of ammunition and equipment.
- Informs FDC of any changes in ammunition status.
- Maintains responsibility for the training, welfare, and safety of squad members.
- Trains squad members in individual and crew-related skills and cross-trains to maintain technical proficiency at all times.
- Submits FBCB2 CBRN and enhanced conventional weapons reports, as appropriate.
- Supervises squad CBRN protective and decontamination measures.

FIRE DIRECTION COMPUTER

1-94. Each mortar platoon has a minimum of two fire direction computers in the FDC. The fire direction computer positions are responsible for computing all calls for fire. The fire direction computer is required to be an Infantry Mortar Leader Course graduate (additional skill identifier B1). When directed, the fire direction computer assumes all duties and responsibilities of the fire direction chief in the chief's absence.

1-95. Fire direction computer personnel—

- Prepare and maintain all analog fire control systems (plotting boards, firing tables, and graphical firing scales) for plotting targets and producing firing data.
- Prepare and maintain digital fire control systems (MFCS, LHMBC) for plotting targets and producing firing data.
- Record all calls for fire on DA Form 2399 (*Computer's Record [LRA]).*
- Maintain DA Form 2188 (*Data Sheet*) and DA Form 2188-1 (*LHMBC/MFCS Data Sheet*) with current firing information for all targets.
- Compute and apply all registration and meteorological data to the guns.
- Plot all target locations and update them with observer corrections.
- Determine number of rounds, deflection, charge, and elevation and announce the gun to fire.
- Determine the message to observer and send to the FO.
- Plot the location of friendly elements, supported unit boundaries, observers, fire support coordination measures (FSCM), and safety limits on analog fire control systems (plotting board) and digital fire control systems (MFCS, LHMBC).

COMPANY AND TROOP MORTAR SECTION LEADERSHIP

1-96. A section leader supervises the mortar section at the company or troop echelon. ABCT and SBCT Cavalry troop mortar sections and IBCT Cavalry mounted troop mortar sections each have two squad leaders, one per squad.

1-97. Infantry company mortar sections and IBCT Cavalry dismounted troop mortar sections each have two squads but only one squad leader. The mortar section leader performs all duties of the second squad leader, in addition to leading and supervising the section.

COMPANY AND TROOP SECTION LEADER

1-98. The section leader serves as the senior NCO responsible for the company or troop mortar section. Section leaders ensure the operation, training, and management of their respective section. The section leader is the primary trainer of all collective tasks within the section and all section echelon (and platoon echelon as applicable) collective drills. The section leader is required to be an Infantry Mortar Leader Course graduate (additional skill identifier B1).

1-99. The section leader is the principal advisor to the company or troop commander and FSO on the tactical employment of mortars and the integration of mortars into the fires plan. The section leader performs the same duties and warfighting functions as the mortar platoon leader, platoon sergeant, and fire direction chief, in addition to the following duties:

- Assists the company or troop commander in planning the employment of the mortar section.
- Coordinates with the company or troop FSO to execute the commander's intent with fires.
- Controls the mortar section during all operations.
- Trains all mortar section weapons, mortar analog and digital fire control equipment, and communications equipment as the primary trainer.
- Attends and advises the company or troop commander of the mortar section fires plan during the fires rehearsal.
- Establishes and maintains situation maps; marks all restrictive fire control measures on the map, onto the plotting boards, and loads into whichever digital fire direction systems are used (MFCS, LHMBC, or both).
- Continuously tracks friendly unit locations using analog methods (map over corkboard with pins, map with map marker, or modified observed fire chart on the plotting board) and digital methods (FBCB2) when digital is available.
- Provides input for the appropriate section of the company or troop TACSOP.

Note. To maintain effective organic indirect fire capability within the company or troop, the mortar section leader is not tasked with or appointed fictitious responsibilities or false duty positions, such as headquarters platoon sergeant.

COMPANY AND TROOP SQUAD LEADER

1-100. Each mortar squad has a minimum of one mortar system organic to the squad. The squad leader is responsible for the emplacement, operation, and maintenance of all squad equipment and the management, development, mentorship, and welfare of squad personnel. The squad leader is the primary trainer of all individual critical tasks within the squad and squad echelon collective drills. The squad leader supervises the safe firing of the mortar system, crew served weapons, and all actions of the squad members.

1-101. The company or troop mortar squad leader performs all warfighting function tasks of the aforementioned battalion mortar platoon squad leader, as well as all the duties and responsibilities of a fire direction computer. The company or troop mortar squad leader is required to be an Infantry Mortar Leader Course graduate (additional skill identifier B1). The squad leader assumes all duties and responsibilities of the company or troop section leader in the section leader's absence.

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Chapter 2
Fire Support Operations

Mortar platoons and sections play a vital role in a maneuver battalion or squadron's outcome as the largest casualty-producing weapon that is organic to the battalion or squadron. When used, indirect fires can control desired effects on the enemy. Chapter 2 is an overview of fire support operations and fire support planning. This chapter enhances the target audience's understanding of how the mortar platoon or section can be used in the warfighter function of fires. This chapter describes the USMC fire support teams (FISTs), fires, and fires planning at a minimum. All information in this chapter comprises multiple fires publications.

SECTION I – BATTALION AND COMPANY FIRE SUPPORT OPERATIONS

2-1. Both the Army and USMC have fire support organizations at the maneuver battalion and company levels.

ARMY ORGANIZATIONS

2-2. Fire support personnel manning the battalion's main CP fires cell, company FISTs, and platoon FOs are assigned to the BCT cannon field artillery battalion. These fire support personnel habitually associate with supported battalions and companies or platoons for training, but for combat operations, are deployed by the BCT commander and the fire support coordinator when and where needed based on METT-TC. Refer to ATP 3-09.42 for more information regarding fire support cell or teams.

FIRE SUPPORT FOR THE BRIGADE COMBAT TEAM—FIRES CELL

2-3. Fires cells in the BCT's maneuver battalions and Cavalry squadron provide a fire support coordination capability for battalion operations and are organized with an FSO, NCO, an electronic warfare NCO, and digital systems operators. The fires cell may have an Air Force tactical air control party.

FIRE SUPPORT TEAM AND OBSERVERS

2-4. Company FIST headquarters personnel and platoon FOs enable effective artillery and mortar support for the maneuver force. The observers are the eyes and ears for the maneuver unit and a major source of information for the fires cell to advise maneuver commanders so observers can execute assigned tasks and respond to enemy actions.

TARGET ACQUISITION PLATOON

2-5. Each BCT field artillery battalion has a target acquisition platoon organized and equipped to quickly detect and accurately locate, classify, and report indirect fire from enemy mortars, artillery, and rockets to permit immediate engagement with counterfire. The information provided includes the point of origin, predicted point of impact, radar cross section, and velocity.

2-6. The platoon comprises radar operators with the military occupational specialty of 13R and is cross-trained to determine meteorological forecasts and surveyed points and targets. This platoon utilizes the AN/GMK-2 computer meteorological data-profiler to determine computer mission-essential tasks. The radar operators use the AN/TPQ-53 Weapon Locating Radar System that has replaced the AN/TPQ-36 and AN/TPQ-37 during FY 16. The target acquisition platoon uses the AN/TPQ-50 Weapon Locating Radar

System, which is designed to detect, track, and locate mortars, rockets, and artillery from distances between 0.5 to 10 kilometers in a 6400-mil coverage. The AN/TPQ-50 replaced the lightweight countermortar radar (known as LCMR) during FY 17. The AN/TPQ-50 Weapon Locating Radar System can be task-organized to the BCT and maneuver battalions according to the fire support coordinator (field artillery battalion commander) and brigade commander's guidance.

Note. Refer to ATP 3-09.12 and ATP 3 09.02 for more information.

UNITED STATES MARINE CORPS ORGANIZATION

2-7. The USMC implements its FISTs similar to the Army with slight differences. For instance, the USMC has a dedicated mortar FO who is responsible for—

- Controlling mortar fires.
- Providing the company commander and the FIST leader with recommendations regarding the employment of mortars.
- Maintaining communications on doctrinal mortar control and coordination nets.
- Assisting the company commander and FIST leader in fire support planning and mortar request.

Note. Refer to MCRP 3-10A.2, chapter one, for additional information on USMC mortar task organization..

SECTION II – MISSION COMMAND

2-8. *Command* is the authority that a commander in the armed forces lawfully exercises over subordinates by virtue of rank or assignments (JP 1). Command includes the authority and responsibility for effectively using available resources and for planning the employment of, organizing, directing, coordinating, and controlling military forces for the accomplishment of assigned missions. Command includes responsibility for health, welfare, morale, and discipline of assigned personnel. (See ADP 6-22 for more information.)

KEY PERSONNEL RESPONSIBILITIES

2-9. There are key personnel within a maneuver battalion or squadron that mortar element leaders work closely with to implement indirect fire planning and the tactical employment of mortars. These key personnel either have a command relationship with the mortar element or are integral to planning mortar fires.

BATTALION OR SQUADRON COMMANDER

2-10. The battalion or squadron commander is responsible for the tactical employment of the battalion and squadron mortar platoon. The commander cannot delegate this responsibility and is the final approving authority for the tactical employment of the battalion mortar platoon. For the battalion mortar platoon to be highly effective, the commander provides a clear and concise intent of what the mortar platoon fires need to do to support the maneuver. The commander understands the capabilities, limitations, and characteristics of the mortar platoon equipment and ammunition available. Specific areas of responsibility concerning the mortar platoon include—

- Tactical employment, to include missions, priority of fires, general locations, security, and final approval of fire plans that support the maneuver.
- Task organization, to include attachments and detachments, command and support relationships, and communications.
- Sustainment, to include basic loads, types and mix of ammunition, priority of transportation, maintenance, and other support.

2-11. For the Army, maneuver battalion commanders directly control their mortar platoon, attaches elements to subordinate commanders, or exercises command through the headquarters and headquarters company

commander. In the USMC, a battalion commander exercises command of the mortar platoon through the weapons company commander or attaches elements to subordinate commanders.

COMPANY COMMANDER

2-12. The company and troop commander are responsible for the tactical employment of the mortar section to support the company operation. The commander exercises command through subordinate leaders and employs the company to accomplish the mission according to the battalion commander's intent and concept. The company commander is responsible for the use of supporting indirect fire and the local security for the mortar section.

2-13. A USMC company commander commands the mortar section directly, through the weapon platoon commander. Both services can attach a mortar squad to a platoon; however, this can create a lack of massing fires. The company commander considers METT-TC, the enemy, and other mission threats when deciding whether to keep the mortar section together or split between platoons. The headquarters and headquarters company commander does not have any control on the tactical employment of the battalion mortar platoon.

OPERATIONS OFFICER

2-14. A battalion or squadron operations officer is a commander's principal staff officer in matters concerning combat operations, plans, organization, and training. The nature of an operations officer's responsibilities requires a high degree of coordination with the mortar unit leader.

2-15. An operations officer does not exercise command authority over the mortar unit. However, the operations officer does exercise a degree of control over a mortar unit's actions. The officer has the authority to direct a unit to accomplish specific missions or tasks within the framework of a battalion or squadron commander's intent. The officer does not exercise administrative control. Concerning a mortar unit, an operations officer—

- Prepares, coordinates, authenticates, and publishes operations plans and orders, incorporating the mortar unit leader's input to these plans and orders while they are being prepared.
- Recommends priorities for critical resources, to include establishing mortar ammunition basic loads by type and number of rounds and the required and controlled mortar ammunition supply rate.
- Recommends task organization to the commander and assigns specific missions to the mortar unit.
- Considers additional security measures when the mortar platoon is dispersed.
- Advises the commander and coordinates fires and displacement of the mortar unit with the actions of other units.
- Prepares, authenticates, and publishes the battalion TACSOP.

Note. The mortar platoon leader or section leader advises the operations officer on the mortar platoon's capabilities and revises all aspects of the employment of the mortar platoon or section.

FIRE SUPPORT OFFICER

2-16. FSOs at all echelons are charged with planning and coordination to execute the fire support plan that supports the maneuver commander's intent. The mortar element leader and FSO have a close professional relationship. They must understand the maneuver commander's intent for fires and work closely to ensure it is properly executed.

2-17. The mortar element is a delivery platform that the FSO includes in the planning process. The mortar element leader is present during the planning process to advise on the capabilities of the mortar element systems, fire direction and communication equipment, personnel, and how best to employ the mortar element to execute the fire support plan within the maneuver commander's intent.

CONTROL

2-18. *Control* is the regulation of forces and warfighting functions to accomplish the mission in accordance with the command's intent (ADP 6-0). Commanders use mission orders, a common operational picture, and communication to implement control over mortar units.

MISSION ORDERS

2-19. *Mission orders* are directives that emphasize to subordinates the results to be attained, not how they are to achieve them (ADP 6-0). Commanders use mission orders to provide direction and guidance that focus the forces' activities on the achievement of the main objective, set priorities, allocate resources, and influence the situation. They provide subordinates with the maximum freedom of action to determine how best to accomplish missions. Mission orders seek to maximize individual initiatives, while relying on lateral coordination between units and vertical coordination up and down the chain of command. The mission orders technique does not mean commanders do not supervise subordinates in execution. However, they do not micromanage. They intervene during execution only to direct changes, when necessary, to the concept of operations. (See ADP 6-0 for more information.)

2-20. Three types of mission orders are warning, operation, and fragmentary, which are described below:

- *Warning order* (WARNORD) is a preliminary notice of an order or action that is to follow. The WARNORD is used as a planning directive that initiates the development and evaluation of military courses of action by a commander and requests that the supported commander submit a commander's estimate (JP 5-0). WARNORDs are usually issued in preparation for an OPORD to follow.
- *Operation order* is a directive issued by a commander to subordinate commanders for the purpose of effecting the coordinated execution of an operation (JP 5-0). An OPORD supplies all-important information on who, what, when, how, and most importantly, the why of the mission. It outlines a commander's intent for fire support. A leader uses an OPORD to tell subordinates how they intend to fight the battle. Leaders use the standard OPORD format to organize their thoughts in a logical sequence. This ensures that a platoon, section, and squad know everything necessary to accomplish their mission. Consistent use of this standard format allows a leader to refine TACSOPs and to streamline orders. The majority of the information needed for a mortar unit's OPORD comes directly from a battalion OPORD. A unit leader can get additional information from an intelligence staff officer, battalion FSO, and logistics staff officer. Some information they must determine themselves during the analysis of the mission.
- *Fragmentary order* (FRAGORD) is an abbreviated OPORD issued as needed to change or modify an order or to execute a branch or sequel (JP 5-0).

COMMON OPERATIONAL PICTURE

2-21. A *common operational picture* is a display of relevant information within a commander's area of interest tailored to the user's requirements and based on common data and information shared by more than one command (ADP 6-0). They choose any appropriate technique to develop and display a common operational picture, such as graphical representations, verbal narratives, or written reports. Development of the common operational picture is ongoing throughout operations and supports developing knowledge and understanding.

COMMUNICATION

2-22. Commanders and staffs disseminate and share information between people, elements, and places. Communication is more than the simple transmission of information. It is a means to exercise control over forces. Communication links information to decisions and decisions to action. No decision during operations can be executed without clear communication between commanders and subordinates. Communication between the parts of a command supports the coordinated action. Effective commanders do not take the importance of communication for granted.

2-23. Effective communications is critical in the delivery of fires. A mortar platoon or section uses frequency modulation (FM) voice, digital, and wire. Mortar units use routine and nonroutine reports to keep commanders and their staff aware of their unit's tactical, administrative, and sustainment status.

2-24. Runners are the most secure communication means and are best used when time is not a critical factor. Wire is the most secure real-time communication means and cannot be detected by radio direction finding. Wire communications are primarily used internally within a mortar unit by linking the mortar squads to the FDC. In a semipermanent position, it may connect an FDC with a command group, subordinate units, and FOs. Wire takes time to lay, has limited range, and, if not properly buried, subject to breakage from fire and vehicular traffic. Wire is also used to connect each vehicle's MFCS to send and receive firing data and digital messages.

2-25. A radio is a mortar elements most flexible, most frequently used, and one of the most secure means of communications. It can quickly transmit information over long distances with great accuracy. Current equipment provides a platoon with communications security against most enemy direction finding, interception, and jamming capabilities. Sophisticated direction-finding equipment can trace almost any radio signal. If available, satellite systems are more secure and less subject to interference from terrain and structures but can be affected by weather. Structures, such as those generating an electrical signal, and terrain interfere with direct line-of-sight frequency modulation communications.

2-26. Electronic protection is part of the electronic warfare involving actions taken to protect units from when friendly or enemy use electromagnetic spectrum to degrade, neutralize, or destroy friendly combat capability. Mortar and other units accomplish this by minimizing radio transmissions, using correct radio transmission procedures, reducing signal signature, and employing other techniques to protect electronic transmission. Units operating jamming devices to counter improvised explosive devices can interfere with friendly signals within and outside the AO. Use of such devices is coordinated and minimized to the extent possible. Sending information digitally is the preferred method for transmitting data, as it transmits information at a high rate of speed and handles large amounts of information. Digital transmissions greatly inhibit the enemy's ability to trace the signal.

2-27. An FDC is the net control station for a mortar platoon and section. The smooth functioning of this net enables accurate information to pass quickly to and from an FDC. An FDC net control station communicates with mortars, mortar leaders, and command elements when in either general support (GS) or direct support (DS). DS is a support relationship requiring a unit to support another specific unit and authorizing it to answer to the supported force's request for assistance. GS is a support relationship requiring a unit to support a supported force as a whole and not to any particular subdivision. A mortar unit FDC establishes and maintains communications with—

- A commander, CP, or FSO (based on the commander's guidance and TACSOP).
- Units with priority of fires, priority targets, or units to which the mortar platoon is in DS.
- Mortar sections and mortars under its control.
- Any FOs directly controlling the unit's fires.
- Any fires unit in its DS or providing supporting fires.

2-28. In combat, reports give commanders and leaders information on which to base their plans and decisions. These reports must be accurate, timely, and complete. Standardized reporting procedures save time, promote completeness, and prevent confusion. Ways to transmit and safeguard reports vary and depend on the information transmitted, the available equipment, local requirements, terrain, and electronic-warfare threat. Whatever the method of reporting, communications security is enforced. Any report that contains information about friendly units is encoded or transmitted on secure communications means with approved codes.

2-29. FBCB2 greatly enhances the speed and accuracy of reports. It is the primary method to transmit reports. The system's standard reports include but are not limited to—

- Free text messages.
- Status reports.
- Log reports.

- CBRN reports (CBRN 1, 3, and 4; chemical downwind message; and effective downwind message).
- Battle damage assessment.
- Situation and spot reports.
- Medical evacuations (both combat and long form).
- Obstacle reports.

Note. The mortar element can use the FBCB2 to receive a call for fire from beyond line of site from any supported element that also has the FBCB2. Prior to sending their first call for fire using the FBCB2, each supported element must configure the recipient path for the call for fire. Recipient configuration is done prior to the mission and only needs to be done once, unless there are recipient changes. The recommended recipients are the mortar element FDC (or all organic mortar elements with an FBCB2), the FSO, and whichever maneuver commander holds clearance of fire authority over that mortar element. This recipient configuration ensures the mortar FDC begins computing the firing data while the FSO begins any higher echelon clearance process, and the maneuver commander is aware of the call for fire and can send an FBCB2 free text to the mortar FDC and FSO approving the fire mission.

SECTION III – FIRE SUPPORT PLANNING

2-30. Fire support planning and coordination is the continuous and concurrent process of analyzing, allocating, coordinating, and scheduling of supporting fires. To integrate joint fires, the maximum ordinate of surface indirect fires must be known. Mortars and artillery use the trajectory charts found in the appendices of all firing tables to easily identify maximum ordinate based upon range to target.

2-31. Mortars are a delivery platform at the disposal of FISTs, which are integrated with a maneuver plan that optimizes the commander's organic fires. Mortar platoons and sections are responsive and reliable when they are properly planned, coordinated, and fully integrated into a scheme of maneuver.

2-32. The maneuver commander is responsible for the fire support plan. The fire support plan is based on the commander's intent and is developed primarily by the FSO. It includes targets selected for engagement by organic mortar elements.

2-33. The maneuver commander gives the mortar platoon or section a specific mission during each phase of an operation. The mission must be realistic and clearly understood by the mortar element and the observers who call for fire.

2-34. Mortar elements execute their portion of the fire support plan by engaging planned targets according to schedules of fire provided by their FSO or FIST. They respond to calls for fire on planned targets and targets of opportunity originated by the FIST, FSO, or other designated observers.

2-35. Mortar platoon and section leaders have fire-planning responsibility and must be knowledgeable in fire support planning coordination, including technical computation of firing data for planned mortar targets, determining the mortars' maximum ordinate from a given mortar-firing point when integrating joint fires, and ensuring that the maneuver commander's guidance is met.

2-36. To ensure timely and accurate execution of a mortar unit portion of the fire support plan, mortar element leaders—

- Consider support requirements, terrain, and positioning of firing sections commensurate with the battalion or company scheme of maneuver.
- Consider the means by which the unit's movement and fires are controlled.
- Analyze mortar targets given in the fire support plan to ensure that sufficient quantities of ammunition (by type) are available for firing against planned targets and targets of opportunity, to include checking on a commander's intent to use smoke or illumination extensively.
- Identify, reconnoiter, and select firing positions that enable mission accomplishment, provide the ability to mass fires, and are favorable to mortar employment.

- Coordinate the displacement plan, the use of terrain, and resupply routes with a battalion operations staff officer and support platoon leader, or a company commander and executive officer (XO), as applicable.
- Coordinate required field artillery support, such as survey and meteorological data, with their FSO or FIST to enhance first-round accuracy and the ability to mass fires from separate firing locations.

2-37. The conduct of fires and fire control has a standard set of procedures and techniques used by mortars and field artillery. While TC 3-22.91 covers in detail the conduct of fires and fire control measures used by mortars, it is only the foundation for mortar leader. Mortar leaders must know and understand the procedures, techniques, and graphics used by an FSO to portray how mortars, field artillery, and other support assets assist the maneuver commander. It is imperative that the mortar leaders have a firm understanding of how the mortars can be a force multiplier through cross planning and understanding of the fires warfighting function.

PRIORITY OF FIRES

2-38. Priority of fires is the commanders' guidance to the staff, subordinate commanders, fire support planners, and support agencies to organize and employ fire support according to the relative importance of the unit's mission. It is a key method for a commander to increase the combat power of one of the subordinate maneuver units and is normally given to the unit assigned the main effort for each phase. In the OPORD or FRAGORD, mortar units are given the priority of fire that becomes the basis for their fire support plan. A fires battalion supporting an operation, mortar platoon, and a company mortar section may all have different priorities of fire. An OPORD may assign a single unit as having the priority of fire or may designate the priorities of fire in descending order. For example, an OPORD may assign the priorities of fire to Alpha company, then Charlie company, and then a reconnaissance platoon. Priorities of fire may change with each phase of the operation. The important thing is only one maneuver unit has the priority of fires at any one time.

2-39. A unit with priority of fires does not have exclusive use of these fires. Units without priority of fires may call for fire, but their fire mission is at a lower priority and may be executed later than needed or not executed at all, given ammunition constraints. For example, a mortar platoon may be firing a mission for Alpha company when Charlie company, who has priority of fires, requests fires. The mortar platoon ceases firing Alpha company's mission and fires Charlie company's mission. Once it completes Charlie company's mission, it then continues to fire Alpha company's mission.

2-40. A commander may shift the priority of fires to meet the threat, when necessary, and can assign priority of mortar fire to increase the effectiveness of direct fires. For example, the effectiveness of close-combat missiles can be increased by having mortar fire obscure enemy overwatch elements, forcing enemy armor to close hatches, suppressing accompanying infantry, and canalizing an enemy.

ASSIGNMENT

2-41. In both the offense and defense, priority of fire normally assigned to a unit is the main effort of a phase. In the offense, a unit assigned the main effort may be different for each phase of the operation. A mortar unit must be in position to support the unit with the priority of fire. This may include establishing decentralized or predesignated control methods for FOs and a mortar leader monitoring the unit's command net.

2-42. In the defense, priority of fires is normally given first to a company or platoon that can best place effective long-range fires on the enemy. As an enemy continues to advance, priority of fires may be shifted to the company responsible for defending the most dangerous avenues of approach into the unit's AO or battle position. When more than one unit is positioned to cover the same avenue of approach, such as around an engagement area, priority of fires is given to the company or platoon that can best observe and place effective fire on enemy forces posing the greatest threat. A commander may assign priority of fires to the—

- Forward security force, either a reconnaissance platoon or another maneuver force given a security or counter reconnaissance mission.
- Counterattacking force upon initiation of a counterattack.

2-43. To ensure that the most threatening enemy forces are fired on first, a commander prioritizes anticipated demands but may modify their guidance. A mortar unit leader stays in contact with the CP and the battalion FSO or company FIST to quickly change priorities of fires when needed.

CONFLICTS

2-44. It is essential that the mortar fire direction personnel have clear and unambiguous instructions on the priority of missions to fire. Careful analysis of the mission and a unit's support relationships allow leaders to identify and resolve potential conflicts. Potential conflicts related to priorities of fire are identified and resolved before the mission. This allows for an immediate and timely process for a call for fire.

COMMAND RELATIONSHIPS

2-45. Situations may occur when a mortar unit cannot support an entire battalion, company, or troop while remaining under direct control as an organic element, such as when a company, troop, or platoon is given a mission that separates it from its parent unit, to include—

- Raid or ambush.
- Advance, flank, or rear guard.
- Screen.
- Detachment left in contact.

2-46. In these situations, a commander may specify command relationships for mortars by placing a mortar platoon or section under the control of a maneuver element. These command relationships carry inherent responsibilities that everyone involved knows. When a standard command relationship does not adequately support a commander's intent, a nonstandard one may be assigned. This is accomplished by issuing a separate mortar platoon or section mission statement with explicit instructions on the command relationship desired.

OPERATIONAL CONTROL

2-47. *Operational control* is the authority to perform those functions of command over subordinate forces involving organizing and employing commands and forces, assigning tasks, designating objectives, and giving the authoritative direction necessary to accomplish the mission (JP 1). These can be delegated to a commander to direct forces to accomplish specific missions, usually limited by function, time, or location. (See FM 3-0 for details.)

2-48. The commander who has OPCON of the mortar unit controls the tactical employment, movement, and missions. The commander plans and controls its fires and is not responsible for sustainment, logistics, or administrative support. OPCON of the mortar unit is given for a limited time or for a specified mission. Once the mission is accomplished, a mortar unit reverts to its parent unit's control.

2-49. A mortar platoon or section under the control of a company or troop establishes direct communications with that unit's headquarters. Fire missions are passed on the battalion mortar fire direction net or on another net designated by the controlling headquarters. A company or platoon that has OPCON of the mortar platoon plans the platoon's fires and can further assign priority of fires and priority targets.

ATTACH

2-50. *Attach* is the placement of units or personnel in an organization where such placement is relatively temporary (JP 3-0). Subject to any limitations imposed by an attaching commander, commanders receiving the attachment exercise the same degree of authority as they do over units organic to their command. (See FM 3-0 for details.)

2-51. A commander who has mortars attached is responsible for planning and employing the fires, as well as providing all classes of supply, medical evacuation, vehicle recovery, and administrative support. The commander specifies the general mortar-firing location, directs displacement, and integrates the attached mortar unit into the unit's security plan.

2-52. Attachment is a restrictive command relationship. It ensures that mortar fires are immediately responsive to the new headquarters. However, it hinders the mortar platoon or sections in providing responsive fires to any other element of the battalion or squadron. It places a logistics burden on the headquarters receiving mortars as attachments. A commander with mortars attached designates the priority of fires and priority targets.

2-53. Attachment of mortar platoons and sections is not a normal command relationship. Examples of when the attachment of mortars is appropriate are during—

- Unit movement over great distances or along multiple routes.
- Infiltrations over compartmentalized terrain.
- Widely dispersed and noncontiguous operations.
- Company or platoon raids when the objective is out of range of normal supporting fires.
- Initial phase of an airborne operation until a battalion has completed its assembly and linkup.
- Initial phase of an air assault until the landing zone has been secured and the battalion headquarters can coordinate the actions of the companies.

SUPPORT RELATIONSHIPS

2-54. A commander specifies support relationships by assigning one of two standard tactical missions for mortars. The two standard tactical missions are either DS or GS.

DIRECT SUPPORT

2-55. DS is a mission requiring a force to support another specific force and authorizing it to answer directly to the supported forces' restrictive fire area (for example, when the battalion mortar platoon supports one of the maneuver companies directly).

GENERAL SUPPORT

2-56. GS is support that is given to the supported force as a whole and not to any particular subdivision. This is the GS mission of a mortar platoon when supporting the entire battalion with no DS to the maneuver companies. This is a prime example of on-order fires.

2-57. The two standard tactical missions of GS and DS carry inherent responsibilities that everyone who is involved in fire support knows. They describe in detail the fire support responsibilities of a mortar platoon or section (see table 2-1 on page 2-10). When a standard tactical mission cannot adequately support a commander's intent, a nonstandard one may be assigned. This is done either by issuing a separate mortar platoon or section mission statement along with explicit instructions on each of the inherent responsibilities or by assigning a standard tactical mission and explaining how it has been altered.

ARMY SUPPORT RELATIONSHIPS

2-58. An Army commander assigns one of the following standard tactical missions:

- GS with priority of fires.
- GS with priority targets.
- GS without established priorities.
- DS to a maneuver element.

2-59. An example of the inherent responsibilities for standard Army mortar tactical mission is in table 2-1.

Table 2-1. Inherent responsibilities of standard United States Army mortar tactical missions

Mortar Unit With A Mission Of—	*General Support With Priority Of Fires*	*General Support With Priority Target(S)*	*General Support Without Priorities*	*Direct Support*
Answers call for fire in priority from—	Unit with priority of fires. All others in order of receipt.	Unit calling for priority target. All others in order of receipt.	Elements with the Bn or Co in order of receipt of call for fire.	Supported unit. Mortar unit leader. All others in order of receipt.
Has as its zone of fire in priority—	AO of priority unit Bn or Co AO.	Priority target. Bn or Co AO.	Bn or Co AO.	Supported unit AO.
Establishes communication in priority with—	Priority unit Bn or Co CP. All others.	Unit with priority target. Bn or Co CP. All others.	Bn or Co CP.	Supported unit HQ and FISTs. With FOs, as directed.
Is positioned by—	Bn or Co commander.	Bn or Co commander.	Bn or Co commander.	Coordinated between supported unit, mortar leader, and unit leader.
Has its fires planned by—	Bn or Co FSO.	Bn or Co FSO. Unit with priority target.	Bn or Co FSO.	Supported unit.

Legend:
AO – action officer, Bn – battalion, Co – company, CP – command post, FIST – fire support team, FO – forward observer , FSO – fire support officer, HQ – headquarter

General Support with Priority of Fires

2-60. The assignment of priorities of fire allows a commander to retain overall control of the fires of the organic mortars but makes them available to subordinate commanders. When two or more observers are calling for fire at the same time, a mortar unit leader has clear guidance as to whom the platoon supports first. A unit fires for nonpriority observers when priority fire missions are complete. A commander can alter priority of fires at any time as the tactical situation changes.

2-61. If given a GS mission with priorities of fire established, a mortar unit leader positions at least one mortar or section of the unit to cover the company or platoon with priority of fires. A commander attempts to locate a position that permits coverage for the entire battalion or company.

2-62. If providing priority of fires coverage to one company or platoon means a mortar unit cannot provide coverage for all the other elements of the battalion or company, a mortar leader informs the commander and FSO. If a commander changes the company or platoon to which priority of fires is allocated, a mortar platoon or section may be forced to displace to provide coverage. If so, a mortar unit leader immediately notifies the commander of the need to displace.

General Support with Priority Targets

2-63. This is a standard tactical mission where the delivery of fires on a specific target takes precedence over all other fires for the mortar section or platoon. The mortar unit prepares for the engagement of such targets as much as possible. It lays its mortars on this target when not engaged in other fire missions. If any observer calls for the priority target to be fired, the mortar unit does so immediately, even if engaged in another fire mission. Only the maneuver commander can direct the mortar unit to cease firing on a priority target to engage in another fire mission with the exception of the established FPF. Once a priority target mission is complete, the mortar unit immediately returns to firing other missions unless the FO sends the order REPEAT.

Note. An FPF is an immediately available, prearranged barrier of fire designed to impede enemy movement across defensive lines or areas (JP 3-09.3).

2-64. A commander may designate a priority target by type, location, or time sensitivity. A commander gives the FSO or fire support element specific guidance as to when targets become priority targets and when they are no longer priority targets. The commander states the desired effects-on-target and any special ammunition to be used.

2-65. A mortar unit is normally assigned only one priority target at a time. A heavy mortar platoon can be assigned one priority target for each section. Under unusual circumstances, such as in a strongpoint defense, a section can be assigned more than one priority target. This may occur during execution of the battalion's close-in suppression of enemy air-defense fires or during illumination missions. Multiple priority targets require close coordination between the mortar unit leader and maneuver unit FSO or fire support element. A commander can alter priority targets as the tactical situation changes.

2-66. An FPF is a special type of priority target. Normally, an FPF target is assigned to the company or platoon covering the most dangerous avenue of approach or covering the most vital area. Most often, this company or platoon has priority of fire. This prevents conflict of missions. In some situations, one commander may have priority of fires, while another has the FPF. This could occur when a security force has priority of fires initially, but the FPF target is assigned to a defending company. This requires close coordination between a maneuver commander, operations staff officer, FSO or fire support element, and mortar unit leader. A specific amount of mortar ammunition is always designated, prepared, and set aside for use with the FPF target. This FPF ammunition may not be used on any other mission without specific authorization from the commander. When given the command to fire an FPF, the mortar unit fires until the supported unit requests the FPF fire to stop or the mortar unit is depleted of all ammunition, whichever comes first. Authority to shoot an FPF is that of the lowest maneuver commander, or an authorized representative, in whose area the FPF is placed.

General Support without Established Priorities

2-67. A mortar platoon or section assigned a standard tactical mission of GS, but without established priorities, provides fires exclusively at the direction of the battalion or company headquarters. Assigning the GS mission without priorities of fire may be appropriate during screening missions and closely phased deliberate attacks.

2-68. GS missions provide mortar fires immediately responsive to the needs of a commander. A mortar platoon or section with this GS mission is less responsive in attacking targets of opportunity since no direct communications link with the FIST at the company level. GS missions are most effective against planned targets. GS without priorities is the most centralized of all standard tactical missions.

Direct Support to a Manuever Element

2-69. A mortar unit assigned the standard tactical mission of DS is immediately responsive to the fire support needs of a particular maneuver company, platoon, or some other element, such as the reconnaissance platoon. A mortar platoon establishes effective communication with the supported commander. It coordinates its movements with that commander. The difference between DS and GS with priority of fire is that a mortar unit with a DS mission positions itself to conform to the supported commander's plans, even at the expense of other elements in the unit.

2-70. The essential feature of the DS mission is the one-on-one relationship between a mortar unit and a supported commander or leader. From the standpoint of battalion control, the DS mission is the most decentralized of the tactical missions. It is often used to place a mortar section in support of a rifle company. A commander who has a mortar platoon or section in DS can further assign priorities of fire and priority targets.

UNITED STATES MARINE CORPS SUPPORT RELATIONSHIPS

2-71. The USMC commander specifies support relationships by assigning standard tactical missions of either GS or DS. See table 2-2 for the inherent responsibilities of each mortar standard tactical mission.

Table 2-2. Inherent responsibilities of mortar standard United States Marine Corps tactical missions

A Marine Corps Mortar Unit With A Mission	*General Support*	*Direct Support*
Answers call for fire in priority from—	Unit with priority of fires, if assigned. Elements in order of receipt of call for fire.	Supported unit. Mortar unit leader. All others in order of receipt.
Has as its zone of fire in priority—	AO of priority unit. Bn or Co AO.	Supported unit AO.
Establishes communication, in priority, with—	Priority unit. Bn or Co CP. All others.	Supported unit HQ and FIST.
Is positioned by—	Bn or Co commander.	Coordinated between supported unit, mortar leader, and unit leader.
Has its fires planned by—	Bn or Co FSO.	Supported unit.
Legend: AO – action officer, Bn – battalion, Co – company, CP – command post, FIST – fire support team, FSO – fire support officer, HQ – headquarter		

General Support

2-72. USMC mortar platoons or sections assigned a standard tactical mission of GS, assists the maneuver force as a whole, and remains under the immediate control of the mortar unit's headquarters. This ensures mortars are immediately responsive to the needs of a maneuver force commander and provide fires at the direction of the battalion (or company) headquarters. It is the most centralized of the standard tactical missions.

2-73. USMC commanders usually assign priorities of fire to subordinate units when mortars are assigned the GS mission. If priorities of fire are not assigned, a mortar unit responds to calls for fire in the order received.

2-74. The assignment of priorities of fire allows a commander to retain overall control of the fires of the organic mortars but makes them available to subordinate commanders. When two or more observers are calling for fire at the same time, a mortar platoon leader has clear guidance as to whom the platoon supports first. A platoon fires for nonpriority observers when priority fire missions are complete. A commander can alter the priority of fires at any time as the tactical situation changes.

2-75. If given a GS mission with priorities of fire established, a USMC mortar platoon leader positions at least one section of the platoon to cover the company or platoon with priority of fires and attempts to locate a position that permits coverage for the entire battalion.

2-76. If providing priority of fires coverage to one company or platoon means a USMC mortar platoon cannot provide coverage for all the other elements of the battalion, a platoon leader informs the battalion commander and fire support coordinator. If a commander changes the company or platoon to which priority of fires is allocated, a mortar platoon or section may be forced to displace to provide coverage. If so, the mortar platoon leader immediately notifies the commander of the need to displace.

Direct Support

2-77. A USMC mortar platoon assigned the standard tactical mission of DS is immediately responsive to the fire support needs of a particular maneuver company or some other element, such as the reconnaissance

platoon. A mortar platoon must establish effective communication with the supported commander. It coordinates fire and movement with the battle plans of that commander. The difference between DS and GS with priority of fire is that a mortar platoon with a DS mission positions itself to conform to the supported commander's plans, even at the expense of the other commanders in the battalion. The essential feature of the DS mission is the one-on-one relationship between a mortar platoon and a supported commander. From the standpoint of battalion control, the DS mission is the most decentralized of the tactical missions. It is often used to place a mortar section in support of a rifle company. A commander who has a mortar platoon or section in DS can further assign priorities of fire and priority targets.

SECTION IV – GRAPHIC CONTROL MEASURES

2-78. A *graphic control measure* is a symbol used on maps and displays to regulate forces and warfighting functions (ADP 6-0). Graphic control measures are always prescriptive. They include symbols for boundaries, FSCMs, some airspace control measures, air defense areas, and minefields. Commanders establish them to regulate maneuver, movement, airspace use, fires, and other aspects of operations. In general, all graphic control measures relate to easily identifiable natural or man-made terrain features. See figure 2-1 for an example of graphic control measures.

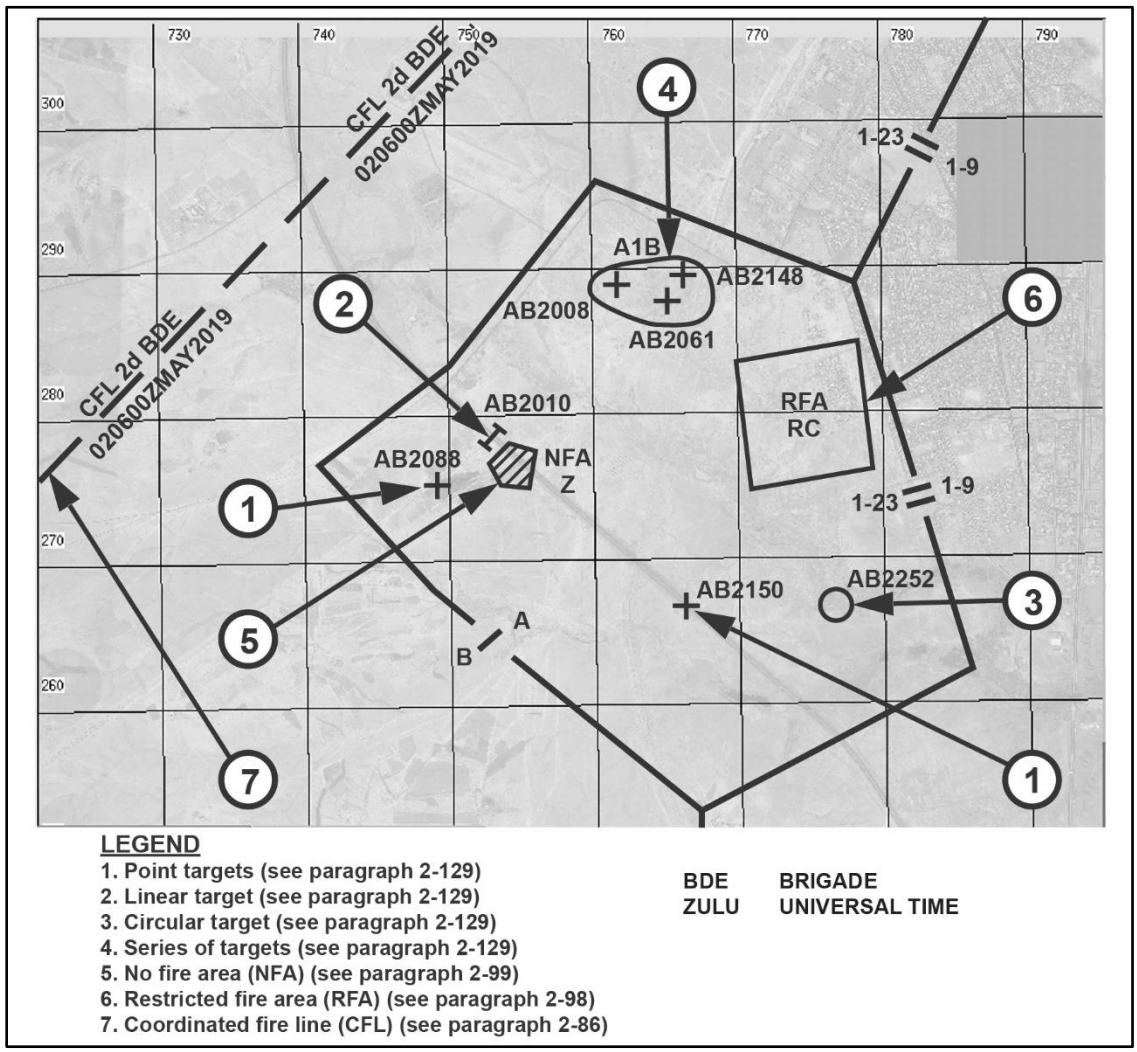


Figure 2-1. Example of graphic control measures

MANEUVER CONTROL MEASURES

2-79. Land, maritime, and amphibious commanders use maneuver control measures to define lines of responsibility in support of movement and maneuver of friendly forces. Refer to JP 3-09 for more information.

BOUNDARIES

2-80. In land warfare, a *boundary* is a line that delineates surface areas for the purpose of facilitating coordination and deconfliction of operations between adjacent units, formations, or areas (JP 3-0). Boundaries designate the geographical limits of a unit's AO. Within their own boundaries, units may execute joint fires and maneuver without close coordination with neighboring units, unless otherwise restricted. Normally, units do not fire across boundaries unless the fires are coordinated with the adjacent unit or the fires are beyond FSCMs, such as a coordinated fire line (CFL). These restrictions apply to conventional and special munitions and their effects. When fires such as obscurants and illumination affect an adjacent unit, coordination with that unit is normally required. In certain situations, a commander can decide to fire across boundaries at positively identified enemy elements without coordination. However, direct and observed joint fires are used when firing across boundaries at positively identified enemy forces when there is no time to coordinate with adjacent friendly units.

PHASE LINES

2-81. A *phase line* is an easily identified feature in the operational area utilized for control and coordination of military operations (JP 3-09). These lines are a maneuver control measure used by land forces. Units normally report crossing phase lines, but do not halt unless specifically directed. Phase lines can be used to identify limits of advance, monitor rates of movement, control joint fires (when dually designated as an FSCM), or define an AO. The purpose of each phase line, and any actions required by forces affected by the phase line, is specified on the OPORD of the establishing headquarters.

FIRE SUPPORT AREA OR FIRE SUPPORT STATION

2-82. A *fire support area* is an appropriate maneuver area assigned to fire support ships by the naval force commander from which they can deliver gunfire support to an amphibious operation (JP 3-09). A fire support area is normally associated with amphibious operations but can be used whenever it is desirable to have a fire support ship occupy a certain geographic position. A *fire support station* is an exact location at sea within a fire support area from which a fire support ship delivers fires (JP 3-02). This designation is used to station ships to be able to reach certain targets. For example, a ship in a fire support area may not be able to reach a certain target except when it is stationed at the fire support station.

FIRE SUPPORT COORDINATION MEASURES

2-83. FSCMs are found in JP 3-09, Appendix A. Within their AO, land and naval force commanders employ permissive and restrictive FSCMs to facilitate the rapid engagement of targets and simultaneously provide safeguards for friendly forces. Permissive FSCMs facilitate attacks and include CFLs, battlefield coordination lines (BCLs), fire support coordination lines (FSCLs), free-fire areas, and kill boxes. Restrictive measures safeguard friendly forces and include airspace coordination areas (ACAs), restrictive fire lines and restrictive fire areas, and no-fire areas (NFAs).

2-84. Locations and implementing instructions for FSCMs are disseminated electronically by message, database update, or overlay through command and joint fire support channels to higher, lower, and adjacent maneuver and supporting units. Typically, they are further disseminated to each level of command, to include the establishing command and all concerned joint fire support agencies. Not all measures may apply to an operation; however, knowledge of the various FSCMs used by each component is necessary for the effective use of joint fire support.

PERMISSIVE FIRE SUPPORT COORDINATION MEASURES

2-85. Permissive FSCMs facilitate the attack of targets by reducing the coordination necessary for the clearance of fires. Fires are cleared with both terrain owners and other airspace users.

Coordinated Fire Line

2-86. The *CFL* is a line beyond which conventional surface-to-surface direct fire and indirect fire support means may fire at any time within the boundaries of the establishing headquarters without additional coordination but does not eliminate the responsibility to coordinate the airspace required to conduct the mission (JP 3-09). The purpose of the CFL is to expedite the surface-to-surface engagement of targets beyond the CFL without coordination with the land commander, in whose AO the targets are located. Such fires still follow the ROE and law-of-war targeting constraints; designation of a CFL is not authorization to fire indiscriminately into the area.

Battlefield Coordination Line

2-87. A BCL is a USMC-specific FSCM that facilitates the expeditious attack of surface targets of opportunity between the measure (the BCL) and the FSCL. When established, the primary purpose is to allow Marine Air-Ground Task Force aviation to attack surface targets without approval of a ground combat element commander in whose area the targets may be located. To facilitate air-delivered fires and deconflict air and surface fires, appropriate coordination measures, such as ACAs and kill boxes, may typically be established in the area between the BCL and the FSCL. Ground commanders may strike any targets beyond the BCL and short of the FSCL, with artillery or rockets, without coordination, as long as those fires deconflict with the established ACA overhead. This includes targets in an adjacent ground commander's zone that falls within the BCL-FSCL area. Such fires still follow ROE and law-of-war targeting constraints; designation of a BCL is not authorization to fire indiscriminately into the area.

Fire Support Coordination Line

2-88. The *FSCL* is an FSCM established by the land or amphibious force commander to support common objectives within an area of operation, beyond which all fires must be coordinated with affected commanders prior to engagement and, short of the line, all fires must be coordinated with the establishing commander prior to engagement (JP 3-09). FSCLs facilitate the expeditious engagement of targets of opportunity beyond the coordinating measure. The FSCL applies to all fires of air, land, and maritime-based weapon systems using any type of munition against surface targets. The FSCL is a permissive FSCM—the permissive area being beyond the coordination measure. The air component, while recognizing this aspect of the FSCL, views the FSCL as a restrictive FSCM when regarding the area short of the coordination measure.

2-89. The joint force land component commander and joint force maritime component commander cannot employ fires along the FSCL without coordination with affected commanders, and the joint force air component commander cannot employ fires short of the FSCL without coordination with the joint force land component commander or joint force maritime component commander. The FSCL is a significant consideration during interdiction operations. The FSCL is primarily used to establish mission command procedures for planning and execution purposes—it does not define mission types. Interdiction can occur both short of, and beyond, the FSCL. Attacks on surface targets short of the FSCL, during the conduct of joint interdiction operations, are controlled by and coordinated with the appropriate land or amphibious force commander.

Free-Fire Area

2-90. A *free-fire area* is a specific region into which any weapon system may fire without additional coordination with the establishing headquarters (JP 3-09). It is used to expedite joint fires and facilitate jettison of aircraft munitions. Such fires still follow ROE and law-of-war targeting constraints; designation of a free-fire area is not authorization to fire indiscriminately into the area.

Kill Box

2-91. A *kill box* is a three-dimensional permissive FSCM with an associated airspace coordinating measure (ACM) used to facilitate the integration of fires (JP 3-09). A kill box is a measure, not a mission. Kill boxes are established to support air interdiction efforts as part of the joint force commanders joint targeting process. Kill boxes allow lethal attack against surface targets without further coordination with the establishing commander and without the requirement for terminal attack control.

2-92. When used to integrate air-to-surface, subsurface-to-surface, and surface-to-surface indirect fires, the kill box will have appropriate restrictions. These restrictions provide a three-dimensional block of airspace in which participating aircraft are deconflicted from friendly surface fires. The restrictive measures prevent nonparticipating aircraft and maneuver forces from entering the kill box. The goal is to reduce the coordination required to meet support requirements with maximum flexibility (permissive attributes), while preventing friendly fire incidents (restrictive attributes). Fires executed in a kill box follow the ROE and law-of-war targeting constraints; designation of a kill box is not authorization to fire indiscriminately into the area.

RESTRICTIVE FIRE SUPPORT COORDINATION MEASURES

2-93. Restrictive FSCMs provide safeguards for friendly forces and noncombatants, facilities, or terrain. They indicate where firing is restricted or even prohibited without prior coordination. A mortar element leader coordinates with the FSO to ensure all restrictive FSCMs are known to all concerned personnel.

Airspace Coordination Area

2-94. An *airspace coordination area* is a three-dimensional block of airspace in a target area, established by the appropriate commander, in which friendly aircraft are reasonably safe from friendly surface fires (JP 3-52). An airspace coordination area is used primarily in close air support situations for high-volume fire. Artillery and mortars, rotary-winged, and fixed-winged aircraft are given specific lateral or vertical airspace within which to operate. See figure 2-2 on page 2-18 for an example of lateral and altitude separation and surface indirect fire maximum ordinate restriction.

2-95. Timely implementation of an airspace control area is dependent on the ground situation. The burden of deconfliction rests with the ground commander.

2-96. An airspace coordination area may be formal or informal. A formal airspace coordination area is one that is coordinated, planned, and promulgated through the airspace control order process. An informal airspace coordination area is one that is established and used for specific operations that do not conflict with other jointly used airspace.

Restrictive Fire Line and Restrictive Fire Area

2-97. The *restrictive fire line* is a line established between converging friendly surface forces that prohibits fires or their effects across that line (FM 3-09). The purpose of the line is to prevent friendly fire incidents and duplication of engagements by converging friendly forces. (See FM 3-09 for additional information.)

2-98. *Restrictive fire areas* are locations in which specific restrictions are imposed and into which fires that exceed those restrictions will not be delivered without coordination with the establishing headquarters (JP 3-09). This is a common coordination measure used with mortars in stability operations.

No-Fire Area

2-99. An *NFA* is an area designated by the appropriate commander into which fires or their effects are prohibited (JP 3-09.3). There are two exceptions—

- When the establishing headquarters approves joint fires within the NFA on a mission-by-mission basis.
- When an enemy force within the NFA engages a friendly force and the engaged commander determines there is a requirement for immediate protection and responds with the minimal force needed to defend the force.

2-100. If possible, an NFA is established on identifiable terrain. An NFA may be located by a series of grids or by a radius from a center point. It may be established in conjunction with a host nation to avoid damage or destruction to a national asset, population center, natural or cultural resources, such as a shrine, or to minimize environmental impact. It may be established to protect an element of tactical importance.

AIRSPACE COORDINATING MEASURES

2-101. ACMs are employed to facilitate the efficient use of airspace to accomplish missions while simultaneously providing safeguards for friendly forces. When ACMs are in place, mortar elements must be prepared to calculate the maximum ordinate of their rounds fired and to modify firing when requested.

2-102. Effectively and efficiently integrating and coordinating joint fires depends on understanding and realizing that the operational environment is a three-dimensional area, or volume of space, through which air assets operate and through which fires are employed. ACMs are nominated from subordinate headquarters through component command headquarters and forwarded to the airspace control authority, according to the airspace control plan.

2-103. Additionally, some ACMs may be established to permit surface joint fires or unmanned aircraft operations. The component commanders ensure that ACM nominations support and do not conflict with joint operations before forwarding to the airspace control authority. The airspace control authority consolidates, coordinates, and deconflicts the airspace requirements of the components and publishes the ACMs in the airspace control order. Simply stated, ACMs are approved by the airspace control authority and promulgated via the airspace control order. The airspace control order is published to meet the operations tempo and is promulgated to meet the pace of the ACM request process. Expect the airspace control order to be distributed both separately and as a section of the air tasking order. ACMs have specific usages that further help to define use and purpose to assist with effective planning, integration, and execution.

Air Corridor

2-104. An *air corridor* is a restricted air route of travel specified for use by friendly aircraft and established for the purpose of preventing friendly aircraft from being fired on by friendly forces (JP 3-52). Air corridor procedures are used to route aviation combat elements between such areas as forward arming and refueling points, holding areas, and battle positions.

2-105. Air corridor usages include minimum-risk routing, transit corridors and routes, and low-level transit routes. Altitudes of an air corridor do not exceed the coordinating altitude, if established.

Coordinating Altitude

2-106. The *coordinating altitude* is an ACM that uses altitude to separate users and as the transition between different airspace control elements (JP 3-52). All airspace users coordinate with the appropriate airspace control elements when transitioning through, or firing through, the coordinating altitude.

No-Fly Area

2-107. A *no-fly area* is airspace of specific dimensions set aside for a specific purpose, where no aircraft operations are permitted, except as authorized by the appropriate commander and controlling agency (JP 3-52). No-fly area procedures can be used to enforce a diplomatically designated no-fly zone, which can stipulate which flights are authorized and which are prohibited. Since no-fly areas negatively impact air operations, its use is balanced against the needs of affected commanders.

Restricted Operations Zone

2-108. A restricted airspace is reserved for specific activities where the operation of one or more airspace users is restricted. Restricted operations zones are used to support the use of unmanned aerial systems, both internal and external to the company, battalion, or squadron.

Coordination Level

2-109. A *coordination level* is a procedural method to separate fixed- and rotary-wing aircraft by determining an altitude below which fixed-wing aircraft normally do not fly (JP 3-52). To manage operational risk, all airspace users coordinate with the appropriate airspace control element when flying or firing through the coordination level.

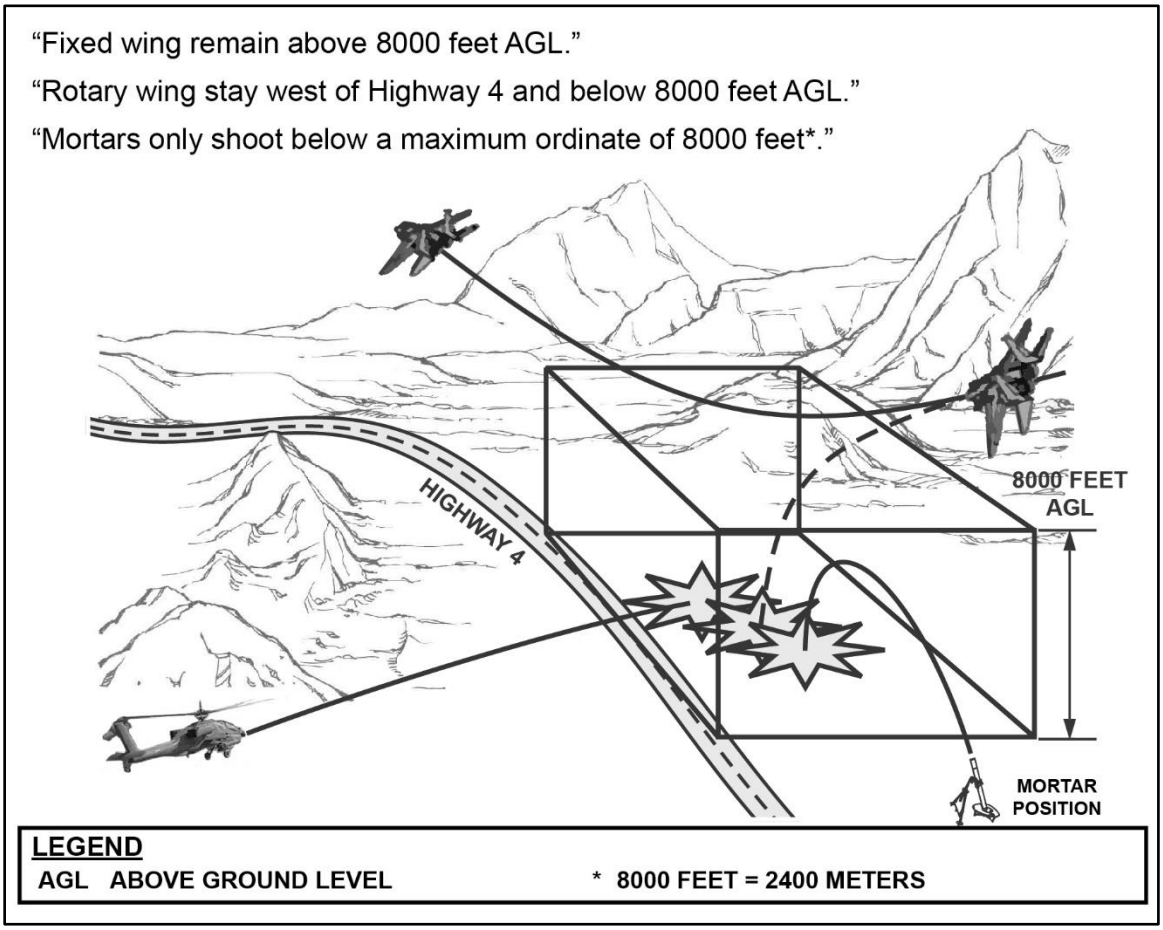


Figure 2-2. Example of lateral and altitude separation

TARGETS AND TARGETING

2-110. Targeting is grouped into two categories: deliberate and dynamic. Each category is associated with a different grouping of targets, planned targets or targets of opportunity, respectively. Neither is indicative of the target to be engaged but is aligned with the planning phase in which the target is identified and prosecuted.

2-111. A target's importance derives from its potential contribution to achieving a commander's objective(s) or otherwise accomplishing assigned tasks. A *target* is-

- An entity or object that performs a function for the threat considered for possible engagement or other action (ATP 3-09.30).
- An area designated and numbered for future firing (JP 3-60).

2-112. Timing is the primary factor that determines whether deliberate or dynamic targeting will support the maneuver commander's targeting requirements. Two types of targets are associated with each category.

DELIBERATE TARGETING

2-113. Deliberate targeting produces planned targets (scheduled targets and on-call targets), which are targets known to exist in the operational environment with engagement actions scheduled against them. With the exception of unanticipated targets, all targets should flow from deliberate targeting. Deliberate targeting supports the commander's and higher echelon planning processes. Deliberate targeting results in targets being properly vetted and validated and being placed on the proper joint target list (JTL) or restricted target list (RTL). Deliberate targeting also identifies the commander's time-sensitive targets. During execution of an OPORD, deliberate targeting supports execution planning.

- Scheduled targets are prosecuted at a specific time.
- On-call targets have actions planned but not for a specific delivery time. The commander expects to locate these targets in sufficient time to execute planned actions. These targets are unique in that actions are planned against them using deliberate targeting, but execution will normally be conducted using dynamic targeting.

DYNAMIC TARGETING

2-114. Dynamic targeting is normally employed in current operations planning, because the nature and timeframe associated with current operations (usually the current 24-hour execution period) typically requires more immediate responsiveness than is achieved in deliberate targeting. Current operations planning addresses the immediate or very-near-term planning issues associated with ongoing operations that usually occur in the tactical operations center by the operations staff. Dynamic targeting prosecutes targets of opportunity that include unscheduled targets and unanticipated targets: those targets that meet the criteria to achieve objectives but were not selected for action during the current joint targeting cycle.

Unscheduled Targets

2-115. Unscheduled targets are known targets and are included on either the JTL or RTL but were not nominated, were nominated but did not make the joint integrated prioritized target list, or were not expected to be available for engagement within the target cycle. However, changes to the target status (priority, access, permissions) could result in the need (or opportunity) to engage the target during the current cycle.

Unanticipated Targets

2-116. An *unanticipated target* is a target of opportunity that was unknown or not expected to exist in the operational environment (JP 3-60). These entities are not included on a JTL or RTL, and an evaluation of the candidate target is needed to determine engagement requirements and timing. In some cases, the candidate target will require engagement in the current targeting cycle and will require use of dynamic targeting. In other cases, the candidate target will be identified, developed, and validated for inclusion on the JTL or RTL.

Targets of Opportunity

2-117. A *target of opportunity* is—

- A target identified too late, or not selected for action in time, to be included in deliberate targeting that, when detected or located, meets criteria specific to achieving objectives and is processed using dynamic targeting (JP 3-60).
- A target visible to a surface or air sensor or observer which is within range of available weapons and against which fire has not been scheduled or requested (JP 3-60).

PRIORITY TARGET

2-118. A *priority target* is a target, based on either time or importance, on which the delivery of fires takes precedence over all the fires for the designated firing unit or element (FM 3-09). The firing unit or element prepares for the engagement of such targets. A firing unit or element may be assigned only one priority target. The designation may be based on either time or importance. The firing unit or element prepares for the engagement of such targets as determined by the fire support coordinator. A firing unit or element may be assigned only one priority target. The supported maneuver commander designates a priority target based on

time requirements or target importance and provides the FSO specific guidance as to when a target is a priority target. The commander states the desired effects on the target and special munitions to use, if applicable. When not engaged in fire missions, firing units set the firing data for assigned priority targets on the weapon systems to reduce the time required to fire the target (see ATP 3-09.30 for more information).

2-119. Priority targets increase fire support responsiveness on specific targets or specific high-threat areas. In addition to artillery priority targets allocated to them, a maneuver commander has one or two (one for each section) mortar priority targets that can be allocated to the mortar platoon. The importance of a priority target normally justifies the allocation of fires from a mortar section or platoon, especially the fires from a heavy mortar unit. However, because of the size of the AO or the number of targets, leaders may have to allocate a priority target to a squad. If it is a heavy mortar squad, then its lethality may be sufficient to achieve the desired target effects. Light mortar squads may achieve some effects on a priority target, but they can rarely achieve destruction.

2-120. As a guide, a battalion mortar platoon can be assigned up to two priority targets, one for each section, and the company mortar section can be assigned one. This guideline normally provides adequate target coverage and results. Mortar platoons using medium mortars and light mortar sections usually cover only a single priority target. A commander indicates the priority target in the remarks column of the target list. Anticipated changes of the priority target are indicated as on-order priority targets on the same target list. Mortar-firing units may be assigned priority targets in a sequence identified by the commander. Mortar element leaders understand that—

- A single priority target according to section is usually best.
- Multiple priority targets are possible when more than one mortar-firing unit of a specified size is available.
- Priority targets may have to be engaged by a single mortar, especially in noncontiguous operations.
- When a mortar-firing unit is not engaged in a fire mission, the mortar is laid on the firing data for the current priority target.

2-121. A battalion commander and FSO carefully consider priority targets before assigning them. Priority targets lie in the AO of the company or platoon having priority of fires. This prevents any confusion if a mortar platoon receives several calls at the same time. If a conflict is possible, such as when a reconnaissance platoon has priority of fires, yet a priority target has been allocated to a rifle company, a commander, FSO, operations officer, and mortar platoon leader coordinate to avoid confusion.

2-122. Priority targets are not always fired using HE ammunition. Illumination or a mix of HE and white or red phosphorus can be used as the designated rounds to be fired.

2-123. With the exception of FPFs, a predetermined amount of ammunition is set aside to be fired on priority targets. A mortar section fires this ammunition at the maximum rate of fire immediately upon the observer's call for fire. An FSO then modifies the fire command or calls for the section to repeat the mission, shift fires, or cease fire, based on the observer's message.

2-124. FPFs are the highest type of priority targets and take precedence over all other fire requests. They are planned barriers of direct and indirect fires designed to protect friendly troops from an enemy dismounted assault.

FINAL PROTECTIVE FIRE

2-125. A type of a priority target in a defensive situation is an FPF. *FPF* is an immediately available prearranged barrier of fire designed to impede enemy movement across defensive lines or areas (JP 3-09.3). An FPF provides continuous fires on a planned target. FPFs are integrated with maneuver crew-served weapons final protective lines. When the threat initiates the final assault into a defensive position, the defending unit initiates its FPFs to kill threat forces and suppress armored vehicles. (See Chapter 3 for more information on FPF.)

2-126. Things to remember about an FPF:

- Fire an FPF at the maximum rate of fire until told to stop, ammunition is exhausted, or the firing unit moves.
- The brigade commander normally allocates field artillery FPFs to the battalion, which may allocate FPFs to company or troop level.
- The battalion commander normally allocates heavy mortar FPFs to company or troop level in conjunction with the company's organic mortar systems, BCT dependent.
- The authority to shoot an FPF belongs to the lowest maneuver commander, or an authorized representative, in whose area the FPF is placed.
- The company and troop FIST have the responsibility to adjust the FPF when the tactical situation dictates.
- Cancel the FPF when it is no longer required.

NUMBERING SYSTEM

2-127. To designate targets for fire support operations, the Army and USMC adhere to the provisions of STANAG 2934. A target number is composed of six characters—two letters followed by four number positions—such as AJ1234. Other than the letter Z, there are no permanently assigned first letters. The senior headquarter for an operation establishes and publishes, in orders, the assigned first letter. A two-letter group may be used to indicate the originator or the target number and the level holding the target data. Target numbers serve as an index to all other information regarding a particular target, such as location, description, and size. Within a major force, normally at corps, a common target numbering system is used. Fire planners and fire support resources at all echelons, including mortar platoons, are assigned blocks of target numbers for their use.

2-128. Because target numbers are assigned in blocks to specific users, a target can be readily traced back to its originating source. Standard blocks of numbers are assigned to each BCT and Marine Infantry regiment based upon the brigade TACSOP. Numbers assigned to the Army and USMC are explained in tables 2-3 and 2-4. Tables 2-5 and 2-6, on page 2-22, detail battalion or squadron suballocation blocks of numbers.

Table 2-3. Example of numbers assigned to a United States Army brigade combat team

Numbers	*Assigned to*
0001 through 1999	Brigade fires cell and combat observation and lasing teams
2000 through 2999	Fires cell, lowest numbered maneuver battalion or squadron
3000 through 3999	Fires cell, second lowest numbered maneuver battalion or squadron
4000 through 4999	Fires cell, third lowest numbered maneuver battalion or squadron
5000 through 6999	Additional fires cell or fire support assets
7000 through 7999	Fire detection center of the brigade combat team fires battalion
8000 through 8999	Counterfire targets

Table 2-4. Example of numbers assigned to a United States Marine Corps regiment

Numbers	*Assigned to*
0001 through 1999	Infantry regiment fire support coordination center
2000 through 2999	Lowest numbered Infantry battalion
3000 through 3999	Second lowest numbered Infantry battalion
4000 through 4999	Third lowest numbered Infantry battalion
5000 through 6999	Attached battalion
7000 through 7999	Attached battalion
8000 through 8999	Unassigned

Table 2-5. Example of numbers suballocated by a United States Army battalion

Numbers	*Assigned to*
000 through 199	Battalion or squadron fires cell
200 through 299	A company or troop
300 through 399	B company or troop
400 through 499	C company or troop
500 through 599	D company or troop
600 through 699	Additional companies and troops or fire support assets
700 through 799	Battalion or squadron mortar platoon (or section)

EXAMPLE

An Army battalion to which a mortar platoon is assigned is allocated target numbers 3000 to 3999. A mortar platoon's block of numbers would be 3700 to 3799. If a division is assigned a first letter of A, and a division then assigns the BCT a second letter of B, a mortar platoon's block of target numbers could be AB3700 to AB3799.

Table 2-6. Example of United States Marine Corps battalions suballocations of target numbers

Numbers	*Assigned to*
000 through 199	Marine Corps Infantry battalion fire support coordination center
200 through 299	Lowest lettered Infantry company
300 through 399	Second lowest lettered Infantry company
400 through 499	Third lowest lettered Infantry company
500 through 599	Weapons company
600 through 699	Scout sniper platoon
700 through 799	81-millimeter mortar platoon

CONTROL MEASURE SYMBOLS

2-129. The following standard symbols are used in the preparation of map, charts, and overlays to identify targets by type (see figure 2-3).

- Point target is a target less than 200 meters wide, identified with target numbers in top right corner.
- Linear target is more than 200 meters but less than 600-meters long. Targets longer than 600 meters require fire support assets other than mortars or be further subdivided into multiple targets for attack. A linear target is designated on the target list by two grids or a center grid, length, and attitude.
- Rectangular target is wider and longer than 200 meters. It is designated on the target list by four grids or a center grid, length, width, and attitude.
- Circular target is circular in nature or is vague as to its exact shape. It is designated by a center grid and a radius on the target list.
- FPFs are types of priority fires that are similar to linear targets. They are a prearranged barrier of indirect fire that prevent or stop the enemy from advancing.
- A series of targets is many targets or groups of targets planned to support the operation. The fact that a series has been formed does not avoid the attack of individual targets or groups of targets within the series. However, once the series is initiated, all of the targets are fired on in the predetermined sequence, as provided by the target list or schedule for the series.

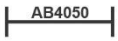
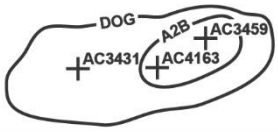
TYPE OF TARGET	SYMBOL
Point	
Linear	
Rectangular	
Circular	
Final protective fire	
Series of targets	

Figure 2-3. Example of target symbols

SECTION V – BATTALION FIRE SUPPORT PLAN

2-130. A fire support task is a task given to a fire support unit or organization that supports the commander's scheme of maneuver. Refer to ATP 3-09.42. A fire support task is an essential element of the fire support plan. The task is clear, concise, and include the elements of task, purpose, and effect.

2-131. The task states the supported maneuver task and the type(s) of effects the firing unit provides for the phase of the operation. The task describes what fire support accomplishes to support the operation. The effect identifies the desired result or outcome the delivered fire is to achieve. The purpose states the supported maneuver commander's intention and the desired end state for the targeted enemy formation, function, or capability. The purpose also describes the why of the fire support task. In this case, why is in order to disrupt the enemy's ability to observe our breaching operation.

2-132. The commander, given the responsibility to complete all or a portion of a task, plans in greater detail how the task will be accomplished. The planning detail typically increases, as the responsibility for task execution is refined at each echelon. Leaders ultimately identify the timing and controls to ensure that targets are effectively engaged. Detailed planning and execution is assisted by a planning worksheet. There is no prescribed format for these planning worksheets, but items for consideration, particularly for a fire support or field artillery task, might include the memory aid TTLODAC (see figure 2-4, page 2-24)—

- Target description.
- Trigger time or event.
- Location of the target (may be exact or general).
- Observers.
- Delivery system.
- Attack guidance.
- Communications.

PHASE: Descriptor if required.							
Task: (what): State the supported or maneuver commander task and the type(s) of effects the fires unit must provide for that phase of the operation (suppress, neutralize, interdict, divert, exploit, deny, delay, disrupt, degrade, destroy, obscuration, or screening). **Purpose (why):** State the supported/maneuver commander purpose and the desired end state for the targeted enemy formation/function/capability. (There may be more than one task/purpose per phase).							
Priority of fire: State the priority of fire to subordinate units for all fires assets under the unit's command and control.							
ALLOCATIONS: List any additional assets assigned to subordinates for planning. Examples are priority targets, radar zones, attack aviation.							
POSITIONING GUIDANCE: Provide positioning guidance to assets such as mortars or observers required for execution.							
RESTRICTIONS: List all restrictions for the phase.							
Fire Support Task	**(T)** Target	**(T)** Trigger	**(L)** Location	**(O)** Observer(s)	**(D)** Delivery System(s)	**(A)** Attack Guidance	**(C)** Communications
List the task number the target supports	List the target number or target type	State the trigger (tactical/technical) for the target	Give the target location	State the observer of the target (primary/alternate)	State the delivery system(s) for the target (primary & alternate)	State the attack guidance/ method of engagement for the target	State the frequency and common net the target will be called in on Primary, Alternate, Contingency, Emergency (PACE)
Notes: This is an alternate location that may include allocation of resources, positioning guidance, restrictions, and coordination information. List information deemed necessary.							

Figure 2-4. Example TTLODAC worksheet with fire support task

2-133. Another version of a planning worksheet similarly uses the memory aid PLOTCR to describe the task considerations for a given target (see figure 2-5). The considerations are—

- Purpose of the planned fires.
- Location of the target.
- Observer identification.
- Trigger event or method to initiate target engagement.
- Communication means among all agencies to observe the target engagement.
- Resources allocated for completing a task or target engagement.

PHASE II: Assault on Objective Bears

Task/Purpose:
Fire Support Task (FST) 1: Provide obscuration fires to disrupt the enemy's ability to observe breaching operation
Purpose 1: Enable the successful breaching operation.

Fire Support Task 2: Provide suppressive fires to disrupt the enemy mechanized infantry platoons' ability to place effective direct fire on the breach site.
Purpose 2: To enable the successful breaching operation.

Task	Target	(P) Purpose	(L) Location	(O) Observer(s)	(T) Trigger	(C) Communications	(R) Resources
FST 1	AB1000	Disrupt enemy's ability to observe breaching operations.	NG12344567	Primary: A Company Alternate: C Company	A Company lead element crosses Phase Line Blue.	Primary: Battalion mortar net FH800 Alternate: Field artillery fire direction net FH700	Primary: Battalion mortars Alternate: Field Artillery 20 minutes x 200 meters smoke
FST 2	AB1005	Disrupt the enemy's mechanized infantry platoons' ability to place effective direct fire on the breach site.	NG45671234	Primary: B Company FIST HQ Alternate: 1/B FO	When support by fire position 1 is set.	Primary: Field artillery fire direction net FH700 Alternate: Battalion fire support net FH600	Primary: Field artillery battalion 6 rounds high explosive/ variable time; Alternate: Attack aviation

Notes:
Priority of Fires: Field Artillery: A Company; Mortars: B Company
Allocations: A Company 1x Critical Friendly Zone; C Company 1x Field Artillery Priority Target
Positioning guidance: Mortars move along Route REDLEG and occupy mortar firing position 1 (azimuth of 1600); in place ready to fire not later than H+30 minutes.
Restrictions/FSCMs: Coordinated fire line is Phase Line RED; No-Fire Areas 1 & 2 in effect

LEGEND

FH	**FREQUENCY HOPPING**	**FSCM**	**FIRE SUPPORT COORDINATION MEASURES**
FIST	**FIRE SUPPORT TEAM**	**HQ**	**HEADQUARTERS**
FO	**FORWARD OBSERVER**		

Figure 2-5. Example PLOTCR completed worksheet

2-134. A task may require identification of various control measures (such as FSCMs, ACMs, and maneuver control measures) and any other considerations. Commanders adjust the worksheet format as needed.

2-135. Fire support tasks are created by the higher headquarters fires planning team. For instance, if the fire support task is part of the brigade operations order, it is planned at the brigade and assigned to a battalion that then assigns the task to a company. The company commander refines the task using TTLODAC as the development of the course of action is established. This is the true example of top down, bottom up refinement. See figure 2-4 on page 2-24 for an example worksheet format for an assigned task using TTLODAC and figure 2-5 with the PLOTCR format. (See ATP 3-09.42 for more information.)

TARGET REFINEMENT

2-136. The commander is responsible for the employment of indirect fires within the company or troop's assigned AO. A critical aspect of this responsibility is target refinement, in which the commander makes necessary changes to the fire support plan to ensure that targets accomplish the commander's intended battlefield purpose. Rather than merely executing targets without regard to the actual enemy situation, the

company commander and FSO, along with the mortar leader, adjust existing targets or nominate new targets that allow engagement of specific enemy forces.

2-137. Necessary refinements usually emerge when the commander war games as part of Step 6 (complete the plan) of the troop leading procedures (TLP). The war-gaming process enables the commander to identify required additions, deletions, and adjustments to the battalion fire support plan. The company FSO then submits refinements to the battalion FSO for inclusion in the scheme of fires for the mission. (This is normally only the first step of target refinement, with the commander and FSO making further adjustments as the enemy situation becomes clearer.)

2-138. As a specific requirement in defensive planning, the commander focuses on target refinement within the company's AO. This usually takes place as part of engagement area development. The commander makes appropriate adjustments to the targets based on refinements to the situation template, such as the actual positions of obstacles and enemy direct fire systems.

2-139. Because fire support is planned from the top down, cutoff times for target nomination and target refinement are normally specified in the battalion OPORD. Commanders ensure that nominations and refinements meet these deadlines in order to provide fire support planners with sufficient time to develop execution plans.

TACTICAL AND TECHNICAL TRIGGERS

2-140. The two types of triggers associated with a target are tactical and technical. The commander develops a tactical trigger for each target, then develops (or the FSO develops) the technical trigger. A tactical trigger is the maneuver-related event or action that causes the commander to initiate fires. This event can be friendly or enemy-based. The tactical trigger is usually determined during course of action development. The technical trigger is the mathematically derived solution for firing the indirect fires based on the tactical trigger to ensure that the indirect fires arrive at the correct time and location to achieve the desired effects. (See ATP 3-21.10 for more information.)

Note. Triggers can be marked using techniques similar to those for marking target reference points.

2-141. When selecting the tactical trigger, the commander, or designated observer, must be able to observe the enemy force or the event that is the tactical trigger if it is enemy-driven (for example, when enemy forces occupy their defensive positions via Objective Brown). The tactical trigger may also be friendly event- or time-driven (for example, when Charlie company crosses Phase Line Bowen).

2-142. Several factors govern the selection and position of the technical trigger. Critical factors are the enemy's likely locations or rate of travel and the time required for the enemy force to move from the technical trigger to the target area. Using this information, the commander can then select the technical trigger location based on the following considerations:

- The amount of time required to initiate the call for fire.
- The time needed by the fire support element to prepare for and fire the mission.
- The time required to clear the fires.
- Any built-in or planned delays in the firing sequence.
- The time of flight of the indirect fire rounds.
- Possible adjustment times.

2-143. The commander can use an estimated rate of enemy movement, along with the response time provided by the mortar leader, to complete the process of determining the location of the technical trigger in relation to the target area. Trigger lines or points (used in this method) are usually employed as technical triggers to synchronize the effects of direct fires, countermobility efforts, and indirect fires in time and space, rather than trying to engage moving targets based on mathematical calculations.

CEASING OR SHIFTING FIRES

2-144. The commander establishes triggers for ceasing or shifting fires based on battlefield events, such as the movement of enemy or friendly forces. One technique is the use of a minimum safe line when a friendly element, such as a breach force, is moving toward an area of indirect fires. As the element approaches the minimum safe line, observers' call for fires shift or cease, allowing the friendly force to move safely in the danger area.

CLEARANCE OF FIRES

2-145. *Clearance of fire* is the process by which the supported commander ensures that fires or their effects will have no unintended consequences on friendly units or the scheme of maneuver (FM 3-09). Fires are cleared to prevent inadvertent engagement of friendly elements and noncombatants.

2-146. The commander has responsibility to approve (clear) fires and the effects within the commander's AO. The commander also considers the effects the fires may have on an adjacent unit. Although the commander may delegate authority to coordinate and clear fires to the FSO, the ultimate responsibility belongs to the commander. Normally, the FSO helps the commander by making recommendations on the clearance of fires.

2-147. When the higher commander establishes ROE within the company or battalion's AO, the commander ensures they are followed through the operations process. ROE, especially during stability, often place limitations or prohibit the firing of certain types of indirect fire systems and ammunition within the company's AO. The ROE may also limit the types of targets and proximity to specified locations, such as schools, hospitals, and buildings of religious or cultural significance, as well as infrastructure to support the local civilian populace (food, energy, water).

OPERATION ORDER

2-148. Once an OPORD has been received by any means, the mortar leader finds the majority of the fire plan in three places. Two are within the execution paragraph, Scheme of Fires, which is the fifth subparagraph, and coordinating instructions, which is the eleventh subparagraph. There are multiple FSCMs in the coordinating instructions. The third is Annex D of the OPORD, which is the Fires Annex.

EXECUTION PARAGRAPH

2-149. The execution paragraph describes how the commander intends to accomplish the mission in terms of the commander's intent, an overarching concept of operations, schemes of employment for each warfighting function, assessment, specified tasks to subordinate units, and key coordinating instructions in the subparagraphs below. (See FM 6-0 for more information.)

2-150. There are eleven subparagraphs and they are—

- Commander's intent.
- Concept of operations.
- Scheme of movement and maneuver.
- Scheme of intelligence.
- Scheme of fires.
- Scheme of protection.
- Cyber electromagnetic activities.
- Stability operations.
- Assessment.
- Task to subordinate units.
- Coordinating instructions.

2-151. It is imperative the mortar leader understands the entire OPORD, including all subparagraphs. This helps the mortar leader meet the commander's intent with fires supporting the unit's mission accomplishment. The following paragraphs detail this process.

ANNEX D–FIRES

2-152. Commanders and staffs use Annex D (Fires) to describe how fires support the concept of operations described in the base plan or order. The fires cell develops Annex D (Fires).

2-153. This annex describes the fires concept of support objectives. A complex fires concept of support may require a schematic to show the fires objectives and task relationships. It includes a discussion of the overall fires concept of support with the specific details in element subparagraphs and attachments. It refers to the execution matrix to clarify timing relationships between various fires tasks. This annex contains the information needed to synchronize timing relationships of each element related to fires. It includes fires-related constraints, if appropriate. Annex D is composed of seven appendixes and this is where a mortar leader can find—

- Appendix 1–Fire Support Overlay.
- Appendix 2–Fire Support Execution Matrix.
- Appendix 3–Targeting.
- Appendix 4–Field Artillery Support.
- Appendix 5–Air Support.
- Appendix 6–Naval Fire Support.
- Appendix 7–Air and Missile Defense (Air and Missile Defense Officer).

Note. The mortar leader understands and ensures the mortar fire direction personnel receive the target list worksheet that is TAB D in appendix 3.

APPENDIX 1–FIRE SUPPORT OVERLAY

2-154. The fire support overlay is a group of graphic control measures composed of maneuver control and FSCMs. The graphic control measures are represented on the overlay using military symbols and are tracked on the mortar element situations maps, plotting boards, and loaded into whichever digital fire direction systems are used (MFCS, LHMBC, or both). Figure 2-6 is an example of a fire support overlay.

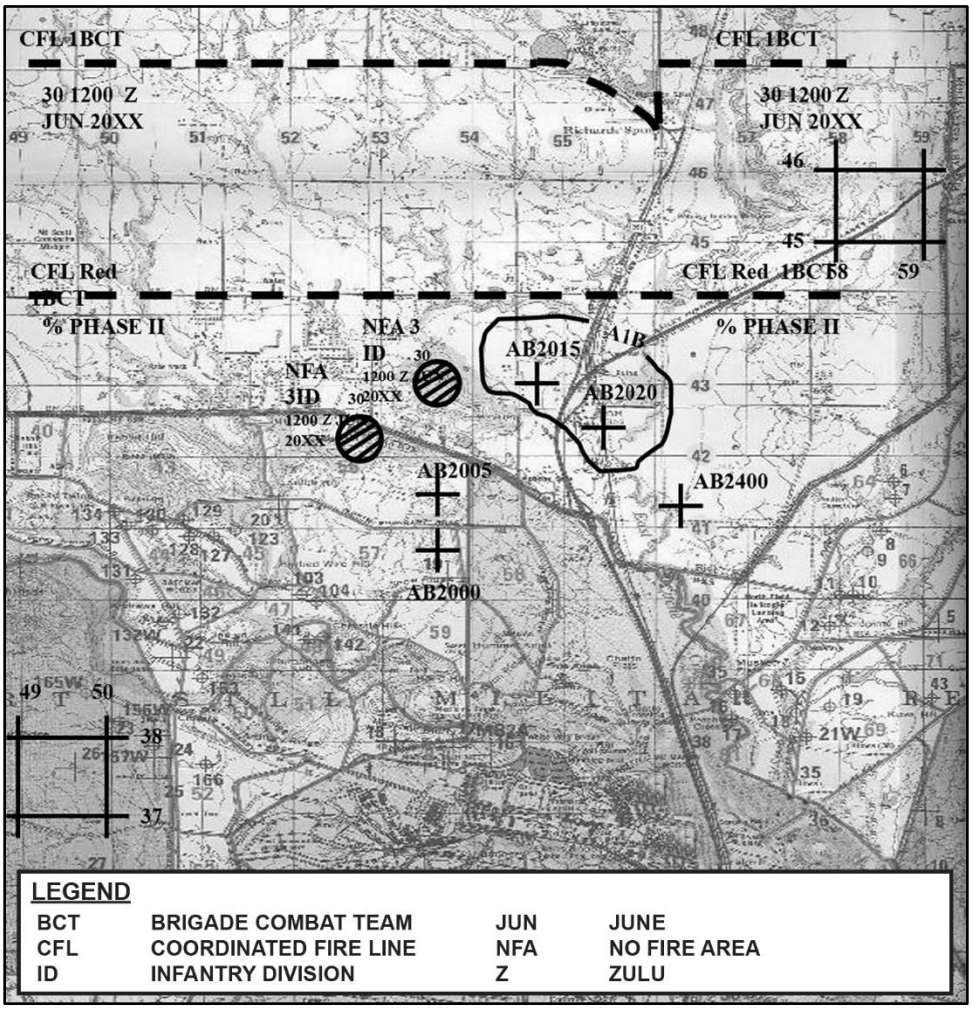


Figure 2-6. Fire support overlay

APPENDIX 2–FIRE SUPPORT EXECUTION MATRIX

2-155. The fire support execution matrix is a concise planning and execution tool for the offense and defense that shows the many factors of a sometimes complex fire support plan. This matrix helps fire support personnel and the commander understand how the fire plan supports the scheme of maneuver. When approved, the matrix becomes the primary execution tool, providing a detailed portrayal of the portions of the fire support plan that each BCT subordinate commander, fires cell, FSO, and observer handles when executing. The matrix can graphically communicate the details of the fires paragraph and ties executors to targets time or events of the scheme of maneuver. The format for the fire support execution matrix and techniques for its development and use varies according to individual unit TACSOPs.

2-156. The matrix is typically set up with the maneuver elements shown along the left side and different phases (phase lines, events, or times) of the mission along the top. Phases in the fire support execution matrix correspond to phases established on maneuver execution matrixes. Refer to figure 2-7 on page 2-30 for an example of a fire support execution matrix.

PHASES	PHASE 1 FPOL	PHASE II ATTACK	PHASE II DEFENSE	PHASE IV TO BE DETERMINED
Task Force CONTROL		1 x Platoon Attack Aviation →	→	
Team A/1-35 Armor	Field Artillery Priority of Fires AB1005 (P) →	1 x Field Artillery Priority Target	AB2010 (P)	→
Team B/1-35 Armor	Mortar Priority of Fires 1X Critical Friendly Zone AB2005 (A)	AB1110 (P)	AB2010 (A)	
Team C/1-6 Infantry	AB1005 (A)		1 x Field Artillery Priority Target AB1115 (A)	→
Team D/1-6 Infantry	On-order Field Artillery Priority of Fires AB2005 (P) →	AB110 (A) 1 x Mortar Target →	AB1115 (P) Field Artillery Priority of Fires	→
Team Force Mortar (4 x 120-mm)	Mortar Firing Position (MFP) 1 AB2005 (Platoon 6 rounds of high explosive) →	→	MFP 2 AB2010 (1 x 5 minutes 300m smoke screen)	

FIELD ARTILLERY ORGANIZATION FOR COMBAT 4-27 FA (3x6 155 SP) 2d BCT 2-3 FA (3x6 155 SP) R 4-27 FA	**MORTARS** MFP 1 NV123456 (Azimuth of Fire 1600) on-order move to MFP 2 NV345321 (Azimuth of Fire 1700) **CLOSE AIR SUPPORT** Close air support will be on station at H+30 minutes to H+1 hour (30 minutes). All missions need to be formulated and transmitted by assigned joint terminal attack controllers. Type 1 close air support missions only.	**AMMO AVAILABLE** Field Artillery: 15 x battalion 6 rounds of high explosive munitions, 5 x battalion 6 rounds of dual-purpose improved conventional munitions, 4 x 20 minute, 400m smoke screens 6 rounds of Excalibur Mortar: 20 x platoon 4 rounds of high explosive 8 x 5 minute, 300m smoke screens 6 rounds of precision high explosive
FIRE SUPPORT COORDINATION MEASURES **Coordinated Fire Line:** Phase Line HAROLD on-order Phase Line HOMER No-Fire Area 1: GV435678 (250 Radius) **Restrictive Fire Area 1:** GV465127 (500m radius) No dual-purpose improved conventional munitions,	**HIGH-PAYOFF TARGET/ATTACK GUIDANCE** 1. Maneuver (Suppress) 2. Fire Support Assets (Neutralize) 3. Air Defense Artillery (Suppress)	**COORDINATION INSTRUCTION** All company targets need to be submitted to the task force fires cell not later than H-6 Hours. Mortars will Route SOFTBALL and Route ROAD King for movement within the area of operations. Voice and digital communications checks will be conducted with the fires cell not later than H-2 Hours.
RESTRICTIONS Field artillery scatterable mine release authority is retained at the division level.	**TARGET BLOCK** Task Force 1-35 Armor: AB2000-2199 A/1-35 Armor: AB2200-2299 B/1-35 Armor: AB2300-2399 C/1-6 Infantry: AB2400-2499 D/1-6 Infantry: AB2500-2599	**REFINEMENT CUTOFF** Not later than H-6 Hours. **FIRE SUPPORT REHEARSAL** H-4 Hours at the task force command post vicinity GV765432

LEGEND

(A)	ALTERNATE	M	METERS	R	REINFORCING
BCT	BRIGADE COMBAT TEAM	MM	MILLIMETER	S	SELF PROPELLED
FA	FIELD ARTILLERY	MFP	MORTAR FIRING POSITION		
FPOL	FORWARD PASSAGE OF LINES	(P)	PRIMARY		

Figure 2-7. Example of a fire support execution matrix

2-157. DA Form 4655 (*Target List Worksheet*) facilitates fire planning. It is a preliminary list of targets and descriptions. Fire support personnel recommend targets be added to the fire support plan for the commander's approval. The mortar fire direction personnel can prepare preplanned data in support of any identified targets, for instance, the tentative direction of fire from the mortar-firing point. This information is refined after the mortar element occupies the position and fire direction personnel receive the base gun location. See figure 2-8 for an example of DA form 4655.

TARGET LIST WORKSHEET

( ) For use of this form, see ATP 3-09.30; the proponent agency is TRADOC.

SHEET 1 OF 1

LINE NO	TARGET NO	DESCRIPTION	LOCATION	ALTITUDE	ATTITUDE	SIZE L	SIZE W	SOURCE / ACCURACY	REMARKS
1	AA3410	82-mm mortars (4 tubes)	14SNG9233443554	340	0440	90	10	1st Plt FO	
2	AA3415	Infantry trench line	14SNG9185256035	410	1600	400	50		
3	AA3420	Aircraft landing strip	14SNG923345044	250	0800	1200	200		
4	AA3425	Regimental CP	14SNG9476534381	270	Radius	800			
5	AA3430	FPF	14SNG8756868955	370	1660	200			
6	AA3435	Road junction	14SNG8857367012	330					
7									
8									
9									
10									
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									
21									

DA FORM 4655, SEP 2017 PREVIOUS EDITIONS ARE OBSOLETE. APD LC v1.00

SAMPLE

LEGEND

CP	COMMAND POST	L	LENGTH	PLT	PLATOON
FO	FORWARD OBSERVER	MM	MILLIMETER	W	WIDTH
FPF	FINAL PROTECTIVE FIRE	NO	NUMBER		

Figure 2-8. Target list worksheet example

ECHELONMENT OF FIRES AND RISK ESTIMATE DISTANCE

2-158. The purpose of echeloning fires is to maintain constant fires on a target while using the optimum delivery system up to the point of its risk estimated distance (known as RED) in combat operations or minimum safe distance in training. (See ATP 3-09.32 for more information.) (Since it is used in training, minimum safe distance is not discussed further in this manual.) Echeloning fires provide protection for friendly forces as they move toward and assault an objective, allowing them to close with minimal casualties. It prevents an enemy from observing and engaging the assault by forcing them to take cover, allowing the friendly force to continue the advance.

2-159. The concept behind echeloning fires is to begin attacking targets on or around the objective using the weapons system with the largest RED. As a maneuver unit closes the distance, crossing the RED line for that specific munition en route to the objective, fires cease, shift, or switch to a different system, such as the

120-mm or 60-mm mortar. This triggers engagement of the targets by the delivery system with the next largest RED-combat. The length of time to engage targets is based on the rate of the friendly force's movement between the RED-combat trigger lines. The process continues until the system with the least RED-combat ceases fires and the maneuver unit is close enough to eliminate the enemy with direct fires or make its final assault and clear the objective.

2-160. Using echelon of fires within the specified RED-combat for a delivery system requires a unit to assume some risks. Maneuver commanders determine, by delivery system, how close they allow fires to fall in proximity to the forces. The commander makes the decision for this risk level but relies heavily on the FSO's expertise. The commander considers the effects of terrain and weather, experience of the observers, and communication systems involved. While this planning is normally accomplished at the battalion level, the company FSO has input and must be familiar with the process.

RISK-ESTIMATE DISTANCE

2-161. RED takes into account the bursting radius of munitions and characteristics of the delivery system. It associates this combination with a probability of incapacitation for personnel at a given range. RED is the minimum distance at which friendly troops can approach friendly fires without 0.1 percent or more probability of incapacitation. A commander may maneuver the units into the RED area based on the mission, but then makes a command decision to accept the additional risk to friendly forces. (See ATP 3-09.32 for more information.)

EXAMPLE

When a battalion makes contact with an enemy during a movement to contact, an example of echelonment of fires and REDs is when an Infantry battalion commander and an FSO in close coordination with ground maneuver directs and executes—

- On-call close air support on the objective.
- The DS fires- or DS battalion 155-mm artillery fires on the objective while the close air support shifts to another target.
- When the maneuver element reaches the RED for 155-mm fires, the artillery shifts to another target and the 120-mm mortars commence firing.
- When the maneuvering force reaches the RED for 120-mm mortars, the 120-mm mortars shift to another objective and the company 60-mm mortars commence firing.
- When the maneuver element reaches the RED for 60-mm mortars, the maneuver element begins direct fire on the objective from a support by fire position.
- The maneuver force assaults and seizes the objective.

Chapter 3
Mortar Units in Operations

This section discusses in general terms the Army's overarching guidance on unified land operations. Military operations occur in complex environments shaping the nature and affecting outcomes. This requires an understanding of the operational environment in which the unit fights, how the Army fights, and the way small-unit leaders lead their units and how Soldiers conduct themselves. Offensive, defensive, and stability operations take place simultaneously throughout the land component's AO, although subordinate elements, particularly those at brigade and lower echelons, generally focus on one type of operation at a time. Units engaged in close operations generally focus on offensive or defensive operations first, although they take into account long-term stability considerations while executing those operations. Avoiding civilian casualties and unnecessary destruction of infrastructure are examples of stability considerations that all units account for during planning. (See FM 3-0 for more information.)

SECTION I – UNIFIED ACTION

3-1. *Unified action* is the synchronization, coordination, and/or integration of the activities of governmental and nongovernmental entities with military operations to achieve unity of effort (JP 1). *Unity of effort* is coordination and cooperation toward common objectives, even if the participants are not necessarily part of the same command or organization, which is the product of successful unified action (JP 1).

3-2. *Unified action partners* are those military forces, governmental and nongovernmental organizations, and elements of the private sector with whom Army forces plan, coordinate, synchronize, and integrate during the conduct of operations (ADP 3-0). Military forces play a key role in unified action before, during, and after operations. The Army's contribution to unified action is unified land operations.

OPERATIONAL ENVIRONMENT

3-3. An *operational environment* is a composite of the conditions, circumstances, and influences that affect the employment of capabilities and bear on the decisions of the commander (JP 3-0). An operational environment encompasses physical areas of the air, land, maritime, space, and cyberspace domains; as well as the information environment (which includes cyberspace); the electromagnetic spectrum, and other factors. Included within these are adversary, enemy, friendly, and neutral actors that are relevant to a specific operation.

3-4. Commanders and staffs analyze an operational environment using the eight operational variables. Though a battalion or BCT-level staff is capable of generating a truncated analysis of the operational environment, the division or corps-level intelligence analysts provide the detail necessary to fully understand the complexity of the operational environment.

OPERATIONAL VARIABLES

3-5. Commanders and staffs use the operational and mission variables to help build their situational understanding. They analyze and describe an operational environment in terms of eight interrelated operational variables: political, military, economic, social, information, infrastructure, physical environment, and time.

3-6. The operational variables are fundamental to developing a comprehensive understanding of the operational environment. The following is a brief description of each variable, along with examples (in parentheses) of questions a small-unit commander might need to have answered about each variable.

- Political. Describes the distribution of responsibility and power at all levels of governance—formally constituted authorities, as well as informal or covert political powers. (Who is the tribal leader in the village?)
- Military. Exposes the military and paramilitary capabilities of all relevant actors (enemy, friendly, and neutral) in a given operational environment. (Does the enemy in this neighborhood have antitank missiles?)
- Economic. Encompasses individual and group behaviors related to producing, distributing, and consuming resources. (Does the village have a high unemployment rate?)
- Social. Describes the cultural, religious, and ethnic makeup within an operational environment and the beliefs, values, customs, and behaviors of society members. (Who are the influential people in the village—for example, religious leaders, tribal leaders, warlords, criminal bosses, or prominent families?)
- Information. Describes the nature, scope, characteristics, and effects of individuals, organizations, and systems that collect, process, manipulate, disseminate, or act on information. (How much access does the local population have to news media or the Internet?)
- Infrastructure. Comprises the basic facilities, services, and installations needed for the functioning of a community or society. (Is the electrical generator in the village working?)
- Physical environment. Includes the geography and man-made structures as well as the climate and weather in the AO. (What types of terrain or weather conditions in this AO favor enemy operations?)
- Time. Describes the timing and duration of activities, events, or conditions within an operational environment, as well as how various actors in the operational environment perceive the timing and duration. (For example, at what times are people likely to congest roads or conduct activities that provide cover for hostile operations?)

MISSION VARIABLES

3-7. Mission variables describe characteristics of the AO, focusing on how they might affect a mission. Incorporating the analysis of the operational variables into METT-TC ensures Army leaders consider the best available relevant information about conditions that pertain to the mission. (See FM 6-0 for more information.) The mission variables are—

- Mission. Commanders and staffs view all of the mission variables in terms of the impact on mission accomplishment. The mission is the task, together with the purpose, that clearly indicates the action to be taken and the reason for the action. It is always the first variable commanders consider during decision-making. A mission statement contains the who, what, when, where, and why of the operation.
- Enemy. The second variable to consider is the enemy dispositions (to include organization, strength, location, and tactical mobility), doctrine, equipment, capabilities, vulnerabilities, and probable courses of action.
- Terrain and weather. Terrain and weather analysis are inseparable and directly influence each other's impact on military operations. Terrain includes natural features (such as rivers and mountains) and man-made features (such as cities, airfields, and bridges). Commanders analyze terrain using the five military aspects of terrain: observation and fields of fire, avenues of approach, key and decisive terrain, obstacles, cover and concealment. The military aspects of weather include visibility, wind, precipitation, cloud cover, temperature, and humidity.
- Troops and support available. This variable includes the number, type, capabilities, and condition of available friendly troops and support. This includes supplies, services, and support available from joint, host nation, and unified action partners. They include support from civilians and contractors employed by military organizations, such as the Defense Logistics Agency and the Army Materiel Command.

- Time available. Commanders assess the time available for planning, preparing, and executing tasks and operations. This includes the time required to assemble, deploy, and maneuver units in relationship to the enemy and conditions.
- Civil considerations. Civil considerations are the influence of man-made infrastructure, civilian institutions, and activities of the civilian leaders, populations, and organizations within an AO on the conduct of military operations. Civil considerations are comprised of six characteristics to include areas, structures, capabilities, organizations, people, and events (ASCOPE).

3-8. Upon receipt of a WARNORD or mission, leaders filter relevant information categorized by the operational variables into the categories of the mission variables used during mission analysis. The mission variables consist of METT-TC.

3-9. Input from the operational variables often emphasizes the operational environment civil aspects. This emphasis is most obvious in civil considerations, but it affects the other mission variables of METT-TC as well. In conjunction with the battalion or brigade intelligence staff officer, the platoon leader analyzes civil considerations in terms of ASCOPE. (See ATP 2-01.3 for more information.)

THREATS AND HAZARDS

3-10. The mortar platoon or section interacts with people at many levels. One reason land operations are complex is all categories are intermixed, often with no easy means to distinguish one from another. In general, the people in any AO can be categorized as a threat, an enemy, or an adversary (see ADP 3-0 for more information.)

- *Threat*. Any combination of actors, entities, or forces that have the capability and intent to harm U.S. forces, U.S. national interests, or the homeland (ADP 3-0).
  - *Hybrid threat*. The diverse and dynamic combination of regular forces, irregular forces, terrorists, or criminal elements unified to achieve mutually benefitting effects (ADP 3-0). Hybrid threats are most effective when they exploit friendly constraints, capability gaps, and lack of situational awareness.
  - Peer threat. An adversary or enemy with capabilities and capacity to oppose U.S. forces across multiple domains worldwide or in a specific region where they enjoy a position of relative advantage. Peer threats possess roughly equal combat power in geographical proximity to a conflict area with U.S. forces.
- *Enemy*. A party identified as hostile against which the use of force is authorized (ADP 3-0). An enemy is a combatant and is treated as such under the law of war.
- *Adversary*. A party acknowledged as potentially hostile to a friendly party and against which the use of force may be envisaged (JP 3-0).
- *Hazard*. Condition with the potential to cause injury, illness, or death of personnel; damage to or loss of equipment or property; or mission degradation (JP 3-33). Hazards include disease, extreme weather phenomena, solar flares, and areas contaminated by toxic materials. Hazards can damage or destroy life, vital resources, and institutions, or prevent mission accomplishment. Understanding hazards and the effects on operations allows the commander to understand better the terrain, weather, and various other factors that best support the mission.

3-11. It is imperative for the mortar leader to understand the threat and hazard that could affect the supporting fires the mortar element can provide. For example, if operating near coastlines or mountains, a major hazard could be the effect of sudden changes and velocity of the wind.

3-12. Incorporating civil considerations into mission analysis requires critical thinking, collaboration, continuous learning, and adaptation. It requires analyzing area, structures, capabilities, organizations, people, and events. In support of unified land operations, Army forces at every echelon strive to obtain support from the indigenous population and institutions. Many social factors influence perceptions; these include language, culture, geography, history, education, beliefs, perceived objectives and motivation, communications media, and personal experience.

SECTION II – UNIFIED LAND OPERATIONS

3-13. The Army's operational concept—the central idea that guides the conduct of Army operations—is unified land operations. *Unified land operations* is the simultaneous execution of offense, defense, stability, and defense support of civil authorities across multiple domains to shape operational environments, prevent conflict, prevail in large-scale combat operations, and consolidate gains as part of unified action (ADP 3-0).

3-14. Unified land operations describe the Army's approach to generating and applying combat power in campaigns and operations. Tactical action is a battle or engagement, employing lethal or nonlethal actions designed for a specific purpose about the enemy, the terrain, friendly forces, or another entity. Tactical actions include varied activities; such as an attack to seize a piece of terrain or destroy an enemy unit, the defense of a population, and training other militaries as part of building partner capacity to assist security forces. Army unified land operations are characterized by flexibility, integration, lethality, adaptability, depth, and synchronization. (See ADP 3-0 for more information.)

PRINCIPLES AND TENETS OF UNIFIED LAND OPERATIONS

3-15. By integrating the six principles of unified land operations—mission command, develop the situation through action, combined arms, adherence to the law of war, establish and maintain security, and create multiple dilemmas for the enemy—Army commanders increase the probability of operational and strategic success. (See ADP 3-0 for more information.)

3-16. *Tenets of operations* are desirable attributes that should be built into all plans and operations and are directly related to the Army's operational concept (ADP 1-01). Tenets of unified land operations describe the Army's approach to generating and applying combat power across the range of military operations during decisive action. Army operations are characterized by four tenets:

- Simultaneity.
- Depth.
- Synchronization.
- Flexibility.

3-17. *Simultaneity* is the execution of related and mutually supporting tasks at the same time across multiple locations and domains (ADP 3-0). Army forces operating simultaneously across all five domains present dilemmas to adversaries and enemies, while reassuring allies and influencing neutrals. (See ADP 3-0 for more information.)

3-18. *Depth* is the extension of operations in time, space, or purpose to achieve definitive results (ADP 3-0). Army forces engage the enemy throughout their depth, preventing the effective employment of reserves, and disrupting command and control, logistics, and other capabilities not in direct contact with friendly forces. Empowering subordinates to act with initiative decentralizes decision-making and increases operational tempo to achieve greater depth during operations.

3-19. *Synchronization* is the arrangement of military actions in time, space, and purpose to produce maximum relative combat power at a decisive place and time (JP 2-0). Synchronization is not the same as simultaneity; it is the ability to execute multiple related and mutually supporting tasks in different locations at the same time.

3-20. *Flexibility* is the employment of a versatile mix of capabilities, formations, and equipment for conducting operations (ADP 3-0). To achieve tactical, operational, and strategic success, commanders must be able to adapt to changing conditions and employ forces in a variety of ways.

OPERATIONS STRUCTURE

3-21. The operations structure—operations process, warfighting functions, and operational framework—is the Army's common construct for unified land operations. The operations process provides a broadly defined approach to developing and executing operations. The operational framework provides Army leaders with basic conceptual options for visualizing and describing operations. (See ADP 5-0 for more information.)

OPERATIONS PROCESS

3-22. The operations process is a commander-led activity informed by mission command. It comprises the major mission command activities performed during operations: planning, preparing, executing, and continuously assessing the operation. These activities may be sequential or simultaneous. They are rarely discrete and often involve a great deal of overlap. (See ADP 5-0 for more information.)

3-23. *Planning* is the art and science of understanding a situation, envisioning a desired future, and determining effective ways to bring that future about (ADP 5-0). Planning comprises two separate but interrelated components: a conceptual component and a detailed component.

3-24. *Preparation* are those activities performed by units and Soldiers to improve their ability to execute an operation (ADP 5-0). Preparation creates conditions that improve friendly forces' opportunities for success. It requires commander, staff, unit, and Soldier actions to ensure the force is trained, equipped, and ready to execute operations.

3-25. *Execution* is the act of putting a plan into action by applying combat power to accomplish the mission adjusting operations based on changes in the situation (ADP 5-0). In execution, commanders and staffs focus their efforts on translating decisions into actions.

3-26. *Assessment* is determination of the progress toward accomplishing a task, creating a condition, or achieving an objective (JP 3-0). Assessment precedes and then occurs during the other activities of the operations process and helps the commander determine progress toward achieving the desired end state, attaining objectives, and performing tasks.

MILITARY DECISION-MAKING PROCESS

3-27. The *military decision-making process* is an iterative planning methodology to understand the situation and mission, develop a course of action, and produce an operation plan or order (ADP 5-0). It integrates activities of the commander, staff, subordinate headquarters, and other partners.

3-28. This integration enables them to understand the situation and mission; develop, analyze, and compare courses of action; decide on the course of action that best accomplishes the mission; and produce an order for execution. The military decision-making process applies to both conceptual and detailed approaches. It is most closely associated with detailed planning. (See ADP 5-0 for more information.)

TROOP LEADING PROCEDURES

3-29. *TLP* are a dynamic process used by small-unit leaders to analyze a mission, develop a plan, and prepare for an operation (ADP 5-0). Heavily weighted in favor of familiar problems and short planning periods, organizations with staffs typically do not employ TLP. (See ADP 5-0 for more information.)

SECTION III – DECISIVE ACTION

3-30. *Decisive action* is the continuous, simultaneous execution of offensive, defensive, and stability operations or defense support of civil authorities' tasks (ADP 3-0). Commanders seize, retain, and exploit the initiative while synchronizing their actions to achieve the best effects possible.

3-31. Operations conducted outside the U.S. and its territories simultaneously combine three elements of decisive action—offense, defense, and stability. Within the U.S. and its territories, decisive action combines elements of the defense support of civil authorities and, when necessary, offense and defense to support homeland defense.

3-32. Each decisive action operation has numerous associated subordinate tasks. When combined with who (unit), when (time), where (location), and why (purpose), the tasks become mission statements. Mortar units provide lethal and nonlethal fires that are vital for close combat in both the offense and defense. During stability and civil support operations, restrictions on lethal force laid out in the unit's ROE may limit mortar fires.

OFFENSIVE OPERATIONS

3-33. An *offensive operation* is an operation to defeat or destroy enemy forces and gain control of terrain, resources, and population centers (ADP 3-0.) Offensive operations impose a commander's will on the enemy and are the most direct means of seizing, retaining, and exploiting the initiative to gain a physical and psychological advantage. Mortar units are used to support the maneuver force during offensive operations and to—

- Destroy or neutralize enemy units.
- Suppress an enemy's observation and fire.
- Fix an enemy.
- Provide close supporting fires for the assault.

DEFENSIVE OPERATIONS

3-34. A *defensive operation* is an operation conducted to defeat an enemy attack, gain time, economize forces, and develop conditions favorable for offensive or stability operations (ADP 3-0). Normally the defense cannot achieve a decisive victory. However, it sets conditions for a counteroffensive or counterattack that enables forces to regain the initiative. Commanders can conduct defensive operations to gain time and economize forces so offensive operations can be executed elsewhere. Mortar units are used to support defensive operations and to—

- Suppress or destroy enemy-supporting weapons.
- Disrupt enemy troop concentrations.
- Destroy an enemy conducting close dismounted assaults.
- Regain the initiative.

STABILITY OPERATIONS

3-35. *Stability operations* are operations conducted outside the United States in coordination with other instruments of national power to establish or maintain a secure environment and provide essential government services, emergency infrastructure reconstruction, and humanitarian relief (ADP 3-0). These operations support governance by a host nation, an interim government, or military government. Commanders are legally required to provide minimum-essential stability operations when controlling populated AO. These essential services provide minimal levels of security, food, water, shelter, and medical treatment. During stability operations, mortar units are used to—

- Support forces in contact.
- Protect friendly bases from attack.
- Destroy enemy indirect fire capability.
- Provide illumination.
- Perform Infantry-common tasks.

SECTION IV – OFFENSIVE OPERATIONS

3-36. Offensive actions are combat operations conducted to defeat and destroy enemy forces and seize terrain, resources, and population centers. They impose the commander's will on the enemy. A commander may also conduct offensive actions to deprive the enemy of resources, seize decisive terrain, deceive or divert the enemy, develop intelligence, or hold an enemy in position. (See FM 3-90-1 for more information.)

3-37. Offensive operations are characterized by surprise, concentration, tempo, and audacity. Effective offensive action capitalizes on accurate and timely intelligence and other relevant information regarding enemy forces, weather, and terrain. (See ADP 3-90 for more information.)

3-38. The main purpose of the offense is to defeat, destroy, or neutralize the enemy force. Fires from mortars are integrated with all available direct and indirect fires to support a commander's scheme of maneuver. Mortar units participate in offensive operations as part of a larger force. When necessary to limit interference

with friendly direct fire visibility of the enemy, mortar rounds are set to achieve airburst to reduce dust and dirt thrown into the air.

3-39. Army offensive operations are—

- Movement to contact.
- Attack.
- Exploitation.
- Pursuit.

MOVEMENT TO CONTACT

3-40. *Movement to contact* is a type of offensive operation designed to develop the situation and to establish or regain contact (ADP 3-90). The goal of a movement to contact is to make initial contact with a small element while retaining enough combat power to develop the situation and mitigate the associated risk. A movement to contact creates favorable conditions for subsequent tactical actions. Commanders conduct a movement to contact when an enemy situation is vague or not specific enough to conduct an attack. A movement to contact may result in a meeting engagement. Once an enemy force makes contact, the commander has five options: attack, defend, bypass, delay, or withdraw. Subordinate forms of a movement to contact include search and attack and cordon and search operations.

3-41. Mortars provide a maneuver commander the most responsive means of indirect fire support during a movement to contact. Displacement techniques used by mortar platoons during this operation depend on the distance to be traveled, the likelihood of enemy contact, and the maneuver commander's guidance. For example, if the objective in a movement to contact is beyond the range of mortars, a mortar platoon can displace by section providing continuous indirect fire support in case of enemy attack, or the entire mortar platoon can be ordered to displace, moving close behind a maneuver element. While a mortar platoon, section, or squad is displacing, it must be prepared to immediately engage targets using standard indirect fire procedures, direct-lay, direct-alignment, or hip-shoot techniques of engagement. Mortar unit leaders aggressively seek out information useful to understanding the changing battlefield environment to accurately recommend employment techniques for the most responsive and effective mortar fires. Considerations for employment of mortars during a movement to contact are—

- Giving priority of fires to leading elements or elements in contact.
- Having an FO for the lead element operate under decentralized control.
- Anticipating frequent moves and hip shoots.
- Expecting numerous requests for immediate smoke to occur when contact is established. (Mortar leaders may consider carrying a larger number of smoke rounds and modifying the ammunition resupply mix to include more smoke.)
- Planning fires along the route and on the flanks, especially on high-speed avenues of approach into the lead element's flanks.
- Planning fires on likely enemy OPs that can observe the march route, designating these as named areas of interest, later to be designated as target areas of interest on confirmation of enemy activity within the area.
- Preparing to fire on enemy forces that directly threaten the mortar unit.
- Maintaining situational awareness and considering methods to increase mortar unit security, such as moving within direct fire support of a maneuver element.

3-42. Fire planning on key terrain and likely enemy positions increases mortar responsiveness upon enemy contact. It includes possible targets en route to the march objective, on the march objective, and beyond.

3-43. *Search and attack* is a technique for conducting a movement to contact that shares many of the characteristics of an area security mission (FM 3-90-1). A commander employs this form of a movement to contact when the enemy is operating as small, dispersed elements whose locations cannot be determined to targetable accuracy by methods other than a physical search or when the task is to deny the enemy the ability to move within a given area. A search and attack is conducted primarily by dismounted Infantry forces and often supported by armor, mechanized, and Stryker-equipped forces.

3-44. *Cordon and search* is a technique of conducting a movement to contact that involves isolating a target area and searching suspected locations within that target area to capture or destroy possible enemy forces and contraband (FM 3-90-1). Commanders conducting a cordon and search organize units into four elements: command, security, search or assault, and support. Cordon and search is normally conducted at the maneuver battalion level and below. ATP 3-21.10 establishes multi-Service tactics, techniques, and procedures for cordon-and-search operations.

ATTACK

3-45. An *attack* is a type of offensive operation that destroys or defeats enemy forces, seizes and secures terrain, or both (ADP 3-90). Attacks incorporate coordinated movement supported by fires. They may be part of either decisive or shaping operations. An attack may be characterized as hasty or deliberate, depending on the time available for assessing the situation, planning, and preparing.

3-46. A commander may decide to conduct an attack using only fires, based on an analysis of the mission variables. An attack differs from a movement to contact because, in an attack, commanders know at least part of an enemy's dispositions. This knowledge enables commanders to better synchronize and employ combat power.

HASTY

3-47. Hasty attacks usually involve little or no time for planning additional fire support. Most targets engaged by mortars are targets of opportunity. Considerations for the employment of mortars during a hasty attack are the following:

- Short and intense missions, target series, or target groups may be used to mass fires on critical areas or targets sets.
- Immediate suppression and immediate smoke fire missions are anticipated.
- Rapid shift of massed fires to exploit identified enemy weak points is expected.
- Ammunition types, especially low-density ammunition such as smoke, may be in short supply as a hasty attack begins.
- Situational awareness is maintained and fire support requirements anticipated.

3-48. After a hasty attack, mortars are resupplied quickly. This enables them to support a continuation of the attack, to protect against a counterattack, or to transition to the defense. Any movement during this phase of the operation quickly minimizes a maneuver element’s vulnerability to a counterattack.

DELIBERATE

3-49. Deliberate attacks allows for more planning time, detailed intelligence, and detailed scheme of maneuver, to include the plan for fire support. Considerations for the employment of mortars during a deliberate attack are—

- Long preparations increasing a unit’s vulnerability to counterfire.
- Mortar elements consider—
  - Dug-in and well-camouflaged positions.
  - Firing missions at the lowest charge and elevation.
  - Frequent displacements, to include firing missions from unprepared positions and then displacing to the prepared positions.
  - Independent split section operations.
  - Massed fires from multiple sections.

3-50. A mortar platoon delivers fires on targets. Company mortars may be included in these fires or may be used against targets of opportunity. Mortar unit leaders consider preparation of ammunition, registration, and resupply. Use of prestocked ammunition, where possible, allows a mortar platoon to save its basic or combat load for the continuing attack.

3-51. The commander can launch an attack to achieve various results or for special purposes. These subordinate attack operations include the—

- Ambush.
- Counterattack.
- Demonstration and feint.
- Raid.
- Spoiling task.

Ambush

3-52. An *ambush* is an attack by fire or other destructive means from concealed positions on a moving or temporarily halted enemy (FM 3-90-1). An ambush stops, denies, or destroys enemy forces by maximizing the element of surprise. In an ambush, ground objectives do not have to be seized and held.

3-53. During ambushes, mortar units can support the maneuver force by—

- Isolating an objective or kill zone.
- Destroying or suppressing nearby enemy forces and enemy forces reacting to a raid or ambush.
- Destroying an enemy within an objective area or kill zone. In a vehicular ambush, mortars can be used to force an enemy to button up.
- Providing illumination.
- Covering the movement of friendly forces after an attack.

Counterattack

3-54. A *counterattack* is an attack by part or all of a defending force against an enemy attacking force, for such specific purposes as regaining ground lost or cutting off or destroying enemy advance units, and with the general objective of denying to the enemy the attainment of the enemy's purpose in attacking. In sustained defensive actions, it is undertaken to restore the battle position and is directed at limited objectives (ADP 1-02).

Demonstration and Feint

3-55. In military deception, a *demonstration* is a show of force in an area where a decision is not sought that is made to deceive an adversary. It is similar to a feint, but no actual contact with the adversary is intended (JP 3-13.4). A *feint* in military deception is an offensive action involving contact with the adversary conducted for the purpose of deceiving the adversary as to the location and/or time of the actual main offensive action (JP 3-13.4).

3-56. A commander uses demonstrations and feints in conjunction with other military deception activities. They generally attempt to deceive the enemy and induce the enemy commander to move reserves and shift fire support assets to locations where they cannot immediately impact the friendly decisive operation or take other actions not conducive to the enemy's best interests during the defense. The commander could employ mortars fires to be the main factor with deception fires.

Raid

3-57. A *raid* is an operation to temporarily seize an area to secure information, confuse an adversary, capture personnel or equipment, or to destroy a capability culminating in a planned withdrawal (JP 3-0). Raids are usually small, involving battalion-sized or smaller forces.

3-58. Raids are normally conducted in five phases: insertion or infiltration, objective area sealed off, surprise attack, objective seized and task accomplished, and withdrawal. Operations designed to rescue and recover individuals and equipment in danger of capture are normally conducted as raids.

Spoiling Attack

3-59. A *spoiling attack* is a tactical maneuver employed to seriously impair a hostile attack while the enemy is in the process of forming or assembling for an attack (FM 3-90-1). The objective of a spoiling attack is to disrupt the enemy's offensive capabilities and timelines while destroying targeted enemy personnel and equipment, not to seize terrain and other physical objectives. A spoiling attack usually employs armored, attack helicopter, or fire support elements to attack enemy assembly positions in front of the friendly commander's main line of resistance or battle positions. This is a prime example of harassment fires that the mortar platoon or sections can be integrated into.

3-60. A commander conducts a spoiling attack to—

- Disrupt the enemy's offensive preparations.
- Destroy key assets that the enemy requires to attack, such as fire support systems, fuel and ammunition stocks, and bridging equipment.
- Gain additional time for the defending force to prepare its positions.
- Reduce the enemy's current advantage in the correlation of forces.

EXPLOITATION

3-61. *Exploitation* is a type of offensive operation that usually follows a successful attack and is designed to disorganize the enemy in depth (ADP 3-90). Exploitations seek to disintegrate enemy forces to the point where they have no alternative but surrender or take flight. Exploitations take advantage of tactical opportunities. Division and higher headquarters normally plan exploitations as branches or sequels to the current operation.

3-62. Since the force conducting an exploitation typically covers a wider front than an attacking force, fire support assets may find supported elements operating outside normal supporting ranges. They displace forward to ensure the continued provision of fires on and beyond enemy formations, which may cause some difficulty in supporting the exploiting force's flank elements. While field artillery assets are moving, organic mortar platoons and sections may be the only friendly indirect fire support available to maneuver commanders.

3-63. Exploitations can destroy an enemy's defenses and keep them disorganized so they cannot resupply or regroup forces. Exploitations require rapid advance and violent action. Pursuit normally follows successful exploitation. The primary difference is that it is oriented on the final destruction of retreating enemy units. Other considerations for the employment of mortars during an exploitation or pursuit are—

- More missions from any direction; planning for 360-degree fires.
- Increased requirement for mortar element local security.
- Frequent displacements and moving relatively close behind forward units.
- Mortar unit leaders maintain good situation awareness and anticipate maneuver elements needs for fire support.

3-64. In the exploitation, FRAGORDs are common. An operation may require changes in the direction of attack to ensure destruction of an enemy. There may be small groups of enemy throughout the AO, which may be a threat to the security of the mortar platoon or section.

3-65. Due to the speed with which an exploitation is conducted, mortars may be directed to move by platoon or section with, or just behind, a maneuver element. The majority of fire missions received during an exploitation are conducted using hip-shoot or direct-lay techniques.

PURSUIT

3-66. A *pursuit* is a type of offensive operation designed to catch or cut off a hostile force attempting to escape, with the aim of destroying it (ADP 3-90). There are two forms of the pursuit: frontal and combination. A pursuit normally follows a successful exploitation. However, if enemy resistance breaks down and enemy forces begin fleeing the battlefield, any offensive operation can transition into a pursuit. Pursuits entail rapid

movement and decentralized control. Bold action and calculated initiative are required in the conduct of a pursuit.

3-67. Even more so than during an exploitation, mortars may be a maneuver commander's only means of indirect fire support. As such, mortar leaders position the mortars to provide continuous fire support throughout the operation. Special consideration is given to mortar ammunition consumption during a pursuit, due to the higher difficulty and extended times for mortar ammunition resupply. Sections and squads generally cover greater distances between mortar-firing positions and are prepared to fire most missions using emergency firing techniques.

MORTAR SUPPORT IN THE OFFENSE

3-68. Movement, maneuver, and rapidly changing situations characterize offensive operations. Flexibility in fire support is required to provide effective fires. Commanders integrate all available fires to ensure all known or suspected enemy positions are targeted.

3-69. A mortar elements plans to conduct fires en route to, on, and beyond the objective. Mortars accomplish this by positioning near the line of departure, with a one-half to two-thirds maximum range forward of the line of departure, and then moving forward as needed.

3-70. Mortars provide support during an attack to neutralize, suppress, or destroy an enemy while the assault element moves to the final coordination line, screens friendly movement by obscuring the enemy's observation, neutralizes resistance during the final assault, and isolates the objective.

3-71. Mortars neutralize and suppress enemy defenses during the final phase of an attack by short, violent preparations targeted against forward defenses and OPs. Mortar fires are lifted or shifted at the last possible moment before assault elements close on the enemy's position.

3-72. Once an objective is seized, friendly forces consolidate and prepare to repulse enemy counterattacks or to reorganize with minimum loss of momentum to continue the attack. Mortars protect friendly troops during consolidation or reorganization by preventing enemy reinforcements from entering the objective area or by breaking up enemy counterattacks.

FIRES

3-73. Commanders plan mortar fires on the terrain to be traversed and on the flanks to protect the force. If friendly forces make unexpected contact, immediate suppression missions may be fired. Mortar sections establish firing positions within forward assembly areas to protect against enemy attacks. Mortar fires are always planned from these assembly areas, though they may not be registered or prefired.

FIRES EN ROUTE TO AN OBJECTIVE

3-74. Fires en route to an objective can be divided into the following phases:

- Short of the line of departure or line of contact. Because both maneuver and mortar units can identify those, plan fires in the vicinity of checkpoints, passage points, release points, and attack positions to support movement to the line of departure or line of contact. Plan targets to support in the event the enemy conducts a spoiling attack.
- From the line of departure or line of contact to the final coordination line. Fire smoke to screen the breaching operations and HE to suppress enemy fires. Plan mortar fires in the vicinity of known locations, such as friendly rally points, objective rally points, and assault positions.
- From the final coordination line to the limit of advance. Fires on and around the objective to destroy and isolate it. Besides fires on the objective, this includes fires on enemy mutually supporting positions. Plan interdiction fires on the rear of enemy locations and along likely avenues of withdrawal. Plan smoke and HE fires on likely enemy reserve positions and assembly areas. Plan fires on likely enemy counterattack routes and support positions.

PREPARATION FIRE

3-75. *Preparation fire* is normally a high volume of fires delivered over a short period of time to maximize surprise and shock effect (FM 3-09). Fires may start at a prescribed time or be held on call until needed. Fires normally begin before H-hour and may extend beyond it. Duration is influenced by factors, such as fire support needs of the entire force, number of targets, and firing assets and ammunition. Mortars may not always have adequate ammunition supplies or the range to fire on all planned targets. Commanders plan fires based on sustained rate of fire for each weapons system.

3-76. An example sequence of preparatory fires includes—

- Phase I provides for the early attack of enemy indirect fire support assets and observation capabilities. These targets are the slowest to recover. This degrades an enemy's ability to react with indirect fires and to gain intelligence about the friendly force. A battalion mortar platoon may play a major role in this phase of preparatory fires. A commander may mass fires against identified enemy mortar units or reconnaissance elements. Mortars may contribute to the counterfire program to free artillery and to aid in joint suppression of enemy air defense systems.
- Phase II concentrates on identified CPs, communications positions, assembly areas, and reserves. The goal is degradation of an enemy's ability to reinforce their defense and to shift forces to counter the main attack. Mortar targets are based on weapons capabilities.
- Phase III concentrates on the forward portions of an enemy defensive area and targets that pose an immediate threat to attacking troops. The purpose of this phase is to suppress and obscure enemy direct fire systems until the assault force has closed with them. Mortar fires are most likely used during this phase, especially against enemy reverse-slope positions, which can only be reached by high-angle fire.

ON-CALL FIRES

3-77. On-call fires are planned targets fired on request not influenced by time schedules. On-call targets isolate all or part of the objective, provide illumination during night attack, if needed, and disrupt an enemy counterattack.

FIRES IN SUPPORT OF CONSOLIDATION AND REORGANIZATION

3-78. Fires in support of consolidation and reorganization protect friendly units against enemy counterattack or reinforcement. Mortar fires on likely enemy withdrawal routes disrupt organized retrograde operations.

EXECUTION CONSIDERATIONS

3-79. When lead elements of an attacking force approach a designated phase line or control measure en route to an objective, an FSO normally begins the preparation. Lead element observers or company team FSO tracks movement rates and confirm them for a battalion FSO. A battalion FSO may need to adjust the plan during execution based on unforeseen changes to anticipated movement rates.

3-80. As a unit continues movement toward an objective, the first delivery system engages its targets. It maintains fires on targets until a unit reaches the line that corresponds to the RED of the weapon.

SECTION V – DEFENSIVE OPERATIONS

3-81. Defensive actions alone normally cannot achieve a decision. Their purpose is to create conditions for a counteroffensive that allows Army forces to regain the initiative. Other reasons for conducting defensive actions include—

- Retaining decisive terrain or denying a vital area to the enemy.
- Attriting or fixing the enemy as a prelude to offensive actions.
- Surprise action by the enemy.
- Increasing the enemy's vulnerability by forcing the enemy to concentrate subordinate forces.

3-82. A *defensive operation* is an operation to defeat an enemy attack, gain time, economize forces, and develop conditions favorable for offensive or stability operations (ADP 3-0). While the offense element of decisive action is more decisive, the defense is the stronger element. The static and mobile elements of the defense combine to deprive the enemy of the initiative. The defender contains the enemy while seeking every opportunity to transition to the offense. Successful defenses share the following characteristics:

- Disruption.
- Flexibility.
- Maneuver.
- Massing effects.
- Operations in depth.
- Preparation.
- Security.

3-83. All types of mortar fire can be employed during the defensive operation. Mortars can be used to disrupt the enemy from massing before an attack and disrupt the enemy supply lines and storage area operations. Heavy mortars can be more flexible for the battalion by shifting fires to where the enemy attacks with priority of fires constantly changing due to real-time situations as they develop. The mortar leader needs to understand the defensive operations that the element is supporting with indirect fires and act as a liaison for the command and to integrate mortar fires into the defensive plan.

AREA DEFENSE

3-84. The *area defense* is a type of defensive operation that concentrates on denying enemy forces access to designated terrain for a specific time rather than destroying the enemy outright (ADP 3-90). The focus of an area defense is on retaining terrain where the bulk of a defending force positions itself in mutually supporting, prepared positions.

3-85. Units maintain their positions and control the terrain between these positions. The decisive operation focuses fires into engagement areas, possibly supplemented by a counterattack. Commanders can use their reserve to reinforce fires, add depth, block, or restore a position by counterattack, seize the initiative, and destroy enemy forces. Units at all echelons can conduct an area defense.

MOBILE DEFENSE

3-86. The *mobile defense* is a type of defensive operation that concentrates on the destruction or defeat of the enemy through a decisive attack by a striking force (ADP 3-90). The mobile defense focuses on defeating or destroying the enemy by allowing enemy forces to advance to a point where they are exposed to a decisive counterattack by the striking force. The *striking force* is a dedicated counterattack force in a mobile defense constituted with the bulk of available combat power (ADP 3-90). A *fixing force* is a force designated to supplement the striking force by preventing the enemy from moving from a specific area for a specific time (ADP 3-90). A fixing force supplements the striking force. The commander uses the fixing force to hold attacking enemy forces in position, to help channel attacking enemy forces into ambush areas, and to retain areas from which to launch the striking force.

3-87. A mobile defense requires an AO of considerable depth. The commander must shape the battlefield, causing an enemy force to overextend its lines of communication, expose its flanks, and dissipate its combat power. Likewise, commanders move friendly forces around and behind the enemy force that is targeted to be cut off and destroyed. Divisions and larger formations normally execute mobile defenses. However, BCTs and maneuver battalions may participate as part of the fixing force or the striking force.

Note. The Army and USMC concept and terminology for the conduct of a mobile defense are different. The USMC does not use the fixing- and striking-force terminology. The USMC discussion of a mobile defense addresses allocating minimum forces to a positional defense while allocating maximum combat power to counterattack forces.

RETROGRADE

3-88. The *retrograde* is a type of defensive operation that involves organized movement away from the enemy (ADP 3-90). The enemy may force these operations, or a commander may execute them voluntarily. The higher commander of the force executing the retrograde approves the retrograde operation before its initiation in either case. The retrograde is a transitional operation; it is not conducted in isolation. It is part of a larger scheme of maneuver designed to regain the initiative and defeat the enemy. The three forms of the retrograde are—

- Delay.
- Withdrawal.
- Retirement.

3-89. A *delay* is when a force under pressure trades space for time by slowing down the enemy's momentum and inflicting maximum damage on enemy forces without becoming decisively engaged (ADP 3-90). In delays, units yield ground to gain time while retaining flexibility and freedom of action to inflict the maximum damage on enemy forces.

3-90. *Withdraw* is to disengage from an enemy force and move in a direction away from the enemy (ADP 3-90). Withdrawing units, whether all or part of a committed force, voluntarily disengage from an enemy force to preserve the withdrawing force or release it for a new mission.

3-91. A *retirement* is when a force out of contact moves away from the enemy (ADP 3-90). In each form of the retrograde, a force not in contact with the enemy moves to another location—normally by a tactical road march. In all retrograde operations, firm control of friendly maneuver elements is a prerequisite for success.

3-92. Mortars participate in the retrograde by providing responsive indirect fire support to harass, delay, destroy, suppress, obscure, or illuminate the enemy. In addition, a mortar platoon can screen the displacement of a rifle companies and provide deceptive fires to confuse an enemy as to a commander’s intent to withdraw or delay.

3-93. A mortar platoon supporting the delay or withdrawal provides a commander with a quick and effective means to support the maneuver. Mortar fire can be used to screen movement of friendly units between positions and delay lines, or to suppress enemy weapons so the maneuver platoons can move to break contact without heavy enemy fire. Planning for positioning of ammunition allows for an increased use of smoke. Mortar fires may be used to deceive an enemy by maintaining a heavy volume of fire while friendly elements withdraw.

3-94. In a delay or withdrawal, a mortar platoon plans its displacement so that it is in position to fire when needed. When and how to displace relies on how far mortars are behind the forward units, how far to the rear those units move, and the intensity of enemy contact. The platoon usually displaces by section.

3-95. In withdrawal, a mortar platoon can be effective when employed in support of the security force. Employing mortars in split sections allows mortars to be used in the deception plan and to support withdrawing maneuver elements. An effort is made to keep mortar fire at the same level during withdrawal to increase effectiveness of the deception plan.

3-96. A section or squad can be attached or placed under OPCON of the security force or detachment in contact. If enemy pressure is great, employing the entire mortar platoon can support the disengagement.

3-97. In a delay not under pressure, a mortar leader can expect to have half of the unit assigned to the detachment left in contact. These mortars are expected to fire the same number and types of missions as the complete unit.

3-98. While retrograde operations are conducted similarly for both the Army and the USMC, a retrograde is part of defensive operations for the Army. The USMC considers a retrograde as one of three fundamental types of defense. (See FM 3-0 or MCDP 1-0 for details.)

MORTAR SUPPORT IN THE DEFENSE

3-99. In the defense, a mortar platoon leader must understand the intent of defensive operations a commander employs. These operations affect how a mortar platoon provides support, since specific actions and techniques vary depending on the type of the defense. Mortar fires are used in defense against both mounted and dismounted enemy forces.

3-100. Against a mounted attack, they are used to suppress—

- Armored forces by using proximity-fuze HE rounds to cause the crews of tanks and fighting vehicles to close the hatches, reducing the field of view and ability to detect friendly forces.
- Antiarmor guided missile systems while friendly maneuver units are displacing.
- Enemy direct fire overwatch positions.
- Enemy air defense weapons and vehicles.
- Enemy mortars, automatic grenade launchers, and rocket launchers.

3-101. Against a dismounted attack, they are used to—

- Engage dismounted enemy infantry beyond direct fire weapon ranges.
- Suppress enemy mortar fires supporting the attack.
- Break up enemy troop concentrations.
- Cover dead space in front of friendly positions.
- Reduce an enemy's mobility and canalize their assault forces into engagement areas.
- Neutralize and destroy enemy forces attempting to breach friendly obstacles.
- Suppress and obscure enemy direct fire support weapons.
- Provide close-in FPFs against an enemy's dismounted assault.
- Deny an enemy a specified piece of terrain.
- Conceal friendly obstacles from the attacking force.

3-102. Against both mounted and dismounted attacks, mortar fire is used to—

- Screen movement of friendly forces between firing positions.
- Isolate attacking enemy units, especially to separate dismounted Infantry from Armor.
- Illuminate areas where enemy forces are known or suspected to be, so they can be engaged with other weapons.
- Mark targets for attack by direct fire weapons or aircraft.

3-103. Mortar fires are often used to support security forces. Mortar fires are used to engage an advancing enemy at long ranges, inflict casualties, delay and disorganize movements, and assist the security force in breaking contact. If a mortar platoon or section moves forward of main defensive positions to accomplish these tasks, a leader coordinates the subsequent rearward displacement. The leader then confirms the timing of the displacement, changes in OPCON or fire priority, routes of displacement, passage point through friendly barriers, recognition signals, and plan for occupying the subsequent position.

3-104. Closely coordinated mortar fire can significantly increase the effectiveness and survivability of antitank weapons. HE fires force tank crews to close hatches and smoke interferes with laser-targeting systems. An Infantry battalion weapons company and an SBCT weapons troop commander can be given priority of mortar fires or even OPCON of a mortar platoon or section. They are rarely given OPCON of mortar squads. An antitank company does not have a company FSO. An FSO or FO team can be task-organized. However, a mortar platoon leader and antitank company commander must be prepared to coordinate and execute fires in support of antiarmor companies without a FIST. Because both organizations are organic to the same battalion, this is easily accomplished.

3-105. Mortar smoke rounds can be fired to isolate the lead element of an advancing enemy force from the main body. The antitank company can then attack this isolated element, free from enemy overwatching fires. Mortar smoke can be placed between an antitank company and an enemy to aid in the movement out of initial firing positions to subsequent ones. Commanders coordinate mortar smoke rounds. In addition, a mortar platoon leader must be prepared to cease firing smoke rounds immediately if shifting winds move the smoke

to an unfavorable area. Smoke and HE rounds can be used to complement the effects of antiarmor ambushes and to cover the withdrawal of an ambushing force.

FIRES

3-106. In the defense, the commander uses the fires warfighting function to neutralize, suppress, or destroy enemy forces, to delay or disrupt the enemy's ability to execute a given course of action, and to enhance the effects of massed direct fires. Thus, fire support systems support both the commander's decisive and shaping operations.

FIRES BEFORE ENEMY ATTACK

3-107. Fires delivered before enemy attacks break up an attack before it starts or disorganizes, delays, and weakens the attack. These fires are categorized in the following paragraphs.

Harassment and Interdiction Fires

3-108. Ammunition resupply constraints severely restrict the amount of harassment and interdiction fires mortar platoons or sections provide. In a high-threat environment, harassment and interdiction fires can expose the mortar-firing location to enemy targeting and counterfire. Against a dismounted enemy on close terrain, mortar platoons may fire harassment and interdiction fires to slow and disorganize the enemy as they concentrate forces and supplies to continue their offensive. Mortar-harassing fire limits the enemy in preparing OPs. If an enemy must move personnel and supplies through a defile or across a ford, interdiction fire severely hampers reinforcement and carrying parties.

3-109. Mortar harassment and interdiction fires are usually unobserved and they require coordination to ensure accuracy and safety. Some may be fired based on recurring patrol reports, sniper observation teams, stay-behind forces, aerial sightings, or sensor alerts. Close coordination with field artillery survey teams and target-locating radars can greatly increase the effectiveness of mortar interdiction fires.

Planned Defensive Targets and Targets of Opportunity

3-110. Defensive fires are planned on all known, likely, and suspected enemy locations. This does not mean that an unmanageable number of targets are planned. Known enemy locations are the first priority, followed by suspected, and then likely enemy locations.

3-111. As enemy forces appear near planned targets, mortar fire is delivered on them. Targets of opportunity are engaged by shifting fires from planned targets.

Counterpreparation Fires

3-112. *Counterpreparation fire* is intensive prearranged fire delivered when the imminence of the enemy attack is discovered (FM 3-09). Since the mortar's range is limited compared to artillery, artillery fires most of the counterpreparation fires.

3-113. Mortar platoons and sections fire against enemy forces that are massing near friendly forward positions. Mortar smoke obscures the view from suspected enemy OPs. Mortar illumination confirms or denies the presence of enemy forces near defensive positions, while not revealing individual weapon locations. Because U.S. mortars outrange most threat mortars of similar caliber and can hit targets in defilade, mortar units may provide countermortar fires.

FIRES DURING ENEMY ATTACK

3-114. Once an enemy attack begins, mortar fires break up the formations to suppress and neutralize supporting weapons and to destroy as much of their force as possible. Targets in relation to friendly defensive positions are planned as follows:

- In front of the position on all confirmed and suspected enemy locations, on likely avenues of approach, and on prominent terrain features that can be used by enemy overwatch elements.

- In front of friendly barriers and obstacles, these fires are often critical to the defense. Any obstacle not covered by both direct and indirect fires can be obscured and breached. HE with proximity settings can effectively prevent enemy dismounted forces from breaching an obstacle. Mortar fire is preferred for this task since it is always available to the commander. Its use permits a field artillery to concentrate destructive fires against enemy formations backed up behind the obstacle.
- On the position, so that if an enemy penetrates friendly defenses, effective fire can be delivered on them immediately. If friendly forces are fighting from properly constructed fighting positions with sufficient overhead cover, the mortar fire from rounds with a proximity fuze can be placed directly on them to destroy the exposed enemy. This is a combat emergency technique, since some friendly casualties could still result. Mortar fires planned on friendly positions aid immediate counterattacks.
- Behind friendly positions to provide flexibility to the defense if an enemy surprises the defender by attacking from an unexpected direction. They aid the defender in blunting enemy penetration, making the counterattack decisive.
- Avenues of approach into the flanks of a unit's position.

FINAL PROTECTIVE FIRE

3-115. *FPFs* are an immediately available prearranged barrier of fire designed to impede enemy movement across defensive lines or areas (JP 3-09.3). They are the highest type of priority targets and take precedence over all other fire requests. FPFs differ from standard priority targets in that they are fired at the maximum rate of fire until mortars are ordered to stop or until all ammunition is expended. The RED for a given delivery system is a factor in how close the FPF can be placed in front of friendly front lines. Closer FPFs are easier to integrate into direct fire final protective lines. The high rate of fire achievable by mortars creates effective barriers of fire. The normal allocation of FPFs is identical to the allocation of priority targets (one for each battery or platoon and one for each mortar platoon). While firing FPFs, mortar sections are not normally allowed to cease fire and displace due to countermortar fire. They take precautions to avoid or withstand countermortar fire.

3-116. Mortar units normally have a single FPF. A battalion heavy mortar platoon normally has a single four-mortar FPF, but a battalion commander may direct the heavy mortar platoon to prepare two two-mortar FPFs. This is done only if terrain dictates the need for more FPFs than the battalion commander has been allocated and only after seeking additional artillery allocations. (See table 3-1 for the approximate width and depth of FPFs, which are based on the bursting diameters of mortar rounds.)

3-117. A company commander assigned an FPF is responsible for the precise location of the mortar FPF and FPF integration into the direct fire final protective lines. The mortar fire direction personnel plot, precompute, and save all firing data for the FPF as early as possible.

Table 3-1. Final protective fire approximate dimensions

Size	*Number of Mortars*	*Width (m)*	*Depth (m)*
120-mm	4	280	70
120-mm	2	140	70
81-mm	8	300	40
81-mm	4	150	40
81-mm	2	80	40
60-mm	3	90	30
60-mm	2	60	30
Legend: m – meter, mm – millimeter			

3-118. Mortar FPF widths and depths listed in table 3-1 are neither precise nor restrictive. A mortar sheaf can be opened or closed to cover the specific terrain on which an FPF is located. The bursting radius is the standard method to compare the effectiveness of shells and is defined as the radius from the center of impact

in which 50 percent of casualties can be expected. It is based on a surface burst against a standing target. The bursting diameter is therefore twice the bursting radius. The following mortar-bursting diameters are estimations since the type of round, fuze, range, and target surface all affect the mortar's bursting diameter:

- M120 (120-mm) mortar: 70 meters.
- M252A1 (81-mm) mortar: 38 meters.
- M224 (60-mm) mortar: 28 meters (M720 round).

3-119. Artillery FPFs are allocated to companies in the most critical defensive positions. Mortar FPFs may be allocated to cover less critical avenues of approach that are in the same or a different AO. Once allocated to a company, that commander designates the precise FPF location where they can best augment the direct fire weapons. Figure 3-1 shows how mortar FPFs are positioned to integrate them into the direct fire final protective lines of the defender.

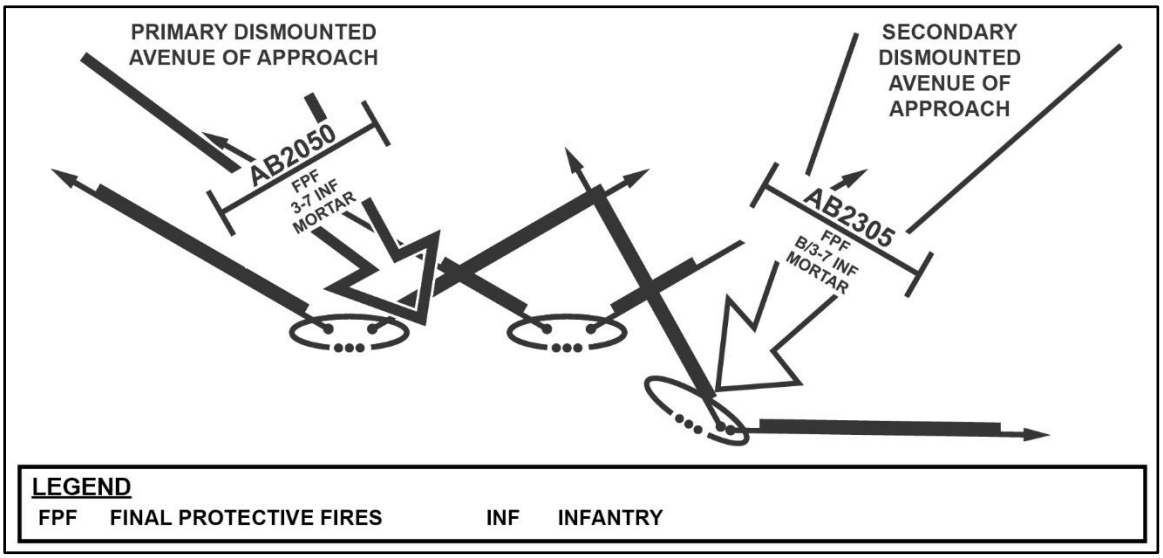


Figure 3-1. Mortar final protective fire integrated with direct fire final protective lines

3-120. Mortar FPFs are always targeted on an avenue of likely dismounted attack. They can be any distance from the friendly position that fits into a ground commander's tactical situation but are always within the range of organic direct fire weapons, normally within 100 to 400 meters of friendly troops. The importance of accurate defensive fires and the proximity of friendly troops means that each mortar firing an FPF is individually adjusted into place, normally using delay fuze settings and the creeping method of adjustment.

3-121. Company commanders may retain the authority to call for the mortar FPF to be fired or they may delegate it to a subordinate. If the decision is delegated to a forward platoon leader, the platoon leader directs FOs to transmit the request to fire the FPF directly to the mortar fire direction personnel or through the company FSO. When the request is transmitted directly to the mortar fire direction personnel, the rifle platoon leader must inform the company commander when initiating the FPF. The mortar section or platoon leader always informs the commander when initiating the firing of the FPF.

3-122. A commander and mortar unit leader must have alternate means of communication to call for the FPF. No one means of communication, such as radio, wire, or voice is sufficient; an alternate means must be established. In addition to standard voice messages, the commander and mortar element leader establish a simple visual pyrotechnic signal.

3-123. Mortar FPFs are fired only when needed. Once begun, FPFs are fired until ordered to terminate or until all mortar ammunition is gone. HE ammunition with point-detonating fuzes are normally used in firing the FPF. When planning FPFs, a mortar platoon leader decides how many rounds to prepare, based on ammunition available and the combat supply rate, and sets them aside for immediate use. This allows mortars to quickly begin the FPF and maintain it without pausing to prepare rounds when the call for fire is received.

Additional rounds can be prepared during the firing of FPFs if the ammunition requirement exceeds the quantity prepared.

3-124. An alternate method when the mortar platoon and section has to cover multiple avenues of approach is to establish multiple priority targets, each with a linear sheaf. Each gun is responsible for the respective target to fire immediately while the other guns shift to the established priority target data.

Note. This method reduces reaction time for the entire mortar element to fire effectively; however, this method can provide 360-degree coverage with indirect fires support on multiple avenues of approach.

COUNTERATTACK FIRES

3-125. Fire support for a counterattack is similar to that for the offense, except fire support priorities are divided between the forces still defending and the forces counterattacking. Mortar platoons may have to provide all or most of the fire support to the defending forces while the artillery supports the counterattack.

COUNTERING ENEMY HARASSMENT FIRES

3-126. Mortar units face the possibility of many different types of attack on today's battlefield. Enemy attacks include, but are not limited to, the traditional ground assault, intense preparatory fires, and heavy direct fire weapons. Mortar units must counterattacks while remaining prepared to conduct a fully integrated defense against a ground assault by delivering counterpreparation fires, close-in fires, and FPFs.

SECTION VI – STABILITY OPERATIONS TASKS

3-127. Within decisive action, mortar units conduct stability operations tasks as part of a larger force. The AO, ROE, and system for clearance of fires are key factors in the employment of mortars during stability operations. In stability operations, mortar units may be required to conduct missions that are unrelated to the delivery of indirect fires. These missions are diverse and a mortar leader and unit plans, prepares, executes, and assesses them in the same manner as they do their primary mission. (See FM 3-07 for more information.)

3-128. In addition to defeating an enemy, Army forces often seek to stabilize an AO by performing stability operations tasks. The six primary Army stability operations tasks are establish civil security, establish civil control, restore essential services, support to governance, support to economic and infrastructure development, and conduct security cooperation. A mortar platoon may be tasked to support or provide security for the execution of any of the above-mentioned operations. (See ADP 3-07 for more information.)

DECENTRALIZED OPERATIONS

3-129. Stability operations are normally planned centrally and conducted in the form of decentralized, small-scale, noncontiguous actions conducted over extended distances. Responsibility for making decisions on the ground falls to battalion and company-level leaders. However, procedures to conduct operations, ROE, clearance of fires, and many other policies that directly affect small-unit operations are issued and controlled by the higher headquarters.

3-130. Mortar units provide a commander with a flexible and adaptive force that has mobility, communications, and well-versed capabilities. Because mortar units can cause large amounts of collateral damage, they are usually tightly controlled. In stability operations, excessive collateral damage adds to the number of active enemy and increases the covert support.

COMPONENTS

3-131. Stability operations tasks have an offensive and defensive component. They may require working closely with non-U.S. military personnel and accomplishing tasks for which the unit is not routinely trained.

Because of the lethal nature, mortars units are usually involved in the offensive and defensive components of stability operations tasks.

OFFENSIVE-RELATED TASKS

3-132. A key element in the employment of mortars in stability operations is mobility. Combined arms, Stryker, and Infantry battalions employ heavy mortar units if the mission requires them to do so, and the ground can support the maneuver. Helicopter support can provide the means to move heavy and medium mortars to establish a base of fire to support the maneuver elements. Infantry and Stryker Army battalions and Marine light armored reconnaissance battalions may employ medium mortars when conducting dismounted operations. However, the amount of ammunition that can be carried may affect the ability to support a commander.

3-133. Stability operations often consist of company- and platoon-level offensive missions. In these situations, light mortar provides effective and mobile fire support. It is often used in the handheld mode firing direct-lay or alignment missions.

DEFENSIVE-RELATED TASKS

3-134. During stability operations, U.S. forces conduct defensive operations primarily to protect a force or to secure key facilities. U.S. mortar units may be constantly switching between offensive and defensive operations. Mortar units may be called upon to—

- Protect the local population.
- Guard local bases.
- Protect and facilitate sustainment or logistics operations.
- Escort and protect resupply efforts.
- Monitor and control personnel and vehicle movement.

3-135. Stability operations often require maneuver units to be responsible for large AO that require constant actions to control. However, some AO may be too large for the assigned unit to physically control. To provide mortar coverage to as much of the AO as possible, commanders often split platoons and sections. Individual mortar squads are often located separately and under control of their own mortar fire direction personnel known as a gun/ FDC. Units with multiple organic mortars calibers, such as SBCT units, may be required to operate both calibers of mortar systems simultaneously. Units may receive additional mortars and mortar equipment once they arrive in-country. Operating more mortar systems requires additional mortar personnel to be OPCON to the receiving unit. In stability operations, mortar units may—

- Operate over wide areas with 360-degree fire coverage responsibility.
- Be called upon to operate semi-independently as sections or squads.
- Be subject to detailed and restrictive ROE.
- Have stringent procedures for clearing fires.
- Be in static positions for long periods.
- Move often to support operations.
- Establish firing positions within perimeters defended by U.S. or other forces.
- Be called upon to perform nonstandard, nonfiring missions.
- Conduct fire missions to—
  - Defend their own position against direct ground attacks or attacks by fire.
  - Support units in the field.
  - Provide illumination fires as a show of force.

Note. Squad leaders conducting mortar operations outside the control of a dedicated FDC are required to have an additional skill identifier of B1 (Infantry Mortar Leader Course graduate).

PREPARATION FOR STABILITY OPERATIONS TASKS

3-136. Deployment to an area to conduct stability operations tasks normally includes time to prepare for operations. Units may have the ability to contact and gain extremely valuable information from the unit they are replacing. However, once in-country the unit may immediately conduct the mission hand-over and begin conducting missions. If possible, mortar units prepare at home and at training centers to immediately conduct effective missions.

3-137. Mortar leaders consider the following when preparing for deployment:

- Preparing subordinates physically and mentally for expected conditions.
- Cross-training mortar system crews and fire direction personnel.
- Training on all mortar systems.
- Training for continuous operations.
- Conducting operations with minimum mortar crews and fire direction personnel.
- Developing close relationships with the FSO and FOs.
- Acquiring any needed equipment and supplies.
- Conducting operations with the same number of mortar systems as currently operating in the AO.
- Planning the shipment of equipment and supplies down to the individual firing position.

NONSTANDARD MISSIONS

3-138. Because of the mission and ROE, mortar personnel may not be able to conduct fire missions or otherwise perform the duties they were trained to do. Mortar personnel and their equipment may be used for other duties. However, mortar leaders must maintain proficiency in individual skills and collective tasks.

3-139. Nonstandard missions are missions that a unit is not designed to conduct but is capable of performing. Examples include conducting mounted or dismounted patrols or carrying supplies during civil support operations. The types of nonmortar-related missions are many, but the following duties are mortar-related:

- Designate as another mounted or dismounted maneuver element (may require additional equipment, personnel, or weapons).
- Provide security.
- Use mortar carriers for Infantry-related missions.

SECTION VII – TACTICAL-ENABLING OPERATIONS

3-140. Commanders direct tactical-enabling operations to support the performance of all offensive, defensive, and stability operations. Tactical-enabling operations are usually employed by commanders as part of shaping operations or supporting efforts. (See FM 3-0 for more information.)

3-141. The tactical enabling operations are—

- Reconnaissance.
- Security.
- Troop movement.
- Passage of lines.
- Relief in place.
- Encirclement operations.

RECONNAISSANCE

3-142. *Reconnaissance* is a mission undertaken to obtain, by visual observation or other detection methods, information about the activities and resources of an enemy or adversary, or to secure data concerning the meteorological, hydrographical, or geographical characteristics of a particular area (JP 2-0). It is performed

before, during, and after operations to provide commanders and staffs information used in the intelligence preparation of the battlefield process so they can formulate, confirm, or modify courses of action.

3-143. Mortar units support reconnaissance operations in the same manner as they support offensive and defensive operations. Although reconnaissance troops have their own mortars, a commander may decide to provide them with additional combat power by assigning them additional mortar units. Considerations for the employment of organic and attached mortar units include—

- Units conducting these missions often operate within a large AO that cannot be completely covered by a mortar unit in a single location. The commander decides whether to keep direct control of mortars or allocate mortar squads, sections, or platoons to subordinate units.
- During reconnaissance operations, the movement of mortars is based on the progress of a unit. While the mortar section is on the move, it must be prepared to provide immediate fires using direct-lay, direct-alignment, or hip-shoot techniques. The movement of the unit is planned so that it is in position to support the maneuver unit at critical times, such as when the unit crosses danger areas or when it clears complex terrain.

SECURITY

3-144. The main difference between performing security operations and reconnaissance operations is that security operations focus on the protected force or location while reconnaissance operations focus on the enemy and terrain. The ultimate goal of security operations is to protect a force from surprise and reduce the unknowns in any situation. Commanders may perform security operations to the front, flanks, or rear of a friendly force. Security operations are shaping operations. As a shaping operation, economy of force is often a consideration when planning. (See ADP 3-90 for more information.)

3-145. Considerations for using mortars in security operations are similar to those for reconnaissance operations. To reduce potential sustainment difficulties during security operations, a commander and section leader may consider the stockpiling of ammunition at subsequent firing positions based on METT-TC variables. There are four types of security operations: area security, cover, guard, and screen-

- *Area security* is a type of security operation conducted to protect friendly forces, lines of communications, and activities within a specific area (ADP 3-90). The security force may be protecting the civilian population, civil institutions, and civilian infrastructure within the unit's AO.
- *Cover* is a type of security operation done independent of the main body to protect them by fighting to gain time while preventing enemy ground observation of and direct fire against the main body (ADP 3-90). Units performing the cover task can operate independently of the main body. The cover task may be used offensively or defensively.
- *Guard* is a type of security operation done to protect the main body by fighting to gain time while preventing enemy ground observation of and direct fire against the main body (ADP 3-90). Units performing a guard task cannot operate independently because they rely upon fires and functional and multifunctional support assets of the main body.
- *Screen* is a type of security operation that primarily provides early warning to the protected force (ADP 3-90).

TROOP MOVEMENT

3-146. Mortar leaders must understand the types and methods of movement to ensure proper time and resources are planned to execute mission success. Mortar element leaders advise the supported unit leader early in the planning process for movement so that the supported unit can include the mortar element personnel, equipment, and ammunition into the movement plan.

3-147. Troop movement is displacement of Soldiers and units from one place to another by any available means. The three types of troop movements are administrative movement, approach march, and tactical road march—

- *Administrative movement* is a movement in which troops and vehicles are arranged to expedite their movement and conserve time and energy when no enemy ground interference is anticipated

(ADP 3-90). Commanders only conduct administrative movements in secure areas. (See FM 4-01 for more information.)

- An *approach march* is the advance of a combat unit when direct contact with the enemy is intended (ADP 3-90). However, an approach march emphasizes speed over tactical deployment. Armored, Stryker, and Infantry forces conduct tactical road marches and approach marches.
- A *tactical road march* is a rapid movement used to relocate units within an area of operations to prepare for combat operations (ADP 3-90.) The primary use of a tactical road march is rapid movement; however, the moving force employs security measures, even when contact with enemy forces is not expected. During tactical road marches, commanders are always prepared to take immediate action if an enemy attacks. (See ATP 4-01.45 for more information.)

METHODS OF TROOP MOVEMENT

3-148. Troop movements are made by dismounted and mounted marches using organic combat and tactical vehicles. Troop movements over extended distances have extensive sustainment requirements. When necessary, dismounted and mounted marches can be hurried by conducting a forced march. (See FM 4-01 for more information.)

3-149. *Dismounted marches* are movements of troops and equipment mainly by foot, with limited support by vehicles. Also called foot march (FM 3-90-2). A unit conducts a dismounted march when the situation requires stealth, the distance to travel is short, transport or fuel is limited, or the situation or terrain precludes using a large number of vehicles. (See ATP 3-21.18 for more information.)

3-150. A *mounted march* is the movement of troops and equipment by combat and tactical vehicles (FM 3-90-2). Armored and mechanized units routinely conduct mounted marches. The speed of the march and the increased amounts of supplies that can accompany the unit characterize this march method. Considerations for mounted marches over extended distances include—

- The ability of the route network to support the numbers, sizes, and weights of the tactical and combat vehicles assigned to or supporting the unit making the move.
- Available refueling and maintenance sites and crew-rest areas.
- The need for recovery and evacuation assets.
- Available spill kits, personal protective equipment, and spill cleanup waste disposal equipment.

FORCED MARCHES

3-151. In cases of tactical necessity, a unit can accelerate its rate of movement by conducting a forced march so it arrives at its destination quickly. Armored, Stryker, and Infantry units can conduct a forced march. Forced marches require speed, exertion, and an increase in the number of hours marched or traveled by vehicles each day beyond normal standards. Soldiers cannot sustain forced marches for more than a short period. In a forced march, a unit may not halt as often or for as long as recommended for maintenance, rest, feeding, and fuel. The commander understands that immediately following a long and fast march, Soldiers and combat vehicles experience a temporary deterioration in their physical condition. The combat effectiveness and cohesion of the unit also temporarily decrease. The plan must accommodate the presence of stragglers and increased fuel consumption and address increased vehicle and equipment maintenance failures.

3-152. A normal dismounted march day, under ideal conditions, is eight hours, for a distance of 32 kilometers at a rate of 4 kilometers per hour. Under ideal conditions, maximum distances recommended for forced dismounted marches are—

- 56 kilometers in 24 hours.
- 96 kilometers in 48 hours.
- 128 kilometers in 72 hours.

3-153. Although dismounted forced marches may impair fighting effectiveness of units, urgent conditions on the battlefield could require them. Rest periods should be scheduled to avoid marching at the hottest time of day to ensure arrival of the unit in combat-ready condition. Full advantage should be taken of periods when Soldiers are rested to increase rate of march, if necessary

MOVEMENT TECHNIQUES

3-154. The mortar unit leader uses the combat formations described in ATP 3-21.8 in conjunction with three movement techniques: traveling, traveling overwatch, and bounding overwatch. Figure 3-2 illustrates when a unit is most likely to use each technique.

3-155. Based on the chance of enemy contact, the mortar unit leaders select the appropriate movement technique to limit the unit's exposure to enemy fire and to position the unit in a good formation to react to enemy contact. Contact with the enemy is made with the smallest force possible to allow the majority of the unit freedom to maneuver against the enemy.

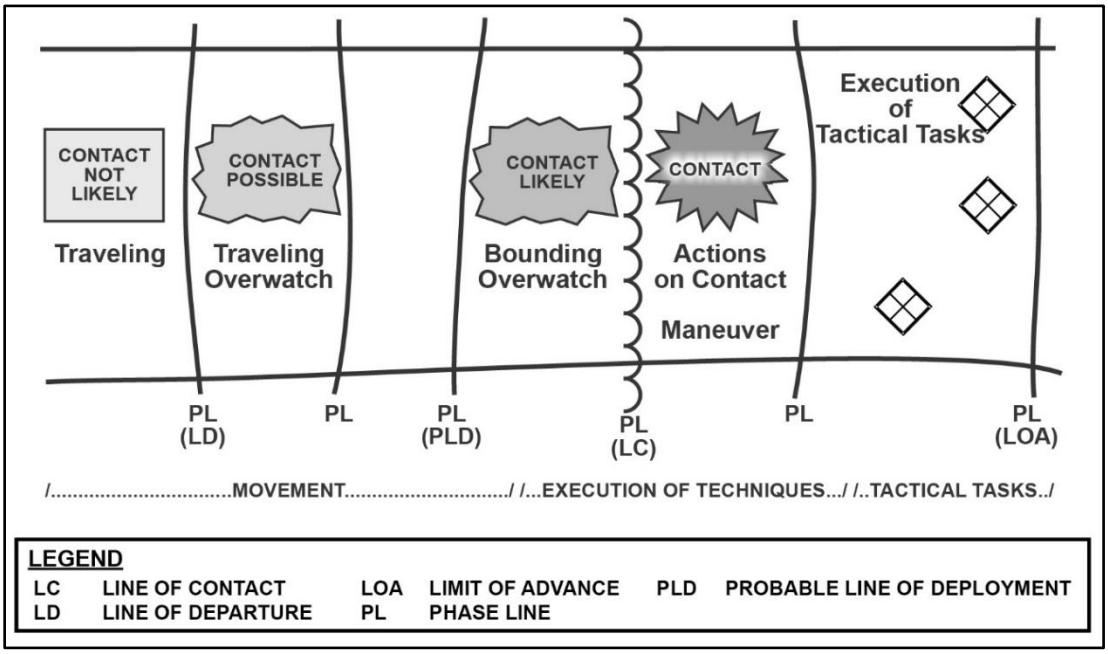


Figure 3-2. Movement techniques

Traveling

3-156. The unit leader uses the traveling movement technique when speed is necessary and contact with enemy forces is not likely. All elements of the unit move simultaneously. The leader is located where that individual can best control the situation. Trailing elements may move in parallel columns to shorten the column and reaction time.

Traveling Overwatch

3-157. The unit leader uses the traveling overwatch movement technique when contact with enemy forces is possible, but speed is important. The *traveling overwatch* is a movement technique used when contact with enemy forces is possible (FM 3-90-2). The lead element and trailing element are separated by a short distance, which varies with the terrain.

3-158. The trailing element moves at variable speeds and may pause for short periods to overwatch the lead element. It keys its movement to terrain and the lead element. The trailing element overwatches at such a distance that, should the enemy engage the lead element, it will not prevent the trailing element from firing or moving to support the lead element.

Bounding Overwatch

3-159. *Bounding overwatch* is a movement technique used when contact with enemy forces is expected. The unit moves by bounds. One element is always halted in position to overwatch another element while it

moves. The overwatching element is positioned to support the moving unit by fire or fire and movement (FM 3-90-2). There are two variations of this technique: alternate bounds and successive bounds.

3-160. In bounding overwatch, movement is based on the next support by fire position, which offers at least some of the following advantages—

- Cover and concealment.
- Good observation and fields of fire.
- Protection for stationary weapon platforms.

3-161. If the unit uses alternate bounds, the lead element moves forward, halts, and occupies a support by fire position that is covered at all times by the rear overwatching element. That former rear overwatching element advances past the former lead element and takes an overwatch position. The initial lead element then advances past the initial trail element and occupies a new support by fire position. One element moves at a time. This method is usually more rapid than successive bounds.

3-162. If the unit uses successive bounds, the lead element, covered by the trail element, advances and occupies a support by fire position. The trail element advances to a support by fire position abreast of the lead element and halts. The lead element moves to the next position and the move continues. Only one element moves at a time, and the trail element avoids advancing beyond the lead element.

PASSAGE OF LINES

3-163. *Passage of lines* is an operation in which a force moves forward or rearward through another force's combat positions with the intention of moving into or out of contact with the enemy (JP 3-18). A passage may be designated as a forward or rearward passage of lines and involves transferring the responsibility for an AO between two commanders. That transfer of authority usually occurs when roughly two thirds of the passing force has moved through the passage point. If not directed by higher authority, the two unit commanders determine, by mutual agreement, the time to transfer command.

3-164. A passing unit's mortars conduct a rearward passage of lines using appropriate displacement techniques until the maneuver element is within range of the stationary mortar platoon. Mortars can then move to and through the passage point either as a platoon or in sections.

3-165. A mortar platoon normally conducts a forward passage when the maneuver element is just short of the stationary mortar platoon's maximum range. Passing mortars then begin displacement techniques to support their maneuver element with continuous fire.

RELIEF IN PLACE

3-166. A *relief in place* is an operation in which, by the direction of higher authority, all or part of a unit is replaced in an area by the incoming unit and the responsibilities of the replaced elements for the mission and the assigned zone of operations are transferred to the incoming unit (JP 3-07.3).

3-167. Mortar sections and their FOs are normally relieved after the maneuver companies. The mortar platoon remains in position, ready to fire, until relief is nearly completed. The mortar element being relieved passes on its target lists and overlays to the incoming mortar platoon to ensure effective delivery of fires. Mortar baseplates (if ground-mounted), aiming posts, telephones, and wire lines can be left in place and exchanged. Authority to do so would be included in the relief order of the next higher commander. This simplifies the effort and lessens the time required to affect the relief. To ease occupation of positions during hours of limited visibility, an incoming platoon leader conducts both a day and night reconnaissance.

ENCIRCLEMENT OPERATIONS

3-168. *Encirclement operations* are operations where one force loses its freedom of maneuver because an opposing force is able to isolate it by controlling all ground lines of communications and reinforcement (ADP 3-90). A unit can conduct offensive encirclement operations to isolate an enemy force or conduct defensive encirclement operations because of the unit's isolation from the actions of an enemy force.

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Chapter 4
Platoon and Section Operations

This chapter presents the fundamental mortar unit operations. It includes mortar employment, helicopter operations, and operations in urban and mountainous terrain. The chapter includes employment by unit, position reconnaissance and occupation, displacement, movement, and firing positions. Successful mortar unit leaders apply understanding of a commander's intent, knowledge of tactics, and analysis of METT-TC variables to develop a course of action.

SECTION I – EMPLOYMENT OPERATIONS

4-1. A maneuver commander employs a mortar unit based on analysis of the METT-TC variables. There is no mortar employment option that is routine; each has advantages and disadvantages. Mortar leaders consider how to configure the units if vehicles or personnel are not available.

EMPLOYMENT TECHNIQUES

4-2. When considering how to use the battalion mortar platoon, a battalion commander has three general options: employ the unit by platoon, section, or squad. A company commander with a company mortar section has only two options: employ the unit as a section or by squads.

4-3. Although individual light mortars can be very effective when employed in the direct lay or alignment mode, company commanders consider their limited capability for indirect fire control and FSCMs when using this method.

Note: USMC mortar platoons consist of eight mortar squads and two complete FDCs. When the USMC mortar platoon is employed as a section (with FDC), all tactics for platoon employment still apply. When a USMC section of four guns is divided into two separate firing units of two guns apiece separated by space or terrain with the FDC controlling all four guns, then section employment techniques apply.

PLATOON EMPLOYMENT

4-4. Using the employment option, a platoon operates from one or two firing positions and usually fires all mortars on each target, under the control of a platoon leader. Firing from one location may be the only option for an understrength platoon. Even when a mortar platoon is being used as a single firing unit, it can still fire multiple missions simultaneously. It can displace from its firing position either by echelon or as a complete platoon. Platoons may occupy two separate firing positions. If these positions are up to 300 meters apart, it greatly decreases an enemy's chance of neutralizing them with countermortar fire. If a platoon occupies two positions, the distance between mortar sections is limited primarily by the ability to cover the target area, terrain, enemy threat, and limits in communications. Separated firing positions must not be so far apart as to prevent a platoon leader from controlling them both. Separating the sections must not prevent massing the fires of a platoon on a single target.

4-5. When employed by platoon, the controlling FDC is the mortar fire direction net control station. The controlling FDC issues the fire command designating the platoon, a section, or squad to deliver fire.

4-6. Massing fires requires FDCs to compute data for each section on the same target. With automated fire direction systems, an FDC designates the type of sheaf desired, such as linear or converged, and sends the commands to the mortar squads. When a linear sheaf is used with fire control computers, the location of the guns firing for effect will not change the strike of the round.

4-7. When using analog fire control systems, if the FDC computes a parallel sheaf, the strike of the round from each gun fired represents the formation the mortars are employed in. (See TC 3-22.91 for more information.) With the linear sheaf, rounds impact within the total effective width of the bursts, regardless of the mortar location. See figures 4-1 and 4-2 for examples of linear and parallel sheafs.

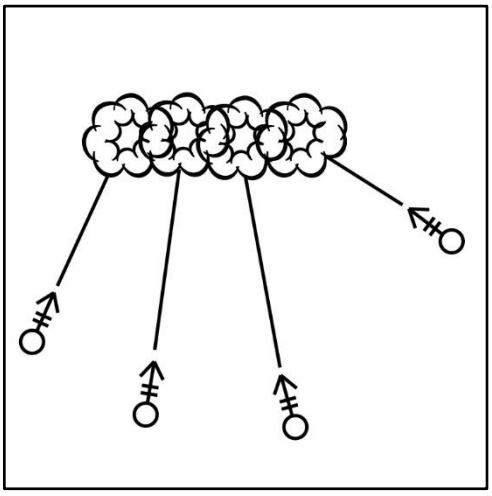


Figure 4-1. Example of linear sheaf with gun location dispersion

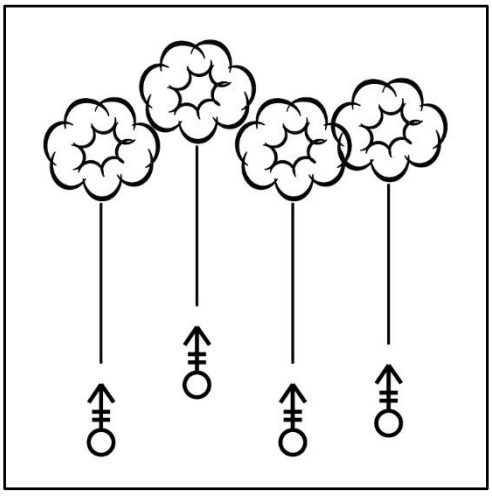


Figure 4-2. Example of parallel sheaf with terrain positioning

4-8. When operating analog fire control systems, an FDC computes the fires of both sections on a single, adjusting point utilizing a single gun from either section. For the fire for effect phase, the FDC computes data for all guns firing on the target. Figure 4-3 shows an example of a platoon dispersed over 300 meters firing a linear sheaf.



Figure 4-3. Section firing locations with 300-meter separation for survivability

4-9. Some of the advantages for a mortar platoon firing in one location are—

- Simplifies control of a unit.
- Simplifies sustainment and logistics actions.
- Enables a unit to rest personnel and rotate duties to maintain alertness.
- Allows for the most efficient use of personnel.
- Improves a unit's ability to maintain local security.

4-10. Some of the disadvantages are—

- Unit is massed and more vulnerable to counterfire.
- Requires more space and may limit a leader's choice of positions.
- May limit the portion of a unit's AO that can be covered by fires.

PLATOON EMPLOYMENT BY SECTION

4-11. Section employment places each section as a separate firing unit. Each section acts semi-independently and covers its own targets or area. There are multiple methods to control each section. One method is to configure one mortar system as the gun/FDC that controls the other. If in communication range, the FDC can control both sections to engage a target utilizing both sections or have each section fire two different targets. The platoon leadership advises the capabilities to the maneuver commander. Each section can work independently or one or both may be controlled by the FDC.

4-12. Mortar platoons use section employment to cover wide frontages. Each section is positioned so that it can provide fires within a defined AO. Depending on the range to the target and the separation of sections, more than one section may be able to mass fires on the same target.

4-13. Section employment is more appropriate when rifle companies operate over wide frontages or move along more than one widely separated axis of approach. Section employment is more difficult to control and to support logistically than employment by platoon.

4-14. Sections operate on a platoon's mortar fire direction net. Depending on the type of control, an FSO (or FOs) requests fire from a designated section using that section's call sign. If separate frequencies are available, each section may operate on its own fire direction net.

4-15. Mortar and section leaders control the displacement of each section. Displacement is coordinated with the movement of the battalion or company that the section is supporting. Since both sections cannot cover the entire area, they may be moving at the same time.

4-16. Some of the advantages for the mortar platoon splitting sections under separate fire direction control or the company mortars establishing a single position are—

- Greater area coverage.
- Less vulnerable to counterfire.
- Easier to find covered and concealed firing positions.

4-17. Some of the disadvantages are—

- More difficult to provide sustainment and logistics.
- More difficult to provide local security.
- Increased radio traffic.

SQUAD EMPLOYMENT

4-18. Squad employment places one or more squads on the battlefield as separate firing units. This usually supports special requirements, such as—

- Widely dispersed unit positions across a large AO.
- Security force operations.
- One mortar illumination missions.
- Roving mortar adjustment technique.

- Combat patrols.
- Withdrawals not under enemy pressure (as part of a detachment left in contact).

4-19. This is the least desirable method of employment and is used only when the situation or terrain prevents adequate support, if otherwise employed. The maneuver commander will determine how to effectively employ the mortars to support the unit's operations. The following are examples of when it may be necessary to employ a platoon or section by squads:

- When a supported maneuver element is required to cover a large front, such as a battalion task force screening a division's flank.
- During decentralized operations where units are assigned very large AO and cover them with mortar fire.

4-20. These situations may not occur often. If a section can provide adequate support, squad employment is avoided. Squad employment reduces the effects on a given target, increases difficulty in fire control, and exposes the mortar squads to destruction by small enemy forces. It is the most difficult option to support logistically. The following are some considerations when employing by squads:

- The crew is configured as a gun/FDC team, and the squad leader must be prepared to compute firing data according to TC 3-20.33.
- Each squad is normally attached to a maneuver element, such as a rifle platoon. The attached squads normally operate on the supported unit's radio net or as directed by the supported commander. The FO then requests fires using that mortar squad's call sign.
- If a target is within range of more than one squad, fires may be massed to engage that target. The massing of fires requires more effort due to clearance of fires and the increased number of radio nets involved. The best practice for this would have a single gun/FDC control all the squads in range to evenly distribute the rounds fired for area coverage.

4-21. Some of the advantages of employing single mortar squads are—

- Greater area coverage.
- Less vulnerable to counterfire.
- Easier to find covered and concealed firing positions.
- More responsive to unit, if attached.

4-22. Some of the disadvantages are—

- More difficult to provide sustainment and logistics.
- Greater stress on mortar unit leaders to maintain standards.
- More difficult to provide local security.
- Radio traffic.
- More reliance on communications.
- Inability to conduct coordinated illumination missions.
- Difficulty in conducting simultaneous fire missions.

AVAILABILITY OF PERSONNEL AND EQUIPMENT

4-23. Mortar element leaders must be prepared to operate without the full complement of personnel and equipment. Personnel may be unavailable, vehicles may be inoperable or restricted to certain areas, and equipment may be damaged. Leaders cross-train personnel to be proficient in more than one position. Contingency plans for vehicle cross-loading is included in the TACSOP and practiced. For example, an FDC knows which vehicle to use if the FDC vehicle is inoperable or cannot go on operations. Likewise, mortar squads know what equipment to carry and what vehicles to transfer to if their vehicle breaks down.

4-24. Mission accomplishment determines whether leaders, with their commander's concurrence, reduce the number of mortar systems or the configuration carried. For example, a light mortar leader may determine the mission is best accomplished with light mortar systems in handheld mode compared to conventional mode. In this instance, the mortar element leader is sacrificing the range and capabilities of conventional mode for

increased responsiveness and a greater capacity of mortar rounds carried within the section. A mortar leader's last option is reducing the number of mortars carried.

SECTION II – MORTAR POSITIONS

4-25. The tempo of battle and the threat of enemy counterfire mean that mortar platoons and sections may have to move often. To reduce the time spent displacing, a mortar platoon accomplishes the reconnaissance, selection, occupation, and movement tasks quickly and efficiently.

4-26. The key to a successful reconnaissance, selection, and occupation of position is frequent and effective training. Although FBCB2 and automated fire direction systems provide extremely accurate locations and greatly simplify the techniques used to occupy and fire from a new position, mortar leaders must be prepared to conduct operations under analog conditions.

RECONNAISSANCE

4-27. Mortar units conduct reconnaissance to identify suitable primary and alternate mortar unit firing positions and routes. A continuous and aggressive reconnaissance is essential to timely and accurate fire support.

4-28. A mortar leader continually performs this reconnaissance and plans ahead to meet any contingency. The mortar leader may be given the general location of new positions or may have to select and recommend them to the commander. Mortar leaders may conduct reconnaissance by any means necessary (for instance, utilizing a map or imagery of any nature; by air, if assets are available; or on the ground).

RECONNAISSANCE BY MAP AND IMAGERY

4-29. A mortar leader conducts a map reconnaissance and uses the factors of observation, cover and concealment, obstacles, key terrain, and avenues of approach to systematically analyze the terrain in the AO. Reconnaissance can be conducted using a map or the FBCB2 with the requisite overlays. When using the FBCB2, a mortar leader has available, current friendly and enemy locations and can use the line-of-sight, navigation, and steer-to tools. Potential positions and routes to the new position can be chosen. This method is fast and eliminates unsuitable routes. It identifies possible ambush sites. In some combat situations, a map reconnaissance may be the only one possible.

4-30. The major disadvantages of conducting only a map inspection are—

- Terrain and other features may have changed. For example, a bridge shown on a map may no longer exist. Military load classifications of bridges are not listed on maps and must be physically inspected.
- The surface conditions of a route and position cannot be determined. For example, soil texture may not support a mortar carrier.
- Enemy and friendly locations may not be current.

4-31. If available, aerial photographs and unmanned aircraft system feeds are used to supplement maps because they are more recent, show more detail, and present a clearer picture of the current condition of the terrain to be crossed.

GROUND RECONNAISSANCE

4-32. The preferred method of reconnaissance is ground reconnaissance because the suitability of routes can be physically examined. The true condition of the terrain is critical if the surface has been affected by enemy action, such as a CBRN attack, or weather conditions. Ground reconnaissance has the disadvantage of being the slowest but has the advantage of being the most thorough method of reconnaissance.

AIR RECONNAISSANCE

4-33. If time and resources are available, information gained from an air reconnaissance can be beneficial in selecting routes to be used and areas to be occupied. Although this is a fast method, true surface conditions can be indistinguishable or may appear distorted.

4-34. A commander or platoon leader is careful that the flight plan does not compromise the route or the new position area. This method may not be available to a platoon leader in all operations or theaters. Using organic or attached unmanned aircraft systems as an air reconnaissance can reduce the signature and the risk of manned aircraft, especially in hostile territory.

PLANNING THE RECONNAISSANCE

4-35. To maximize its tactical benefit, reconnaissance is thoroughly planned before it is executed. As part of the planning phase for any OPORD or reconnaissance, selection, and occupation of position, the METT-TC variables are considered before any action is taken.

4-36. A platoon leader or the designated representative performs the reconnaissance. A platoon sergeant and section leaders must be able to perform a detailed ground reconnaissance. The reconnaissance party is planned to be as small as possible while still able to accomplish the mission. The platoon leader, an NCO (usually the most experienced FDC member), and a driver normally compose the reconnaissance party.

Note. Depending on the operational environment, additional security may be needed and is tasked to a maneuver platoon.

POSITION SELECTION CONSIDERATIONS

4-37. Mortar-firing positions are selected based on mission accomplishment (the most important factor), tactical situation, target range criteria, target area coverage, survivability, overhead and mask clearance, surface conditions, communications, and routes.

MISSION ACCOMPLISHMENT

4-38. Mission accomplishment is the most important factor. The position must permit a mortar section or platoon to accomplish its primary mission. Mortar unit leaders ensure that the potential position can support the mission. For example, even though a position may have excellent defilade, it may also limit the range of the mortar and, therefore, the ability of a unit to support the mission.

TACTICAL SITUATION

4-39. A mortar leader must understand the tactical situation, the supported unit's mission, the location of friendly units, and potential enemy threats. By considering the tactical situation, a mortar leader can ensure the mortar element provides effective indirect fire support while maintaining security for the mortars.

TARGET RANGE CRITERIA

4-40. Maximum and minimum mortar ranges determine whether mortars can support from selected firing positions. Good mortar position selection allows the mortar to fire at least one-third of the weapon's range behind the forward line of their own troops to support retrograde, and two-thirds of their range to the front of the forward elements of the supported friendly force. These range criteria are only a guide, not inflexible rules. These may vary due to METT-TC variables or a commander's guidance.

4-41. Longer ranges available from medium and heavy mortars do not mean platoons equipped with these weapons are located further to the rear. The added range allows a platoon leader flexibility in choosing firing positions (for example, firing out of deeper defilade and still covering the battalion (or company's) sector). Positions that place targets at the extreme edge of the mortar system range are avoided, whenever possible. Figure 4-4 is an example of a heavy mortar applying one-third, two-third guide.

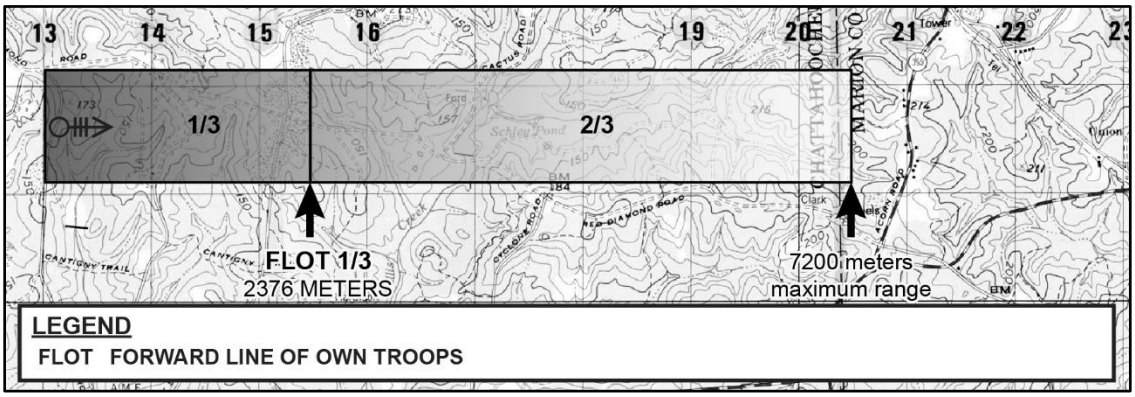


Figure 4-4. Example of one-third, two-third guide

Note. The one-third to two-thirds guide can act as a trigger for the mortar platoon or section to displace and move to a new position. This is not a rule; the situation and mission accomplishment are the major deciding factors.

TARGET AREA COVERAGE

4-42. Mortar positions give maximum coverage of the battalion or company AO. To do this, the mortar platoon leader begins by analyzing the defensive plan, locations of priority targets, and the enemy avenues of approach. To cover the supported unit, the mortar unit often positions itself near the center of the unit's position. Positioning in the center does not take precedence over priority targets or priority of fires that a commander assigns to a specific mortar element. For example, if mortars must be positioned on a flank to support the company with priority of fire, a priority target, or because of terrain, then positioning in the center of the AO becomes a secondary concern.

4-43. A mortar leader chooses an area that allows the element to cover the company with priority of fires or the priority targets. By choosing a firing position within the designated area that maximizes the fires, the mortar leader can provide for the rest of the battalion without reducing support to the priority company. If the priority of fires is planned to change, the mortar platoon leader chooses a position from which both units are covered, plans a displacement, or operates by section to cover the other unit.

SURVIVABILITY

4-44. Mortar crews face many threats on the battlefield, including CBRN hazards, countermortar fire, ground attacks, and air attacks. These are all considered when a mortar position is selected.

4-45. The position facilitates both active and passive defense measures so it—

- Cannot be hit by direct or low-angle indirect fire (defilade) (see figure 4-5 on page 4-8).
- Can be entered without enemy observation.
- Offers good cover and concealment.
- Avoids obvious avenues of approach.
- Has more than one entrance and exit route.
- Takes advantage of existing terrain features and natural obstacles.

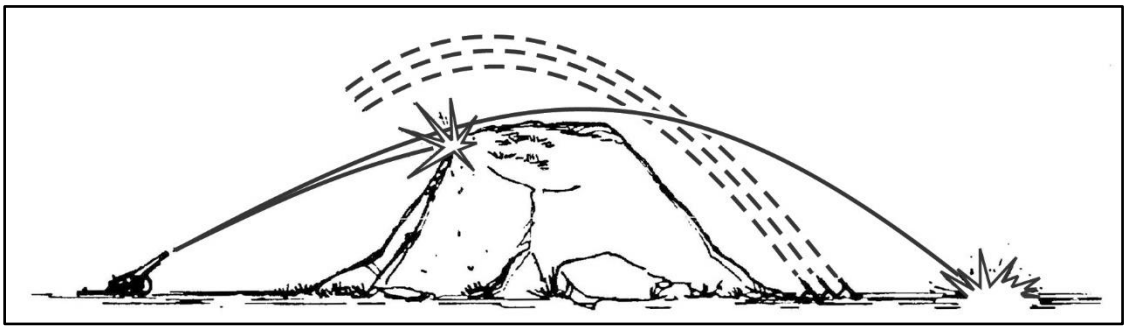


Figure 4-5. Example of mortars in defilade

MASK AND OVERHEAD CLEARANCE

4-46. For survivability, mortar systems are mounted in defilade whenever possible. When in defilade there is mask (intervening object that screens the mortars from view of the enemy or target) such as a hill, trees, buildings, a courtyard, solid fences, or a rise in the ground. There may also be overhead interference from roofs or overhanging tree branches.

4-47. When selecting the exact mortar position, the squad leader quickly checks for mask clearance and overhead clearance. A thorough check is conducted immediately after the mortar is mounted. (See TC 3-22.90 for more information.)

4-48. All mortar leaders ensure that the concealment and positioning of the mortars does not interfere with their effective operation. When the mortar position has reduced capability caused by mask interference or overhead interference, the mortar element leader is immediately notified. Prior to firing, the gun target line must be free of any obstruction, such as tree limbs and power lines.

SURFACE CONDITIONS

4-49. Soil at each mortar position must be well-drained and firm so that mortar baseplates do not sink into the ground when the mortars are fired. If mortars are mounted on carriers, the soil must be firm for the carriers to remain stable when mortars are fired. (See ATP 3-37.34/MCTP 3-34C for more information.)

4-50. Sandbags and other material can be used when firing from a hard surface, such as a road or other areas found in urban terrain. When the ground is frozen, slots are chopped into the earth for the baseplate spades and extra time is allotted to emplace mortars. When temperatures cycle repeatedly above and below freezing, personnel ensure baseplates do not become frozen into the earth.

COMMUNICATIONS

4-51. The mortar element must be able to communicate with a supported unit, and platoon mortar squads must be able to communicate with an FDC. During reconnaissance, radio checks are made at the position to be occupied. Outside interference can degrade the radius that mortars can communicate with line-of-sight-based radios. Terrain features and heavily populated areas are examples of outside interference.

4-52. Maximum effort is made to protect a platoon from direction-finding capabilities of the enemy. Direction antennas and maximum use of wire communications reduce the electronic signature of the platoon. Digital-messaging devices allow a mortar unit to communicate quickly and accurately.

ROUTES

4-53. Mortar positions may be close to access routes to speed resupply and displacement as long as the position does not prevent concealment or limit mortar element survivability. When required, helicopter landing zones are identified for sustainment/logistics or maneuver purposes.

Note. Do not place mortar positions directly on or adjacent to a high-speed avenue of approach unless the area is free of enemy influence.

ADVANCE PARTY OPERATIONS

4-54. After the reconnaissance is complete, an advance party proceeds to the initial or next position. If time is limited, reconnaissance may be performed in conjunction with advance party operations. An advance party operation includes a minimum of personnel and equipment needed to prepare a position for occupation. It accompanies a mortar platoon leader, or the representative, and begins preparations when the designated individual confirms the firing locations. For a deliberate occupation, a prearranged signal or procedure is used to alert and assemble the advance party. The signal is in the unit TACSOP, which also lists the personnel, equipment, vehicles, and place of assembly.

4-55. Many improvements in mortar fire control associated with the fielding of the FBCB2, MFCS, and GPS navigation have greatly enhanced the process of preparing and occupying positions. In some cases, these systems have also greatly simplified the process.

4-56. A platoon leader determines the personnel and equipment required for the advance party based on the tactical situation and assets available. In some instances, a complete mortar squad may be in an advance party and establishes a firing position to support the movement of the rest of the unit. This squad becomes the base mortar at the new firing position. Equipment required to prepare a new position is identified, maintained, located, and loaded on prescribed vehicles.

4-57. An advance party also—

- Verifies and marks the route with engineer tape, signs, lights, aiming posts, or road guides. If tentative routes are determined to be unsuitable, the advance party leader contacts the remainder of the platoon, recommends an alternate route, and sends an overlay showing the alternate route, if required.
- Checks to ensure that tentative routes and positions have the best cover and concealment.
- Locates and marks minefields and obstacles, as time allows. It reports the discovery of minefields to the battalion CP, and mortar leaders mark these areas on maps and digital displays. TACSOPs prescribe actions taken when minefields are encountered.
- Uses CBRN-detection equipment during movement and at the position to detect and identify contaminated areas. It reports the location of all contaminated areas, marks the locations of contaminated areas in FBCB2 and on maps, reports to the displacing element, and alters the route.
- Determines and reports the time required to displace to the next position.
- Verifies tentative emergency occupation positions along the route selected during map reconnaissance. It informs the displacing element of any changes in the suitability of these positions.

4-58. After reconnaissance, an advance party occupies a new mortar position. It prepares the position to the maximum extent possible before the main body arrives. The main body continues to improve the original position.

MOVEMENT BRIEFING

4-59. Before leaving to reconnoiter the new position, a unit leader briefs key personnel on movement information. At a minimum, a movement briefing covers the following:

- Situation, including—
  - Enemy situation, including activity, major avenues of approach, air activity, and potential ambush sites.
  - Friendly situation, including changes in tactical missions, and locations of friendly maneuver units and supporting artillery.
- Mission. Changes in the mission of the maneuver unit.

- Execution, including—
  - Concept of the operation, including the general location of platoon positions, azimuth of fire, routes, order of march, location of start and release points and times.
  - Mission-oriented protective posture status.
  - Areas of known CBRN contamination.
- Administration and logistics, including—
  - When and where to feed personnel.
  - Priority for maintenance recovery.
  - Ammunition resupply.
  - Refueling location.
- Command, including—
  - Changes in the location of the CP.
  - Location of the commander.
- Signal, including—
  - Movement radio frequencies.
  - Net control restrictions.
  - Signals for immediate actions at the halt and during movement.

OCCUPATION

4-60. *Occupy* is a tactical mission task that involves a force moving a friendly force into an area so that it can control that area. Both the force's movement to and occupation of the area occur without enemy opposition (FM 3-90-1). An advance party starts the occupation of the new firing position and works continuously until the main body arrives. Therefore, occupation by the main body is a continuation of the actions by the advance party.

4-61. An advance party starts the occupation by—

- Verifying position location.
- Checking the position and surrounding areas for mines, CBRN contamination, and enemy forces.
- Establishing local security and OPs.
- Marking mortar positions with stakes or lights.
- Marking entrances to and exits from positions.
- Guiding the displacing element into position upon arrival. The fire direction control personnel are positioned near the middle of the formation to allow them to announce fire commands to the mortars by voice, if necessary.

4-62. Determining and clearing mask and overhead obstructions includes—

- Improving security and defensive measures.
- Erecting camouflage, or cutting and arranging it.
- Preparing alternate and supplementary positions, as time permits. Soldiers continually improve the positions until the mortars displace.
- Identifying a tentative landing zone for resupply and medical evacuation.

4-63. An advance party has additional duties when conducting analog fire control procedures, such as—

- Setting up the aiming circle or using an M2 compass to determine the azimuth of fire. The advance party identifies the direction of fire with direction stakes.
- Completing a rough lay of the mortar positions, if time allows, which is useful for night occupations.
- Laying the mortars and wire. Plotting boards are already prepared.

4-64. Before moving, a mortar platoon leader ensures the following tasks are accomplished. This includes—

- Informing headquarters of the move.
- Inspecting platoon position for documents, overlays, or anything that may compromise security.
- Retrieving obstacles and claymore mines.
- Retrieving early warning devices, such as trip flares and the platoon early warning system.
- Retrieving communication wire.
- Returning personnel at the OPs to the position.
- Remounting carrier-mounted mortars on carriers, if ground-mounted.
- Firing ammunition if it cannot be moved (if the tactical situation permits).
- Initializing automated fire direction systems for the next firing position (if known).
- Ordering mortars out of action.

Note. For performance steps and performance measures for occupying a mortar-firing position (collective task 07-PLT-1351), see the Central Army Registry website.

NIGHT OCCUPATION

4-65. Night occupations present special problems of control. Night vision equipment has improved and simplified the process but even with night vision devices (NVDs), limited visibility makes almost every task associated with position occupation harder to accomplish. To conduct efficient night occupations of firing positions, a mortar platoon leader establishes a detailed TACSOP and trains the platoon in its use.

4-66. Guides are thoroughly briefed and pace the routes to and from a platoon's different elements before and after darkness. They also have filtered flashlights to guide vehicles.

4-67. Although NVDs do not allow users to distinguish colors, color-coding individual squads or sections may facilitate identification during night operations. Light discipline is maintained. Chemical lights are useful during night occupations, but the use must be standardized and controlled.

4-68. A mortar platoon or section must also be prepared to occupy a firing position in complete blackout, without the use of any form of illumination. This also includes the use of infrared. Near-peer threats can and will use NVDs at night or during times of limited visibility. Operating in complete blackout greatly increases the difficulty of any action and decreases the speed at which the firing position can be completed. Rehearsals prior to occupation are critical to reducing the risk and increase the speed of operating in blackout conditions.

OCCUPATION TYPES

4-69. The three types of occupations are deliberate, hasty, and emergency. All three can be conducted in day or night conditions.

DELIBERATE OCCUPATION

4-70. Deliberate occupations are planned and have an advance party preceding a platoon to conduct extensive preparation of a new position. A deliberate occupation may take place during daylight hours following a daylight operation, at night after a daylight preparation, or at night following a nighttime preparation. Only the minimum number of vehicles and personnel go forward. Excessive activity during preparation risks compromise. When a tactical situation allows, a good procedure for deliberate occupations of a new position is to do the preparation before darkness and to move the sections by night. Deliberate nighttime occupation following a nighttime preparation is often necessary, but it can be time-consuming.

4-71. A guide meets a platoon at a pickup point and leads the vehicle to the entrance of the position area. There, the vehicle guides wait to lead the vehicles to selected locations.

4-72. A platoon sergeant implements the security and defense plan as personnel become available. When the mortar platoon occupies a position that has a limited field of vision, each squad establishes OPs with a means of communication. When the position or mission allows the entire platoon to occupy one location, then each

gun provides an OP as early warning. The responsibility for which gun covers each OP is established in the TACSOP. A method is to have each flank gun (one and four) cover the flanks while the two and three guns cover the front and back. This is an example, as METT-TC and manning are the major considerations.

4-73. Considerations for night occupations are as follows:

- Light discipline must be practiced. Proper preparation for a night occupation minimizes the need for lights.
- Noise discipline is most important, since noise can be heard at much greater distances at night.
- The time for occupation is increased.
- Each vehicle guide knows the location of each vehicle in the order of march allowing the platoon to move smoothly into position without halting the column.
- Vehicles do not move within the position without a guide.

HASTY OCCUPATION

4-74. Hasty occupations are also planned. They differ from deliberate occupations in preparation time for the advance party. A hasty occupation may be necessary due to rapid combat operations or unforeseen circumstances. An advance or reconnaissance party may be able to accomplish site preparation, such as marking firing positions, manning the release point, and establishing security.

4-75. Once the platoon has arrived at the location to be occupied, it may require more time to complete the occupation than during a deliberate occupation. This is because some preparatory tasks that are performed during a deliberate occupation cannot be completed during the limited time available for the reconnaissance and selection phase of a hasty occupation. However, platform-mounted MFCS greatly increases the process of occupying a firing position and having the gun(s) ready to fire.

EMERGENCY OCCUPATION

4-76. Emergency occupations result when a call for fire is received while a platoon is making a tactical movement. They require a mortar platoon or section to occupy the first available location without any prior site preparation.

POSITION IMPROVEMENT

4-77. Position improvements are continuous and performed in the priority determined by a mortar leader. These actions include—

- Improving position defense plans.
- Improving camouflage.
- Hardening positions.
- Performing maintenance.
- Rehearsing.
- Cross-training.
- Resupplying.
- Completing position area survey.

4-78. Care is taken in the way ammunition is resupplied and vehicles are refueled, particularly in tracked mortar platoons. These activities must be accomplished in a way that minimizes revealing the location of the platoon.

SECTION III – DISPLACEMENT PLANNING

4-79. While considering the scheme of maneuver and the commander's guidance, a mortar unit leader develops a displacement plan based on the mortar element's part of the fires plan. The displacement plan normally includes a map overlay showing initial positions and subsequent positions. A mortar element leader selects and includes alternate and supplementary positions.

4-80. The displacement plan also includes routes to be taken between positions and any pertinent control measures to support a specific operation or for a specific time. Figure 4-6 is an example of a mortar platoon displacement overlay.

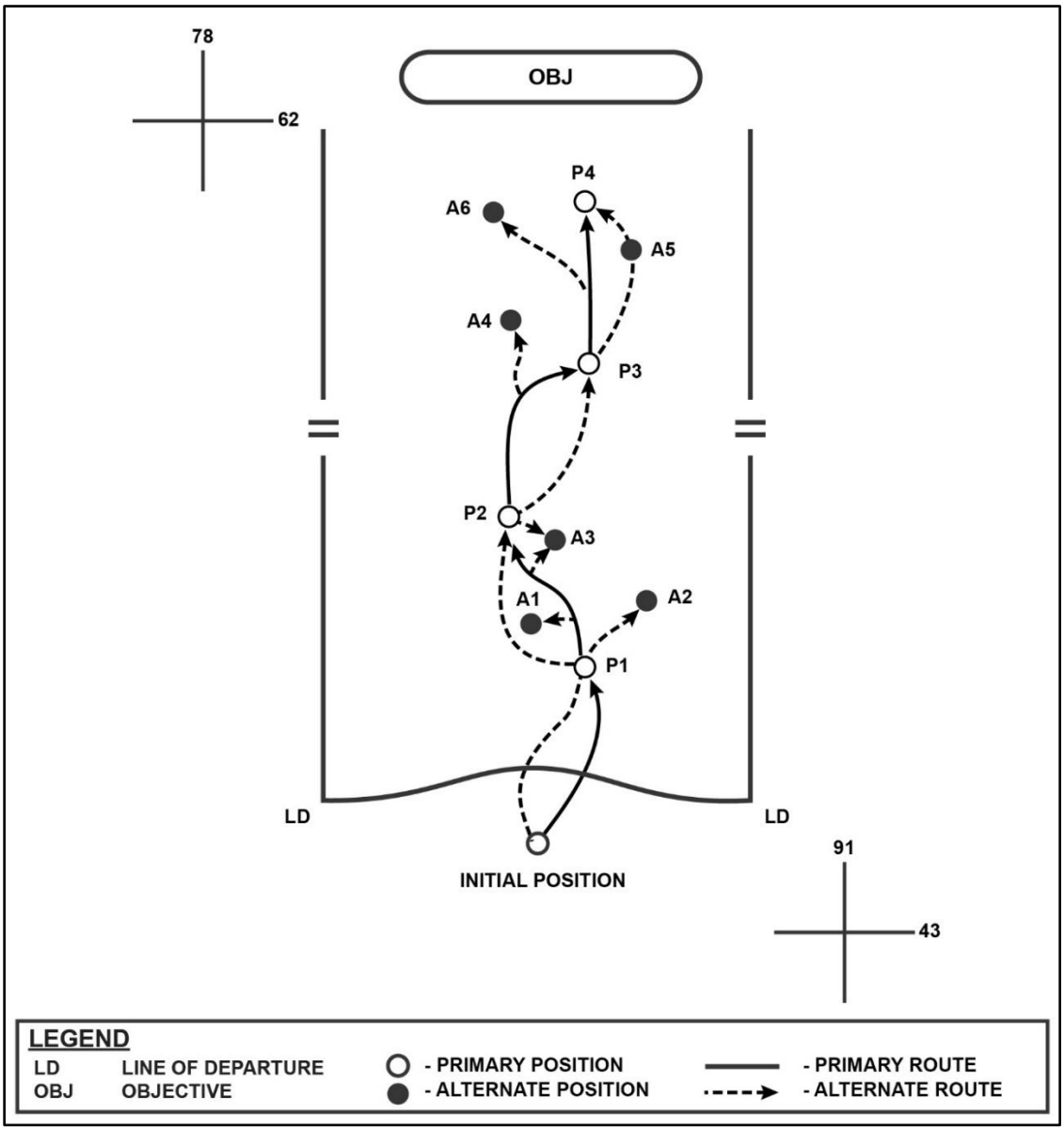


Figure 4-6. Example of a mortar displacement overlay

DISPLACEMENT TIMING

4-81. The maneuver commander controls the displacement of the mortar element by an on-order, event-oriented, or combined displacement. On-order displacement is the most restrictive and requires the most deliberate attention to the mortar element by the maneuver commander. Event-oriented is the least restrictive and does not require deliberate attention by the maneuver commander. Combined displacement is a blending of on-order and event-oriented displacement and requires minimal or no deliberate attention by the maneuver commander.

ON-ORDER DISPLACEMENT

4-82. The maneuver commander directs the mortar element to displace only on order, which is the most restrictive way to control displacement. The commander, not designee, orders the mortar element to displace or directs the operations officer or FSO to relay the order.

4-83. A mortar element leader is responsible for keeping the battalion or company CP informed of his or her status. At a minimum, the mortar element leader reports whenever the fires are falling beyond two-thirds of the maximum range in the offense or less than one-third of the range in the defense. These reports help the commander make timely decisions about mortar displacement. The mortar element leader maintains situational awareness to anticipate the order to displace and be prepared to execute it. If the mortar element leader feels displacement is necessary, the commander is informed of the situation. The mortar element leader then requests permission to displace.

4-84. If the mortar element loses total communications with a CP or commander, the element leader uses his or her best judgment to displace. The mortar element leader tries all possible means to reestablish communications with the CP or its designated alternate. Redundancy in communication platforms reduces the likelihood of losing communication entirely.

4-85. If mortar element leaders cannot reestablish contact, they change to the command frequency of the company (or platoon) having the priority of mortar fires to reestablish the link to the battle. The mortar element leader plays an active role in keeping the lines of communication open to maintain effective fires.

EVENT-ORIENTED DISPLACEMENT

4-86. The commander directs mortar elements to displace whenever certain predetermined events occur. This is less restrictive for a mortar element leader, but it reduces control of the maneuver commander.

4-87. An event-oriented displacement plan is established based on a time schedule, planned phases of an operation, crossing of designated phase lines, or completion of some event. Whatever events are chosen, a mortar unit leader anticipates the one most likely to happen next and is ready to execute the displacement plan immediately. The mortar element leader maintains situational awareness and monitors communications to learn when a specified event occurs. If the mortar element loses communications, the leader actively seeks information as to the course of the battle once communication is restored.

4-88. Mortar elements can also displace on a trigger. A trigger is a physical point on the ground, an action, or event. During the offensive operations, a trigger is often a maneuver action or event. In the defense, a trigger is more often a physical spot on the ground. (See ATP 3-09.42 for more information.)

4-89. When the situation changes and mortar element leaders feel they must displace out of order with events, they informs the CP and requests permission. If communications are lost, the mortar element leader makes a decision and always seeks to take necessary action to keep the mortar element in range while in communication with the supported maneuver elements.

COMBINED DISPLACEMENT

4-90. A combined displacement is when the mortar element will displace based upon an event or trigger but does not displace before initiating communication with and receiving acknowledgment by the maneuver commander. The maneuver commander may delegate the receipt of communication and acknowledgment of the mortar element displacement to the FSO.

4-91. Combined displacement allows the maneuver commander to maintain control of the mortar element position on the battlefield without personally conducting continuous deliberate analysis of when the mortar element needs to displace. Combined displacement is preferred over on-order displacement.

DISPLACEMENT PLANS

4-92. The rapidly changing conditions of modern ground combat require a mortar leader to always be prepared to displace. Detailed displacement planning helps provide immediately responsive fires.

4-93. After developing a tentative displacement plan, an advance party conducts a reconnaissance to verify routes and positions if mission and time permit. It then departs to perform actions that aid displacement and occupation by the displacing element. At the new position, the advance party prepares the position for occupation to the maximum extent possible until a displacing element arrives.

4-94. After a displacement plan is finalized, copies of the overlay are distributed to the commander or operations officer, the FSO, and all mortar unit leaders (at a minimum). This plan is used to help control the movement of mortars. As the tactical situation and mission change, the displacement plan is updated. Often these changes are the result of the reconnaissance.

OFFENSIVE

4-95. To support offensive operations, a displacement plan permits rapid displacement of the mortars and immediate fire support when needed. It is flexible to allow for changes in the scheme of maneuver. The enemy situation, the distance to be covered, and the requirement for continuous fire support determine the number of mortars that are moved at one time and the displacement technique.

DEFENSIVE

4-96. A defensive displacement plan has the same requirements as an offensive plan. A mortar leader also plans for extensive use of alternate and supplementary positions, anticipating future operations and planning displacements to assume the offense or to conduct a retrograde operation. The same factors affecting the displacement in the offense apply to the defense.

4-97. In retrograde operations, initial employment of mortars may be by a platoon or section, depending on the situation and front to be covered. Displacement is planned to provide continuous mortar fire support throughout the operation. Plans include designated locations for prestock ammunition, when possible. Close coordination and communication with supported elements ensure that displacement is planned and timed to allow the mortars to move in advance of maneuver elements. Therefore, maneuver elements' movements are covered, preventing mortars from being left behind.

DISPLACEMENT TECHNIQUES

4-98. A maneuver commander's OPORD provides a mortar unit leader the needed information and guidance for deciding which of the three techniques to employ. The integration of FBCB2 and automated fire direction systems make displacing units much easier and less risky because, even while moving, mortar units can quickly and accurately respond to a call for fire. When displacing part of the mortar unit while the other part provides fire support, a platoon or sections use alternating or successive bounds. The displacement technique used for a particular operation depends on the METT-TC variables.

4-99. Specific considerations include—

- Scheme of maneuver of supported unit.
- Enemy activity.
- Trafficability of terrain.
- Number of sections or mortars in a platoon.
- Availability of supporting artillery.
- Time available. (Time is often the limiting variable that determines the displacement technique.)

MORTAR PLATOON OR COMPANY AND TROOP SECTION DISPLACEMENT

4-100. Mortar unit displacement is when the entire mortar element displaces as once unit in one move. This technique is used when there is little immediate likelihood of enemy contact or when artillery can provide adequate support during displacement. This technique applies to mortar platoons and to company and troop mortar sections. This is the fastest way to displace a platoon; however, the platoon is then slower to provide immediate responsive fire support while moving compared to a complete occupation.

4-101. If a platoon must fire during movement, it uses hip-shoot or emergency techniques to engage. Movements from the assembly area to the initial firing position are usually by platoon and company or troop section. Fielding of the MFCS greatly increases the ability of mortar units to provide fires even while displacing.

PLATOON DISPLACEMENT BY SECTIONS

4-102. This technique requires one section to remain in position while the other section moves. When a displacing section is in position and ready to fire, the remaining section displaces. The platoon FDC displaces with one of the sections.

4-103. Displacing by sections is accomplished when continuous fire support from the mortar platoon is required. Since one section must be ready to provide fire support while the other section moves, this technique takes the entire platoon longer to occupy the new firing position than displacement by platoon but still provides immediate responsive fire support.

SQUAD DISPLACEMENT

4-104. The squad-displacement technique is similar to platoon displacement by sections, except fewer mortars are involved, and is most often employed by sections rather than platoons. This displacement technique involves displacing one mortar squad while another provides continuous support.

4-105. When the mortar element is in position and ready to fire, a mortar squad displaces. There are four methods to manage mortar fire direction control during squad displacement:

- An FDC maintains the fires net, receives calls for fire, computes the data, and sends it to the squad or squads that are still emplaced and ready to fire; most often used during platoon displacement by squad.
- An emplaced mortar squad maintains the fires net, and controls mortar fire direction for all mortar squads still emplaced; most often used during squad displacement by company or troop sections.
- An emplaced mortar squad controls mortar fire direction for all mortar squads still emplaced and, when a fire mission is received, directs the displaced squad to conduct a hasty occupation, receive firing data, and contribute to the fire mission; effective with digital fire control systems.
- Each mortar squad operates its own fire direction control; most often used when a mortar squad is attached to a maneuver platoon.

4-106. When displacing by squads, successive or alternate bounds can be used (see figure 4-7). Alternate bounds are used when displacement is rapid in order to stay with the supported elements. Using alternating bounds is somewhat less secure and a leader has less control. Successive bounds are used when a maneuver element's movements are not as rapid, such as in defensive or retrograde operations. Successive bounds are somewhat more secure and give a mortar unit leader more control.

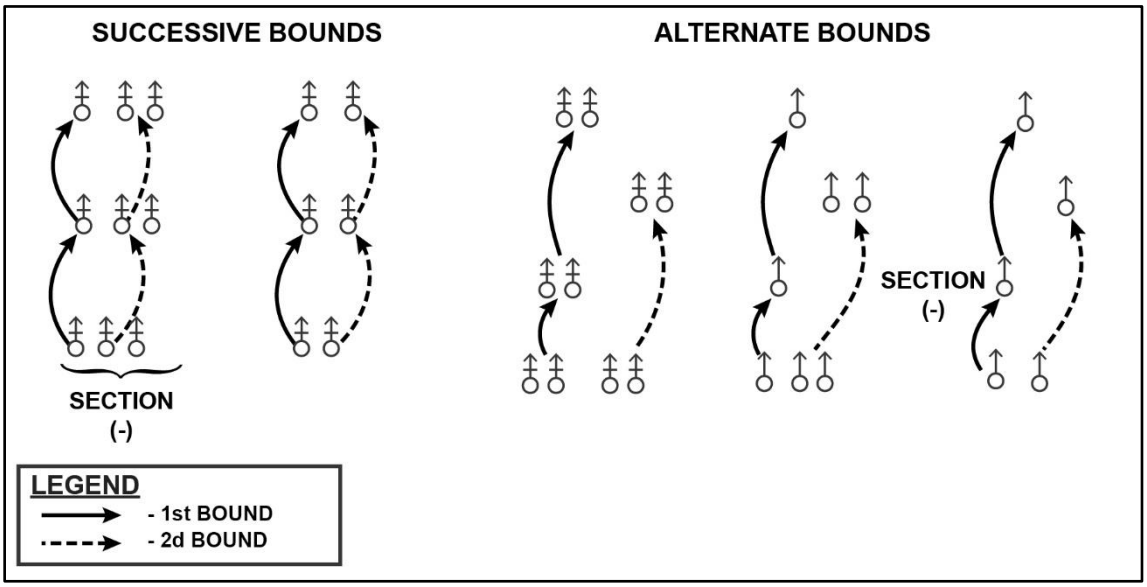


Figure 4-7. Examples of mortars bounding

SECTION IV – MOVEMENT

4-107. METT-TC variables determine the type of movement used by mortar units. As an enemy threat increases, a mortar leader increases the distance between vehicles or units.

4-108. Because of weight, heavy mortars are usually moved by vehicle. Medium mortars are carried by hand or moved by vehicles. Infantry light mortars are usually hand-carried. Mortar platoons or sections move independently or as part of a larger unit.

INDEPENDENT

4-109. A mortar unit moves as part of a larger group, but it may move independently for short distances. When moving dismounted, mortar units employ the same dismounted movement techniques as other Infantry squads and as discussed in chapter 3: traveling, traveling overwatch, or bounding overwatch. Bounding overwatch is not often used because a mortar platoon or section does not normally seek to make direct contact with the enemy. (See ATP 3-21.8 for more information.)

4-110. When moving mounted, a mortar unit leader has several options for moving the unit in a tactical configuration. Each option has specific advantages and disadvantages. A mortar leader decides which method is best for the existing METT-TC.

OPEN COLUMN

4-111. The open column is the most common tactical march technique because it offers the most security while still providing a reasonable degree of control. It normally is used during daylight but also may be used at night with infrared lights, blackout lights, or passive night-vision equipment.

4-112. Using an open column roughly doubles the column's length and, thereby, doubles the time it takes to clear a point when compared to a close column moving at the same speed. (See ATP 3-21.8 for more information.)

CLOSED COLUMN

4-113. A closed column normally is employed for marches during darkness under blackout driving conditions or marches in restricted terrain. This march technique takes maximum advantage of the traffic capacity of a route but provides little dispersion. Distance between vehicles varies from 20 to 25 meters.

4-114. At night, vehicles are spaced so each driver can see the two lights in the blackout marker of the vehicle ahead. During daylight, the mortar unit uses closed column when maximum control is needed, such as during limited visibility or when moving through built-up or congested areas. (See ATP 3-21.8 for more information.)

INFILTRATION

4-115. Infiltration provides the best possible passive defense against enemy observation and attack. It is suited when time, space, security, deception, and dispersion are necessary.

4-116. During infiltration, vehicles are dispatched in small groups, or at irregular intervals, at a rate that keeps the traffic density low and prevents undue massing of vehicles during the movement. (See ATP 3-21.8 for more information.)

OFF-ROAD MOVEMENT

4-117. A mortar element using off-road movement travels close to tree lines, along gullies, and close to hill masses. Off-road movement is conducted when enemy observation or interdiction by artillery fire or air attack is likely.

4-118. A unit may move safely on a road for some distance and then off-road at a point where enemy observation becomes likely or vehicle congestion provides an enemy an inviting target. A unit using off-road movement may move in open column, closed column, or by infiltration. It can also displace as a unit or by echelon.

SECTION V – MORTAR UNIT FIRING FORMATIONS

4-119. A mortar unit leader always considers mission variables when deciding the firing formation for mortars. The main emphasis is on mission accomplishment, but mission variables also affect the choice of the firing formation. A mortar unit leader always considers the appropriate amount of dispersion, the need for position hardening, overhead and mask clearance, defilade, range, available camouflage and concealment.

4-120. With the introduction of automated fire direction systems, mortar leaders are no longer limited to positions that produce a parallel sheaf, provide a set pattern of rounds on target due to mortar positioning, or positions where all the mortars have to have line of sight to an aiming circle. Each mortar can now quickly receive individual fire commands from an FDC without lengthy calculations.

4-121. A mortar unit leader is now more concerned with—

- The ability to support the commander by positioning the unit to effectively hit assigned targets.
- The effective use of existing cover, concealment, and defilade.
- The ability to establish local must to be prepared to conduct analog fire control procedures. When automated systems are not available, a mortar leader must continue accomplishing the assigned mission and establish a firing position using mortar analog fire control systems.

TERRAIN MORTAR POSITIONING

4-122. When the threat of enemy counterfire and aerial attack is high, a mortar element leader considers dispersing mortars over a larger area and maximizing the use of natural cover and concealment offered by the local terrain. This type of dispersal, without regard to any set distance between mortars or effects on a parallel sheaf, is called terrain mortar positioning. This requires fire direction control personnel to compute corrections to fire a linear sheaf (see figure 4-8).

4-123. The time required to compute these corrections decreases the responsiveness of the mortars from a given location, unless terrain mortar position corrections can be computed before occupation of the position. Since mortars move often, computing such corrections before occupation may be impossible. A modified version allows a platoon to use a form of terrain mortar positioning that does not decrease mortar responsiveness.

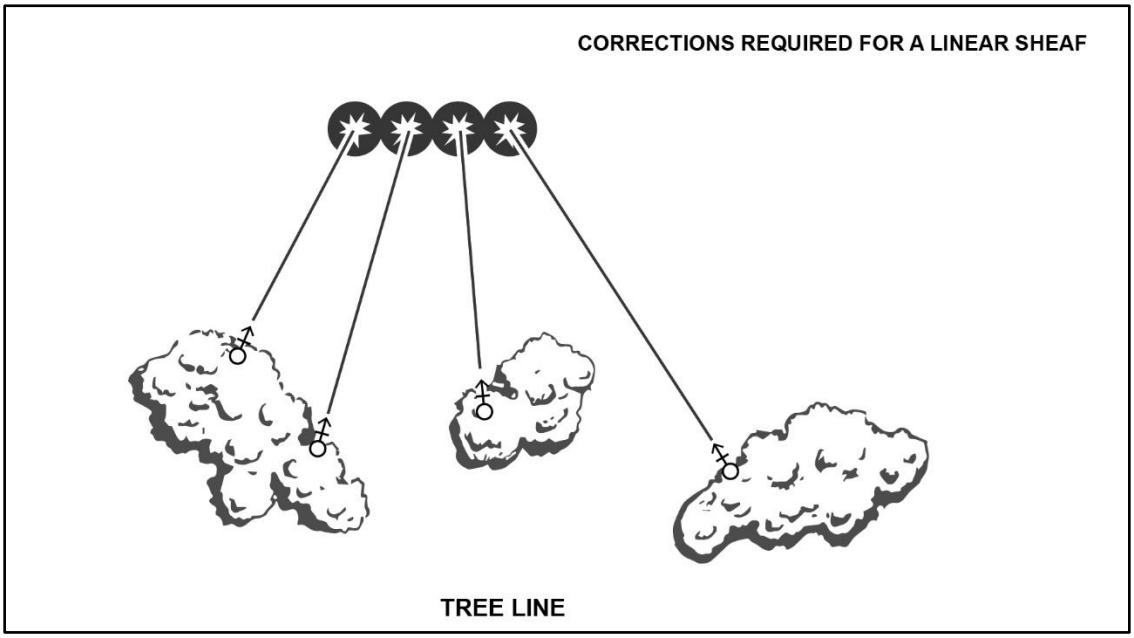


Figure 4-8. Terrain mortar positioning

PARALLEL FORMATION

4-124. A parallel formation has the mortars on line. The distance between mortar positions is the bursting diameter of HE ammunition for the particular mortar employed. A parallel formation is used to employ two or more mortars where the terrain allows dispersion of the mortars and maximum cover and concealment. A parallel sheaf is formed in the target when all mortars fire the same data.

4-125. A parallel formation provides maximum coverage of a linear target. However, it does present an easy linear target for enemy aircraft and artillery to engage and makes all-around security difficult to provide. This formation is one of the easiest to move into during a hasty occupation of a firing position since individual mortar placement is by TACSOP.

LAZY W FORMATION

4-126. The lazy W formation lays mortars on a modified line. It provides better flank security with almost the same target coverage as the parallel formation when all mortars fire the same data. The lazy W is used when the terrain provides little cover and concealment. It adds depth to the sheaf, which is useful when engaging area targets.

DIAMOND FORMATION

4-127. A diamond formation allows a mortar platoon to fire in all directions with equal ease (see figure 4-9, page 4-20). It is used when 6400-mil coverage is required (for example, in support of encircled forces) and creates a tight, defensible position against ground attack. It is excellent for use in restricted terrain. Special corrections, similar to those used in attitude missions, are required to fire a linear sheaf. Since distance between mortars is decreased, the formation is more vulnerable to air attack and counterfire.

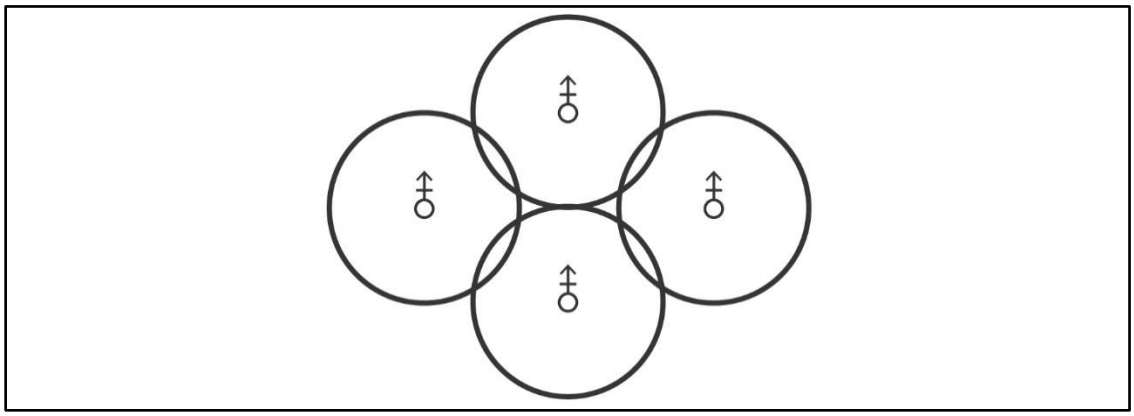


Figure 4-9. Mortar diamond formation

4-128. A diamond formation is also useful in built-up areas (see figure 4-10). By selecting the mortars to fire, an FDC can create different sheaf patterns in the target area without computing time-consuming deflection and elevation corrections.

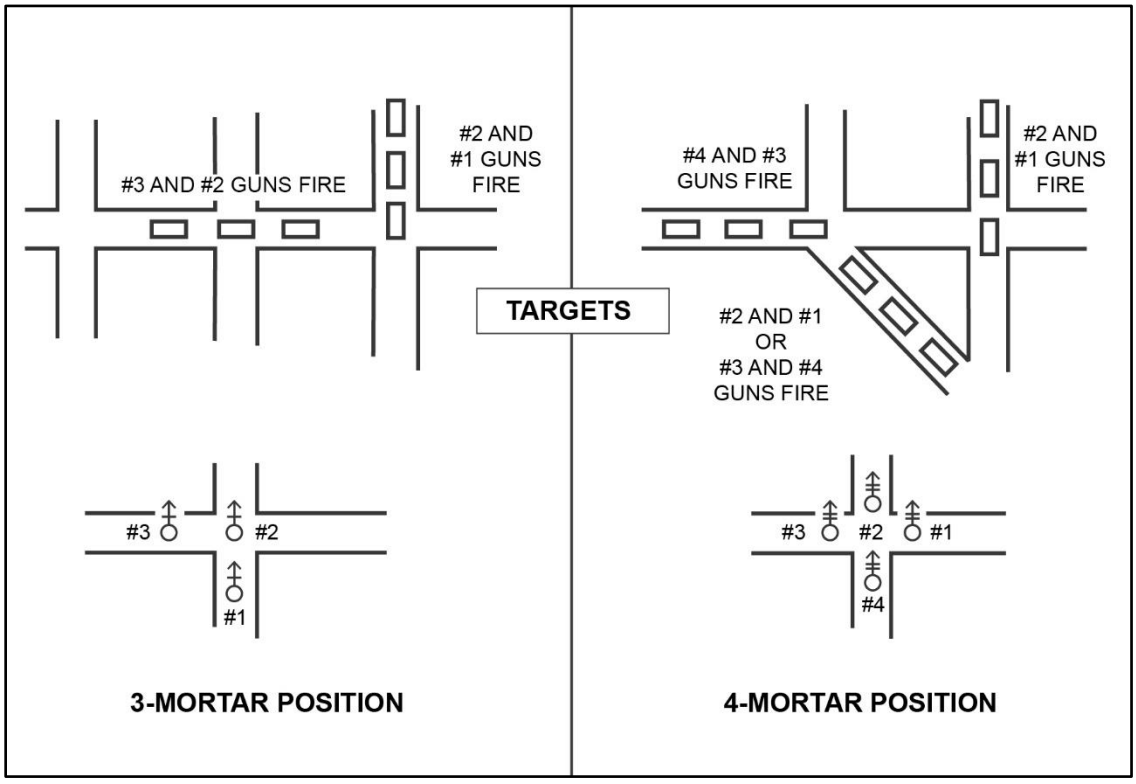


Figure 4-10. Mortar diamond formation used in built-up areas

TRIANGLE FORMATION

4-129. A triangle formation is a modification of the diamond formation in that only three mortars are used (see figure 4-11). It is also used when 6400-mil coverage is required. One of the major advantages of a triangle formation is that it allows distribution of personnel to other crews. Another advantage is this formation allows maintenance to be conducted during continuous operations.

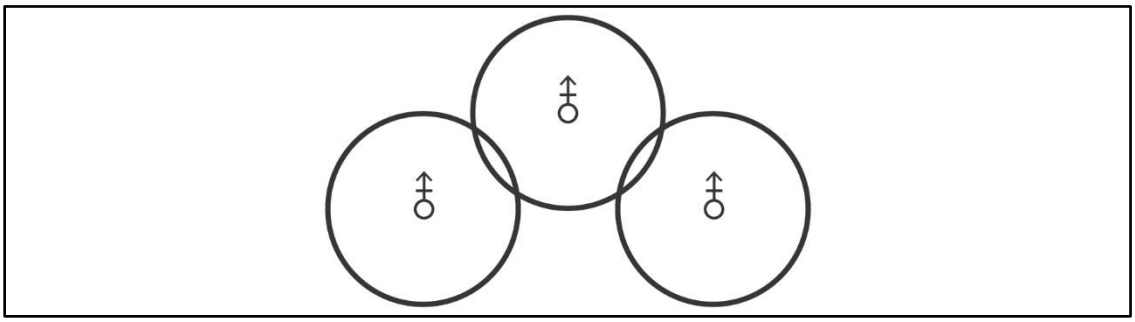


Figure 4-11. Triangle formation

Note. A mortar leader must understand and evaluate the trade-offs required in using the diamond and triangle formations. The ability to provide 6400-mil coverage and increased defensibility is gained by decreasing platoon dispersion and increasing a unit's vulnerability to counterfire.

SECTION VI – AIR ASSAULT OPERATIONS

4-130. Air assaults are not merely movements of Soldiers, weapons, and equipment by Army aviation units and should not be considered as such. An air assault is not synonymous with an air movement. They are separate and distinct missions. (See FM 3-99 for more information.)

AIR ASSAULT

4-131. An *air assault* is the movement of friendly assault forces by rotary-wing or tiltrotor aircraft to engage and destroy enemy forces or to seize and hold key terrain (JP 3-18). It is a precisely planned and vigorously executed combat operation. Commanders and leaders must develop an insight into the principles governing their organization and employment to take advantage of the opportunities offered by an air assault.

4-132. Helicopters can rapidly move mortar units and ammunition directly to where they are needed. Mortars usually participate in air assault operations as part of a larger unit. Battalion and company headquarters are responsible for the planning, coordination, and control of the air assault operation.

4-133. Planning and executing operations involving helicopters require trained, experienced personnel and proper equipment. This is especially true when using exterior helicopter loads. This section provides only a very basic overview for mortar units involved in helicopter operations. Mortar personnel must receive the proper training and certifications before they can execute these operations effectively and safely.

4-134. A mortar unit can use a variety of utility and cargo helicopters. Helicopters allow mortar units to move rapidly to firing positions that may be difficult or impossible to reach. However, weather and altitude greatly affect helicopter capabilities, and a mortar unit leader has to consult with the commander, battalion operations section, or aviation liaison officer to get the current lift capacities. For example, transporting a light mortar section requires different types of helicopters or a different amount of helicopters compared to a medium mortar platoon due to size and weight variables.

4-135. Preparing and planning for an air assault is the same for mortar units as it is for other Infantry units. Forecasting ammunition requirements for the mission is especially important because of the time required to resupply. Depending on the ground tactical plan, mortar units either accompany the Infantry moving toward the objective or maintain their firing position on or near the landing zone. Staying at the landing zone eases ammunition resupply. Mortar units usually participate in air assault operations as part of a larger force, providing a maneuver force with immediate fire support. A mortar unit's relatively small size and weight makes it a versatile force with the ability to be easily airlifted. Some employment considerations include—

- Determining support relationships, priorities, and targets prior to the mission.
- Carrying crew, weapon, and ammunition together.

- Landing mortar element on or near the firing position.
- Avoiding interference of mortar-firing position and firing with the aircraft flight patterns.
- Preparing mortar crew to fire immediately in any direction.
- Establishing communications immediately.

AIR MOVEMENT

4-136. Air movement is air transport of units, personnel, supplies, and equipment, including airdrops and air landings (JP 3-17). Army air movements are operations involving the use of utility and cargo rotary-wing aircraft and operational support fixed-wing assets for other than air assaults. (See ATP 3-04.1 for more information.)

Note. For information on sling-load operations, see TM 4-48.10. For information on air assault, see FM 3-99.

SECTION VII – AIRBORNE OPERATIONS

4-137. An *airborne operation* involves the air movement into an objective area of combat forces and their logistic support for execution of a tactical, operational, or strategic mission (JP 3-18). Mortar element leaders that are organic to airborne units must be proficient in and have a thorough understanding of airborne operations in order to effectively advise the maneuver commander of the capabilities and limitations of the mortar element.

AIRBORNE ASSAULT FORCE

4-138. An *airborne assault* is the use of airborne forces to parachute into an objective area to attack and eliminate armed resistance and secure designated objectives (JP 3-18). An airborne assault force comprises an airborne IBCT with capabilities organized, trained, and equipped to gain entry into an operational area to enable the conduct of follow-on operations or conduct a singular mission. (See FM 3-99 for more information.)

4-139. The airborne assault force seizes an airhead to destroy or capture enemy forces; repel enemy assaults by fire, close combat, or counterattack; for follow-on forces; or for any combination. It can deploy rapidly and be sustained by an austere support structure and can conduct operations against conventional and unconventional enemy forces in all types of terrain and climate conditions. This section addresses how an airborne assault force is organized, to include distinct levels of echelon employment and application to conduct an airborne assault. (See FM 3-99 for more information.)

4-140. Light and medium mortars can provide indirect fire support for the assault echelon as artillery support in the airhead is limited. The bulk of fire support must come from joint fire support assets and organic mortars. Long-range artillery of advancing friendly forces (if in range), Army long-range rocket or missile fire, and joint interdiction can provide fire support. (See FM 3-99 for more information.)

INITIAL AVAILABLE FIRE SUPPORT

4-141. Joint fire support, organic mortars, and limited Army aviation and field artillery are usually the only fire support available to the airborne force until the lodgment is established. Examples of initial available fire support missions include—

- Column cover for the assault, and follow-up echelons and resupply sorties.
- Suppression of enemy air defenses along the corridor selected for penetration and near the objective.
- Counterair operations to gain and maintain air superiority along the corridor and in the objective area.
- Pre-assault fires of the airhead and other critical targets and deception.

- Field artillery may conduct counterair missions by striking enemy aircraft bases, helicopter forward aiming and refuel points, missile storage, and launch sites.
- Air interdiction of the objective area to include armed reconnaissance missions targeted against enemy forces that react to the airborne assault.
- Air defense of marshalling areas, resupply airfields, and the airhead.
- Close air support.

SECTION VIII – MOUNTAIN OPERATIONS

4-142. Infantry units are usually the most suitable force for this type of combat. Small-unit commanders often operate semi-independently. The most reliable sources of combat power for a small unit leader are often organic weapons found at the company and battalion.

MORTARS IN MOUNTAIN OPERATIONS

4-143. Mortars play a critical role in mountain operations. Their high-angle fire can destroy enemy forces that are almost invulnerable to other forms of fires. Heavy and medium mortars can move over most terrain to provide fire support for a commander. Light mortars can maneuver with Infantry, regardless of terrain type. Because ammunition is limited and usually difficult to resupply in the mountains, mortar element leaders have to be especially vigilant about expenditures. They advise the commander on how mortars can best support operations, appropriate targets for mortars, methods of attack, location of firing positions, and expenditure of ammunition on a specific target.

4-144. Using meteorological data in the mountains is critical. Wind direction and speed frequently change, which may cause a mortar round to act erratically. Accuracy decreases without frequent meteorological data updates.

Note. Meteorological data can vary in mountainous terrain. When planning on continuous operations, leaders strive to attain meteorological data for the AO. When mission variables permit, mortar units can conduct registration missions to account for multiple variables compared to only meteorological patterns.

EFFECTS OF MOUNTAINS ON MORTAR OPERATIONS

4-145. Mortar fire can strike targets that low-angle fires cannot reach. These include targets on reverse slopes, in narrow ravines or trenches, and in forests or towns. Light mortar units can accompany Infantry anywhere they can go. Although having to be moved and resupplied by vehicles, heavy mortars can occupy firing positions well forward.

4-146. Units deployed to a mountainous AO must understand the effects of the terrain and weather on operations. Some of the characteristics of mountains that affect mortar operations are—

- Rugged, compartmented terrain with steep slopes.
- Large AO requiring dispersal of units.
- Limited infrastructure and road networks, limited areas to maneuver, and limited resupply routes.
- Isolated small unit actions.
- Difficulty in concentrating combat power.
- High-altitude effect on helicopter support.
- Terrain that favors the defender.
- Weather that may span the entire spectrum from extreme cold with ice and snow to extreme heat.
- Heavy precipitation and the threat of flash floods.
- High winds.
- Large temperature fluctuations.
- Rapidly changing weather.

4-147. At high elevations, atmospheric conditions may significantly alter an indirect fire round's trajectory. Minor variations in wind, air density, air pressure, and air temperature may affect the projectile from round to round. This can be corrected by applying current meteorological data and registration corrections. Meteorological data accounts for much of the correction that must be made, while a valid registration mission helps ensure increased first-round accuracy. Due to rapid changes in weather, meteorological data must be frequently updated.

4-148. It is important to remember that a mortar round impacting 50 meters away from an intended target on fairly level or close to level terrain may have good effects. However, the same horizontal 50 meters in mountainous terrain may cause the round to impact significantly above or below the target. Due to a steep mountain slope, the impact of these rounds may render no effect at all, as shown in figure 4-12. Observers must be aware of this and consider creeping rounds for adjustments to increase the probability of target effects. Observers also consider creeping adjustment rounds from a lower elevation up to a target because impacts over a ridgeline are difficult or impossible to observe.

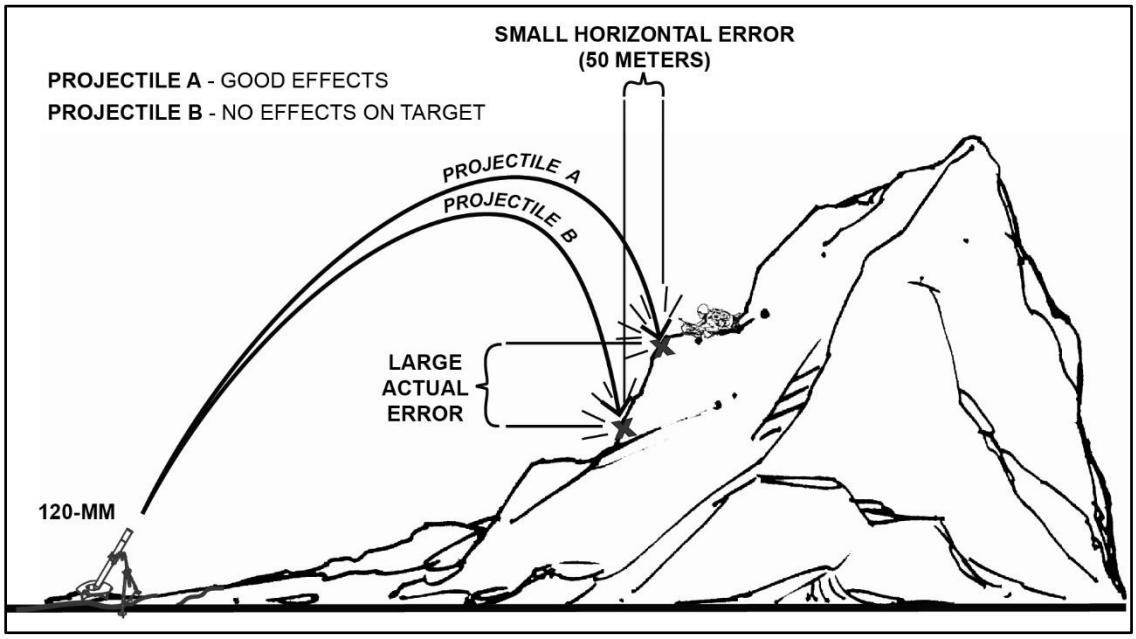


Figure 4-12. Effects of slope on hits

PREPARATION

4-149. To be successful, mortar units must have accurate and timely information on the type of operations and environment they can expect to encounter. Mortar unit leaders use this information to prepare their subordinates and equipment. This preparation falls into the general categories of physical preparation, training for the specific operational environment, and proper preparation of the right equipment.

Physical Fitness

4-150. Every member of a unit must be in excellent physical condition. The extremes of operating in mountains demand even greater emphasis on being in the best physical shape possible. Leaders cannot function if they are not physically ready to keep up with their units. Individual physical fitness is one key to successful operations in any combat environment, but especially in mountainous terrain or when faced with temperature extremes. Physically fit troops are better able to handle fatigue and stress created by the rigors of daily tasks.

4-151. Mortar personnel are also trained to carry additional weight and lift heavy objects. Fatigue is a major cause of carelessness and complacency and is a major factor in an individual's risk of becoming a casualty.

Fatigue rapidly degrades a troop's ability to think clearly and accomplish complex tasks, such as planning fires and operating digital and analog fire direction control systems.

Training

4-152. Mortar elements train for the conditions that they will face once deployed. Some units have the advantage of being able to contact their opposite number in-country and receive information on the conditions and requirements of their future AO. All mortar element leaders must obtain the necessary security clearance to access this information.

4-153. All mortar units in the Department of Defense can receive additional equipment depending upon mission requirements. For example, a heavy mortar platoon may be issued light mortars that are theater-provided equipment. Another example is a USMC mortar platoon issued Army M120 systems.

4-154. From the information gained from their contacts with their opposite number in-country, the mortar units identify—

- Number of sections the unit operates.
- Types of mortars.
- Number of firing positions to be occupied.
- Any in-theater augmentation of mortar weapons and equipment.
- Locations of the most dangerous positions.
- Types of missions fired.
- Type and availability of artillery support in the AO, including counterfire.

4-155. Based on information received during the planning process, a mortar leader can begin to plan and conduct training. Training includes—

- Becoming proficient on all mortar systems.
- Cross-training mortar crews and fire direction control personnel.
- Certifying all mortar personnel in fire direction control duties.
- Training attached service members as assistant gunners and ammunition bearers.
- Conducting missions as gun/FDC.
- Operating and controlling fires for the planned number of mortars deployed.
- Using deployment to training centers to become proficient in controlling more than two mortar sections.
- Calculating fires in mountainous terrain, emphasizing vertical interval and altitude corrections.

Equipment

4-156. An incoming mortar unit prepares and ships equipment well before the unit deploys. Some considerations when shipping equipment include—

- Protecting all equipment to ensure serviceability after transport, especially fragile equipment, aiming circles, sight units, bipod, fire control equipment, and other related items.
- Digital and analog fire direction control equipment, map markers, pencils, erasers, firing tables, forms, and other related items.

4-157. After a unit has shipped their equipment, a mortar unit can utilize equipment from nondeploying units to continue to train, whenever possible. Alternately, the mortar unit can train skills that do not require any equipment support, such as-

- Receiving a call for fire.
- Receiving an operations order and writing down all required information.
- Conducting a talk through of mortar movement and survivability techniques with all Soldiers.
- Conducting a talk through of priorities of work during emplacement, displacement, or contact to ensure all Soldiers thoroughly understand where their duty position fits within the larger operation.
- Training Soldiers how to read Annex D (Fires) of an operations order, a fire support overlay, fire support execution matrix, and target list worksheet.

- Training Soldiers how to develop effective technical triggers from tactical triggers.
- Training Soldiers how to assist in mortar fires planning by understanding and filling out a fires planning worksheet based upon the memory aid TTLODAC or PLOTCR.

4-158. The mortar unit can also use graphic training aids, such as GTA 07-01-029, which is a miniature, thin, flexible plotting board that is used to train analog fire direction control practice computations. An installation map along with GTA 05-02-012 (commonly referred to as a "protractor") can be used to gain or maintain proficiency in map reading and plotting skills.

Note. GTA 07-01-029 is not used for any mortar live fire or training using live mortar rounds or during fire direction certification or examination.

4-159. A mortar element plans to have enough equipment to execute mortar operations based on mission variables and prior planning. For example, a mortar platoon has one FDC but receives a mission to have four mortar-firing points, each operating its own digital and analog fire direction control systems. Have enough equipment and qualified personnel to sustain operations based on how long it takes to be resupplied.

Note. A mortar unit plans to have enough equipment to execute mortar operations based on mission variables and prior planning. For example, a mortar platoon has one FDC but receives a mission to have four mortar-firing points, each having its own FDC. Have enough equipment and qualified personnel to sustain operations based on how long it takes to be resupplied.

OPERATIONAL CONSIDERATIONS

4-160. When a mortar unit arrives to an AO, the mortar unit has to be able to immediately take over and conduct missions. Mortars provide a key security aspect for the warfighter function of protection. If the mortar unit is replacing another unit, there may be a brief transition period with the unit being relieved.

4-161. When a relief in place is conducted with another unit, consider how long the mortar positions have been in place. If mission variables allow, consider different mortar positions, especially during stability operations when operating from an assembly area that has been in position for an extended period.

Note. Refer to ATP 3-90.97 for more information on mountain operations.

SECTION IX – URBAN OPERATIONS

4-162. Mortars are the most used indirect fire weapon in urban combat for their ability to engage targets with a high rate of fire, steep angle of fall, and short minimum range. Indirect fire effects provide the ability to mass firepower on specific enemy positions in the tight confines of urban fighting. (See ATP 3-06 for more information.)

POSITION SELECTION

4-163. Selection of mortar positions depends on the size of buildings, size of the urban area, and mission. Special techniques can be used to position and lay mortars. These include—

- When the depth of the defensive position is shallow, or when suitable firing positions are not available, mortars may have to be positioned directly behind the reserve.
- Displacement is often executed by section or squad.
- Key considerations for selection of positions include the minimum range of the weapon, mask and overhead clearance, terrain suitable for setting baseplates, dispersion, and accessibility.

4-164. Using existing structures for hide positions is recommended (such as garages, office buildings, or highway overpasses) to afford maximum protection and minimize the camouflage effort. Proper use of mask

can enhance survivability. If the mortar has to fire in excess of 885 mils to clear a frontal mask, an enemy counterbattery threat is reduced. These principles can be used in offense and defense. (See chapter 5 for more details on survivability techniques.)

4-165. Mortars are not be mounted directly on concrete. When only concrete is available to mount the mortars, sandbags may be used as a buffer as follows:

- Use two or three layers.
- Butt them against a curb or a wall.
- Extend them at least one-sandbag width beyond the baseplate.
- Rubble may be used to make a parapet for firing positions.

4-166. Mortars are usually not placed on top of buildings except for mission requirements, because lack of cover and mask make them vulnerable. Mortars are not placed inside buildings with damaged roofs unless the structure's stability has been checked.

Note. Overpressure can injure personnel and can weaken or collapse the structure.

COLLATERAL DAMAGE

4-167. The use of mortars in an urban environment can damage civilian infrastructure and cause civilian casualties. A method to control the amount of collateral damage is to use heavy mortars with precision ammunition and fire control systems.

4-168. Another method is to have a restrictive ROE, which limits the use of mortars in urban operations. This is the least desirable method but provides a commander with most control.

RULES OF ENGAGEMENT AND CLEARANCE OF FIRES

4-169. When civilians and significant cultural and religious structures are present, ROE will probably affect how mortar units fire. ROE may restrict ammunition, targets, and conditions under which mortars can fire. Clearance of fires may also reduce responsiveness of fires.

COMMUNICATIONS

4-170. Satellite communications can reduce interference usually encountered when using frequency modulation radios in urban areas. Structures reduce radio ranges; however, remoting of antennas to upper floors or roofs may improve communications and enhances operator survivability. Another applicable technique is use of radio retransmissions. Digital systems are affected the same way as frequency modulation communications.

4-171. Other possible techniques to increase communications reliability include using—

- Existing civilian systems to supplement a unit's capability.
- Wire communications, messengers, and visual signals.
- Wire communications between fire direction control personnel and mortar squads because these elements are usually close to each other.

MAGNETIC INTERFERENCE

4-172. All magnetic instruments are affected by surrounding structural steel, electrical cables, and automobiles. Minimum distance guidelines for M2 aiming circles are difficult to apply. (See TC 3-22.90 for more information.) Such features as the direction of a street may be used instead of a distant aiming point.

AIMING POSTS

4-173. Posts can be placed vertically in dirt-filled cans or ammunition boxes if the frontal area is covered by concrete or asphalt. Natural aiming points, such as edges of buildings or lampposts, may also be used.

HIGH-EXPLOSIVE AMMUNITION

4-174. During urban combat operations, mortar HE fires are heavily used. Some of their greatest contributions are interdicting supplies, implementing evacuation efforts, and reinforcing an enemy rear just behind the forward defensive positions. Although mortar fires are often targeted against roads and other open areas, the natural dispersion of indirect fires with unguided projectiles can result in many hits on buildings. Leaders use care when planning mortar fires during urban operations to minimize collateral damage.

4-175. HE ammunition gives good results when used on lightly built structures within cities, particularly a 120-mm projectile. It does not perform well against reinforced concrete found in larger urban areas.

4-176. When using HE ammunition in urban fighting, point-detonating fuzes are normally the most effective. A delay-fuze setting allows the projectile to penetrate floors before detonating. The nature of built-up areas can cause proximity fuzes to function prematurely. However, proximity fuzes are useful in attacking targets, such as OPs on tops of buildings.

ILLUMINATION

4-177. In the offense, visible illuminating rounds are planned to burst above the objective to put enemy troops in the light. If illumination is behind the objective, enemy troops would be in shadows rather than light. In the defense, illumination can be planned to burst behind friendly troops to put them in shadows and place enemy troops in light.

4-178. Buildings reduce the effectiveness of illumination. Continuous illumination requires close coordination between the FOs and FDC to produce the proper effect by bringing illumination over defensive positions as enemy troops approach buildings.

SECTION X – JUNGLE OPERATIONS

4-179. The mortar unit mission is to provide close and continuous indirect fire support. Where trafficable road networks are available, the mortar element can displace to perform its missions while mounted. It may, however, have problems in the jungle environment due to a limited number of suitable firing positions because of heavy rains and restricted overhead clearance. The use of chain saws and demolitions may be necessary to obtain mask and overhead clearance. It also may be possible to fire from positions on or near roads and trails.

4-180. When operating in terrain where vehicles cannot go, several difficulties surface. Moving a dismounted mortar section in rugged jungle terrain with all of its weapons components and ammunition is difficult. An Infantry platoon can be tasked to assist; however, this will severely hamper its ability to maneuver. If the mortar fire is absolutely essential to the unit's scheme of maneuver, then consideration is given to the employment of only one mortar. Also, consideration is given to the displacement of mortars by helicopter. See Appendix A for more information on munition effects in a jungle environment.

4-181. Heavy vegetation degrades the effects of all types of munitions. More firepower or alternative fuze action is normally required to achieve effective results. Dense woods cause impact-fuzed HE rounds to detonate in the trees, producing airbursts. These airbursts can be dangerous to exposed troops since large wood splinters are added to the round's metal fragments. Wounds caused by large wooden splinters are often severe. Extremely dense woods, such as triple canopy jungle, cause most impact-fuzed HE rounds to detonate high in the trees without much of an effect at ground level.

Chapter 5
Survivability Techniques

Mortar units are vulnerable to enemy attack as they fight alongside their supported units. Because of mortar units' lethality, they are often targeted by an enemy with direct fire, indirect fire, and assault. Mortar units must be able to defend themselves while continuing to provide fires. This chapter covers threats mortar units may face and techniques to reduce vulnerability to enemy attack. It discusses the construction of mortar-firing positions and other techniques to increase survivability, as well as tactics to defend a mortar position against enemy close assault.

SECTION I – SURVIVABILITY

5-1. A mortar leader considers a number of threats. The greatest danger to mortar units are—

- Enemy counterfire.
- Ground attack.
- Air attack.

ENEMY COUNTERFIRE

5-2. Mortar units may encounter intense enemy counterfire intended to reduce the support of friendly forces. Target acquisition radar, along with ground and air reconnaissance (both manned and unmanned), sound ranging, radio direction-finding, and other methods are all used to locate mortar units. Faced with counterfire threat, a mortar leader understands—

- Friendly mortars may be the first priority for enemy artillery, mortar, rocket, and direct fires.
- Skilled enemy observers can accurately locate friendly mortar positions using laser range finders or simple map reading.
- Enemy countermortar radars are accurate with a small location error.
- Enemy radio interception and direction finding can locate radio transmitters rapidly and accurately.

5-3. Many potential adversaries worldwide have effective artillery, rocket, and heavy mortar assets. Foreign nations are also developing, or have developed, precision guided mortar, artillery, and air-delivered munitions. Because of size, range, and high-angle fire, enemy mortars are a likely indirect fire weapon systems to be used against U.S. mortars.

5-4. The doctrine used by many potential adversaries calls for the use of both indirect and direct fire before an attack. U.S. mortar units are specifically targeted. As part of the battalion, they may receive heavy counterfire. Some enemy attacks have delivered up to 450 rounds on a company position as part of a 30-minute preparatory fire. In addition to HE fragmentation rounds, some enemy weapons fire rounds that include—

- Incendiary rounds filled with thermite canisters in a white phosphorus matrix. When these rounds burst, they produce some fragmentation and dense smoke from the white phosphorus. The thermite canisters scatter and burn intensely, causing fires in exposed ammunition and fuel.

- Enhanced blast warheads, which are powerful but have little fragmentation. They are used to suppress and disrupt U.S. tracked mortars, which are protected from fragments by mortar carriers, and to crush field fortifications.
- Subprojectile warheads, which explode above the ground and scatter thousands of small, finned antipersonnel flechettes.

GROUND ATTACK

5-5. When mortars support offensive operations, the greatest ground threat is chance contact with enemy forces that have been bypassed or purposely left behind or from enemy irregular forces (partisans, guerrillas, insurgents). When mortars support defensive operations, the greatest threats are enemy reconnaissance and main forces, but terrorist, guerrilla, or insurgent forces may pose a significant threat.

5-6. Enemy reconnaissance teams may encounter mortars by chance contact or can be given the mission to locate U.S. mortar positions. Once reconnaissance teams encounter mortar locations, they may attack or report locations for destruction by indirect fire or by enemy ground forces. If mortars are located where enemy penetrations occur, they can be attacked by virtue of the enemy's momentum.

AIR ATTACK

5-7. Enemy aircraft pose a threat to mortars due to the difficulty in concealing mortar-firing positions from aerial observation. Armed helicopters pose a major threat because of their standoff acquisition ability. Many armies in the world now have unmanned aircraft systems specifically used for reconnaissance and attack.

Note. A mortar platoon conceals itself from enemy aircraft through passive air defense measures. (See ATP 3-01.8 for more information.)

SECTION II – COUNTERFIRE PROTECTION

5-8. Choosing tactically sound mortar positions in defilade and using concealed reverse-slope positions are effective techniques against enemy counterfire. *Defilade* is protection from hostile observation and fire provided by an obstacle such as a hill, ridge, or bank (JP 3-09). It is important to mortars because of the difference in the trajectories of field guns, howitzers, rocket launchers, and mortars (see figure 5-1).

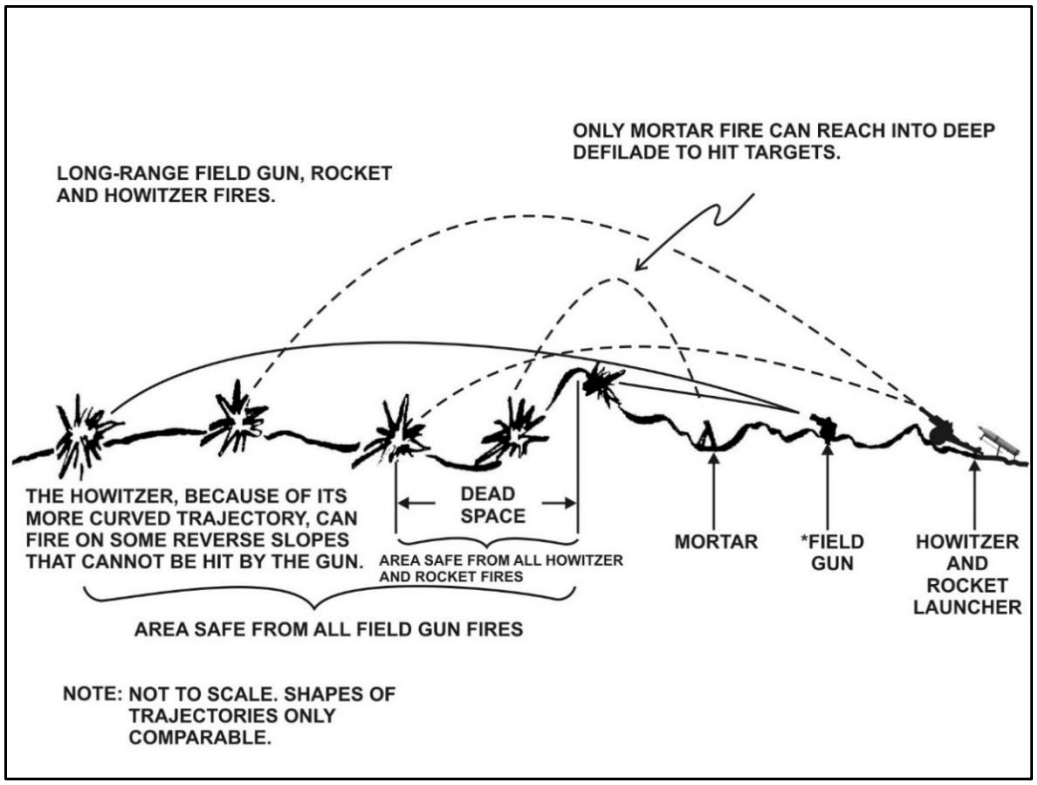


Figure 5-1. Examples of trajectories and dead space

5-9. Establishing a mortar-firing position within the dead space created by a hill mass or building does not eliminate an enemy's ability to locate the unit. It does make it difficult for an enemy to place effective counterfire on the U.S. position.

5-10. The flatter trajectory of enemy field guns, howitzers, and rocket launchers creates a dead space behind large hill masses and tall buildings. U.S. mortars can occupy positions in this area and be almost impervious to counterfire. Because of their trajectory and range, U.S. mortars can fire out of defilade against most targets in the battalion or company area. Even deep defilade only partly reduces the maximum range of a mortar (see figure 5-2 on page 5-4). Defilade protects mortar positions from field gun and low angle howitzer fires but not from enemy mortar fires and artillery high-angle fire. However, to shoot into the dead space, enemy mortars must be moved close to friendly positions, making them vulnerable to U.S. counterfire.

5-11. Defilade provides excellent protection from enemy indirect fire. However, a mortar leader must not think that it provides absolute protection because the enemy has their own methods to seek and destroy friendly fire assets, even when they are in good defilade positions.

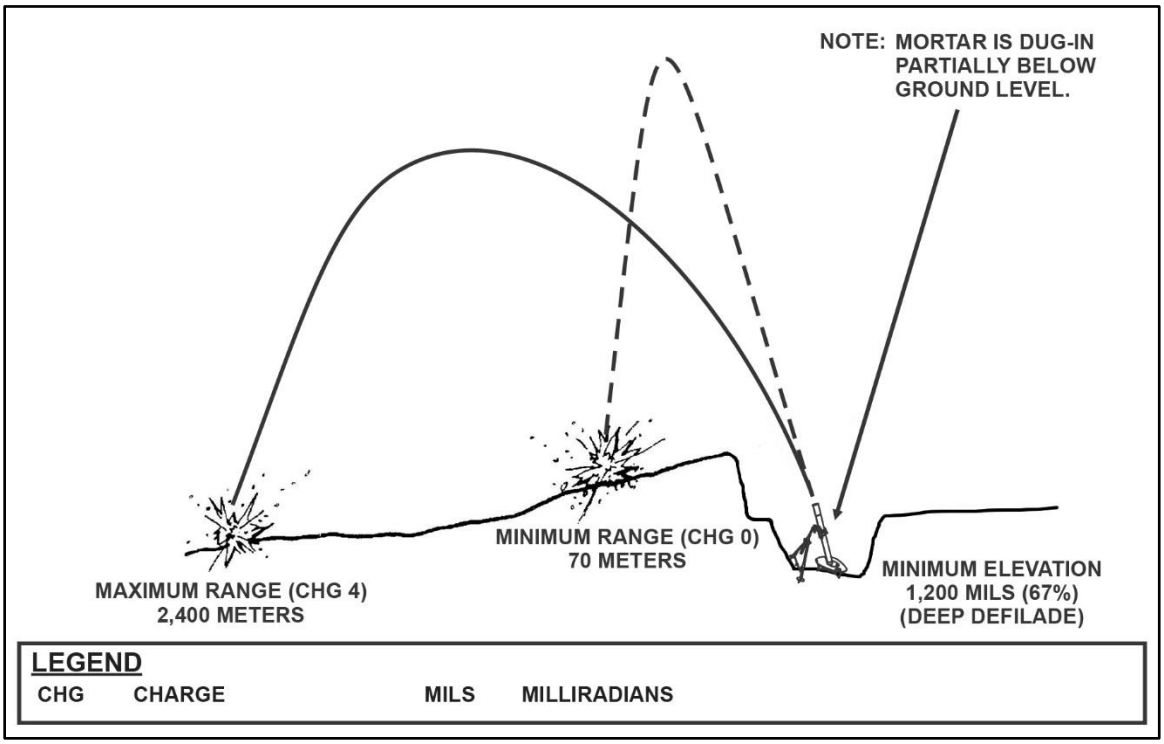


Figure 5-2. Example of range coverage from defilade

5-12. A geometric formula can determine the estimated extent of dead space using the cotangent of the angle of fall for the weapon firing (see figure 5-3). For mortar fires, the cotangent of fall can be extracted from tabular firing tables. Although enemy mortars do not have exactly the same trajectory as U.S. mortars, the information in the U.S. firing tables can be used as a rough approximation until more accurate information is available.

5-13. The average angle of fall of low-angle howitzer fire is about 25 degrees, which equates to a cotangent of the angle of fall of about 2.0. Therefore, the dead space is about two times the height of the defilade. A mortar position is chosen that has a minimum safe elevation of 900 mils and is safe from 122-mm and 152-mm howitzer rounds fired directly over the hill mass or ledge. The angle of fall of field guns is even lower and the dead space is much greater.

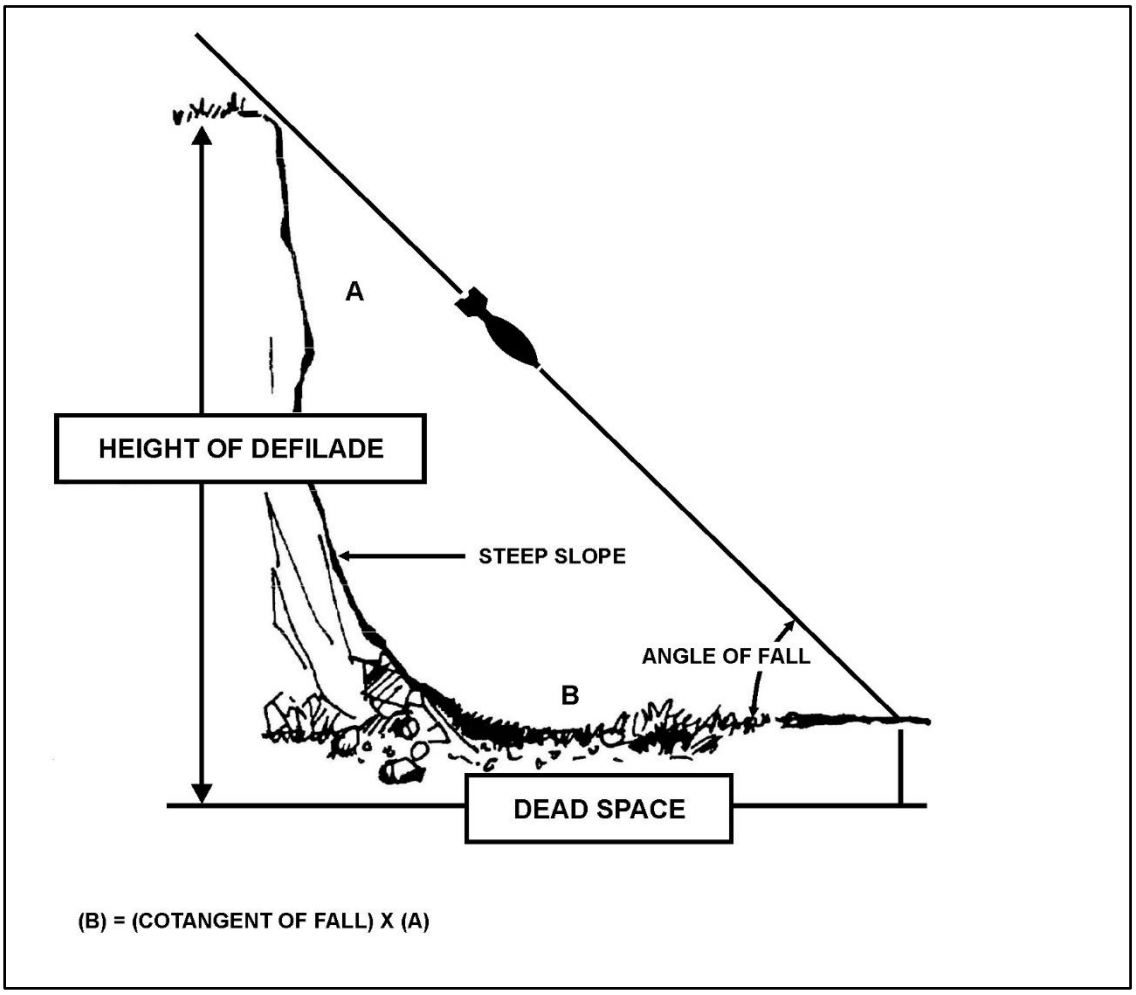


Figure 5-3. Geometric relationships

Note. Many developed countries have sold modern weapons to other countries. A mortar leader is prepared to encounter other systems with different capabilities as determined by the battalion or squadron battalion or brigade intelligence staff officer.

5-14. On flat terrain, defilade may be hard to find. On rolling or slightly broken terrain, it can usually be located. Defilade is easily located in mountainous terrain and built-up areas. Large buildings create large areas of dead space that can extend over several streets. Dead space created by a large building is about three times the height of the building for howitzers and about one-half the building height for mortar fires. (These distances are only guidelines and assume counterfires from directly to the front. Counterfires from the oblique and flank have less dead space.) The actual size of the dead space depends on the weapon, round, charge, range combination, and elevation difference between the weapon and target.

Note. If an enemy fires artillery or rockets at an elevation of 800 mils, the dead space behind each building is about equal to the height of the building.

5-15. If U.S. mortars are close to a tall mass construction building and firing at near maximum elevation, they are virtually impervious to frontal fires from the ballistic missile-21 multiple-rocket system, one of the world's most effective counterfire weapons. The ballistic missile-21 has a maximum firing elevation of about

885 mils. If the mortar position is within a building's dead space, incoming rounds from that direction either strike the building or pass over the mortars to strike behind them (see figure 5-4). U.S. mortars are positioned as close to buildings as possible while still maintaining clearance to fire over them, ROE-dependent.

5-16. Do not position mortars close to buildings that have a large surface area made of glass because of the secondary fragment hazard. Short buildings close to the mortar position on any side do not provide much dead space in which to position mortars, but they stop fragments from that side. If the open area the mortar is firing from is small and the adjacent walls can stop fragments, incoming rounds have to be almost a direct hit to be effective.

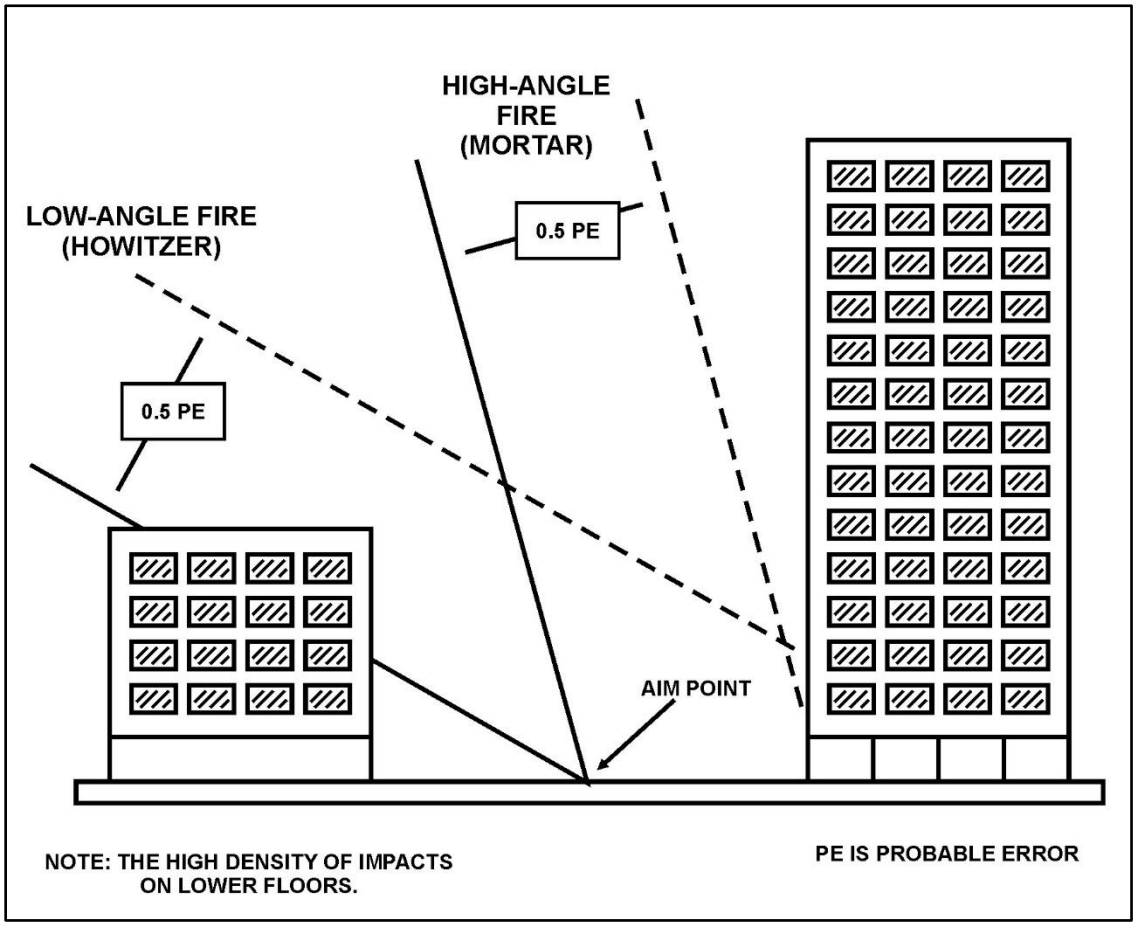


Figure 5-4. Expected locations of impact from high and low angles of fire

SECTION III – PROTECTED POSITIONS

5-17. Mortar elements may occupy a firing position only long enough to fire a few missions before displacing or they may occupy it for several days or longer. Sometimes, mortar units occupy semipermanent firing positions, especially during long-lasting defensive or stability operations. All mortar squads seek protected positions and continue improvements as long as they occupy them.

5-18. Preparing protected mortar-firing positions can take much time, labor, and material. If completely accomplished by hand, it is slow and fatiguing. If construction materials and engineer equipment are available, protective positions can be built more quickly, which results in more rested and responsive mortar crews. Prefabricated protection materials and field expedient materials can also be used to build mortar positions, personnel and ammunition shelters, and FDC shelters.

5-19. This section discusses basic protection criteria and includes sample protected mortar and FDC positions. The examples are specific to mortars but do not go into detail on material and construction methods. See GTA 90-01-011 and ATP 3-37.34 for specific information on construction materials and methods.

CONSIDERATIONS

5-20. Positions are constructed with protective walls, also known as sidewalls, and overhead cover. Protection provided by walls is restricted to stopping fragment and blast effects from near-miss explosions of mortar, rocket, or artillery shells; some direct fire protection is also provided. They are of minimal height, protect against the fragmentation and blast from near hits, and support the overhead cover. The primary purpose of overhead cover is to provide protection from indirect fire and fragmentation, but it also provides some protection from direct fires delivered from a higher position (for example, from a hill) or from enemy aircraft. The basic concept is to provide a bursting layer and a shielding layer over the personnel being protected. The bursting layer causes a point-detonating fuze of the incoming round to function and detonate the round before it can penetrate inside the position. The shielding layer absorbs the resulting fragments. Overhead cover has to be adequately supported and only large enough to protect essential operations.

5-21. Entrances are also constructed to shield fragmentation and blasts from entering the position. This is accomplished by building a barrier in front of an entrance or by building an entrance with a 90-degree angle.

5-22. Considerable time and material is required to protect positions against large caliber rounds, especially those with delay fuzes. Mortar leaders have to prioritize the amount of time devoted to building positions and their other priorities.

Note. To aid a mortar unit in the construction of protected positions, the mortar unit can request a tasking for a horizontal construction squad located in the brigade engineer battalion. When a mortar unit has engineer support, it increases the speed of protecting the mortar unit and increases the response for a call for fire. However, mortar platoon leadership must be prepared to construct the mortar-firing position with only the personnel and equipment available within the platoon or section.

5-23. Mortar positions must be protected against enemy rocket, mortar, and artillery counterfire by either digging into the earth or building up protective positions.

- In 1976, the German Infantry School fired artillery and mortars, with the intensity set by Soviet doctrine, on various field positions in which Infantrymen were represented by mannequins. Results showed that troops laying prone in the open would suffer 100-percent casualties. Those in open fighting positions without overhead cover would suffer 30-percent casualties. However, troops dug-in with overhead cover would expect fewer than 10-percent casualties, mostly by direct hits.
- During the entire month of February 1968, an average 1,100 rounds of enemy indirect fire fell daily on the USMC combat base at Khe Sanh, South Vietnam. This fire included 82-mm and 120-mm mortars, 100-mm and 130-mm field guns, 122-mm and 152-mm howitzers, and 122-mm rockets. The USMC reported this fire had little effect once it had prepared proper field fortifications. One rifle company reported that from 350 to 500 82-mm mortar rounds hit its position within two hours with only moderate damage.

5-24. From this combat experience against common weapons and from tests conducted by the Army, the following guidelines for protection levels have been developed:

- A minimum of 18 inches of packed earth is required to protect a position from fragmentation. This is not enough to protect against direct hits or near misses.
- A predetonation layer and a shielding layer consisting of three layers of well-compacted sandbags protects against a direct hit from an 82-mm mortar round with a point-detonating fuze.
- A predetonation layer and a shielding layer consisting of eight layers of well-compacted sandbags can protect against a direct hit from a 120-mm mortar round with a point-detonating fuze.

- Considerable construction time and materials are required to protect a bunker against a direct hit by a 120-mm mortar round with a delay fuze. Heavy bunkers with timber supports and carefully constructed shielding material can minimize the damage done by a direct hit. They can also protect the occupants from fragments and near misses.
- Without concrete or steel, no field fortifications can be built to withstand a direct hit from a 122-mm rocket or a 152-mm HE round. Even dud 152-mm rounds will penetrate about 4 feet of solid earth. However, properly constructed bunkers protect against fragments and near misses. (See ATP 3-37.34 for more details.)

GROUND-MOUNTED MORTAR POSITIONS

5-25. Mortar units must be able to continue to fire missions while under direct and indirect enemy fire. They must be able to defend their position and contribute to the defense of the larger unit of which they are a part.

PROTECTION CRITERIA

5-26. A commander determines the amount of protection required and balances mission accomplishment, protection, time, and the resources available. No matter what type or level of position the units build, they meet the following criteria:

- Allow crews to engage planned targets, especially priority targets, as well as cover an enemy's most likely avenues of approach. This may require establishing a position capable of firing within a 6400-mil fan out to the full range of a weapon.
- Provide adequate space to prepare ammunition while making deflection and elevation changes.
- Protect crews from direct small arms fire, airbursts, and rounds impacting nearby.
- Expose minimum open area to enemy indirect fires while still allowing effective operations.
- Store and protect ready ammunition from airbursts and rounds impacting nearby.
- Provide crews the ability to defend positions and to contribute to defense of the unit.
- Provide shielded entry and exit points from positions.
- Provide protected routes between adjacent mortar positions, the FDC, and reserve ammunition storage areas.
- Protect the crew, weapon, equipment, and ammunition from inclement weather and flooding.
- Provide communications between the mortar crew, headquarters, observers, and the FDC.
- Protect the FDC from airbursts and rounds impacting nearby.
- Protect the FDC from inclement weather.
- Provide adequate light, heat, facilities, and space within the FDC for continuous operations.
- Provide camouflage and concealment.

LEVELS OF PROTECTION

5-27. Mortar positions can be protected in a variety of ways. The best positions are protected by both defilade and camouflage. When natural defilade is not available, positions must be protected by fortifications. The amount of protection is based on the threat. Under general war conditions, mortar units may have to protect themselves against sophisticated detection devices, such as unmanned aircraft systems and countermortar radars, and firepower equivalent to our own. During other operations the threat may not be as high but the position always has to protect the mortar and crew from powerful direct and indirect fire weapons. (See ATP 3-37.34 for more information.)

5-28. The following are thicknesses of dry soil required to stop the effects of selected direct and indirect fire weapons:

- Direct fire, 7.62 mm at 100 yards: 20 inches.
- Direct fire, 37 mm at 400 yards: 60 inches.
- Direct fire, rocket-propelled, grenade-shaped charge: 78 inches.

- Indirect fire, 82 mm, fragmentation and blast exploding 50 feet away: 10 inches.
- Indirect fire, 152 mm, fragmentation and blast exploding 50 feet away: 20 inches.

SECTION IV – STANDARD GROUND-MOUNTED PROTECTED MORTAR POSITION

5-29. The standard ground-mounted, dug-in mortar position has the following three stages of construction (see figure 5-5):

- Stage I—Basic mortar pit.
- Stage II—Basic mortar pit with added personnel shelters.
- Stage III—Basic mortar pit with personnel shelters, ammunition bunkers, and vehicle position.

Note. For the M120A1, with HMMWV and trailer, position a combination of ground and vehicle mounted protected positions can be used.

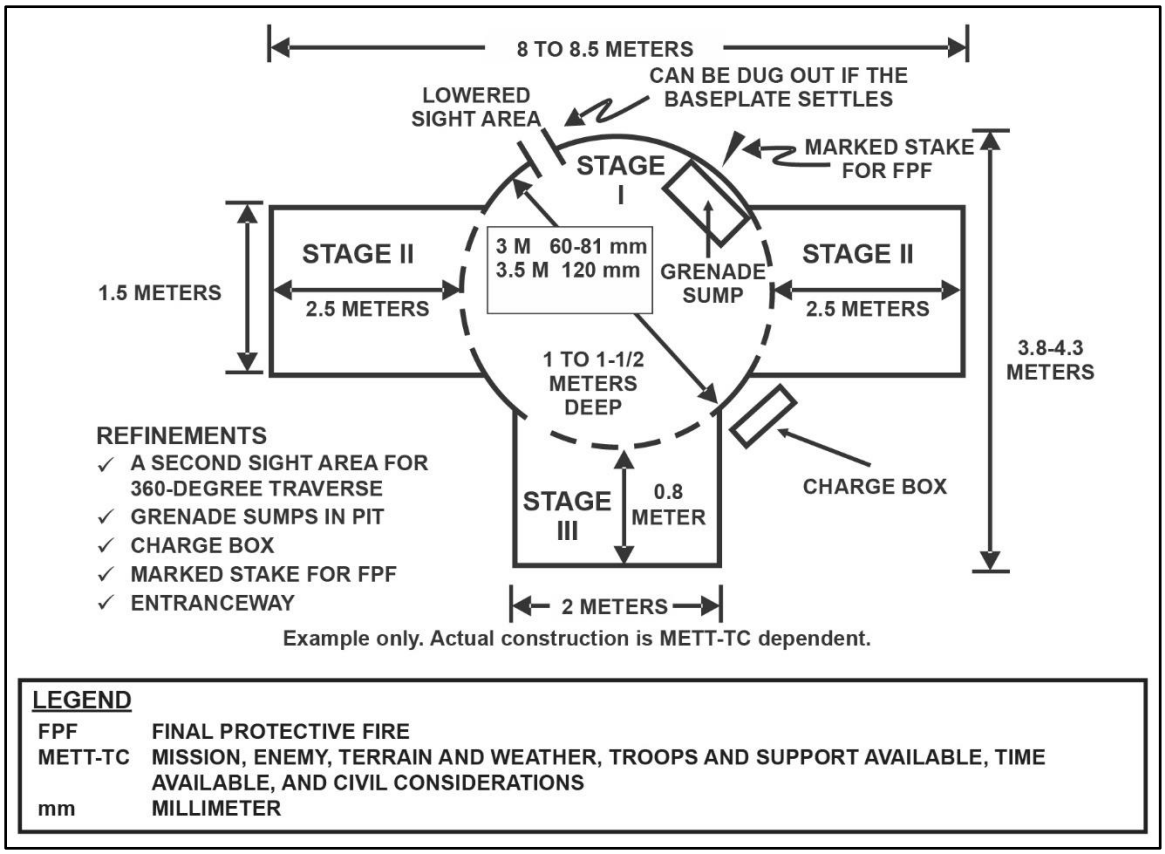


Figure 5-5. Three stages of ground-mounted protected mortar positions

5-30. A dug-in position for 81-mm or 60-mm mortars are the same as for 120-mm mortars with only slight changes in dimensions. A standard mortar position must be constructed with a flat bottom. It can be constructed totally below, partly above, or completely above ground, depending on the time and material available and the composition of the ground at the intended position. A belowground position normally offers the best protection.

Note. Sandbags can be used to support mortar baseplates if soil is unstable to slow baseplates sinking.

5-31. In soft ground, some form of bracing, or backstop is used, especially when firing near the maximum range of each charge. Figure 5-6 demonstrates a method of utilizing sandbags and soil-filled box as a backstop to give a mortar baseplate stability in soft ground.

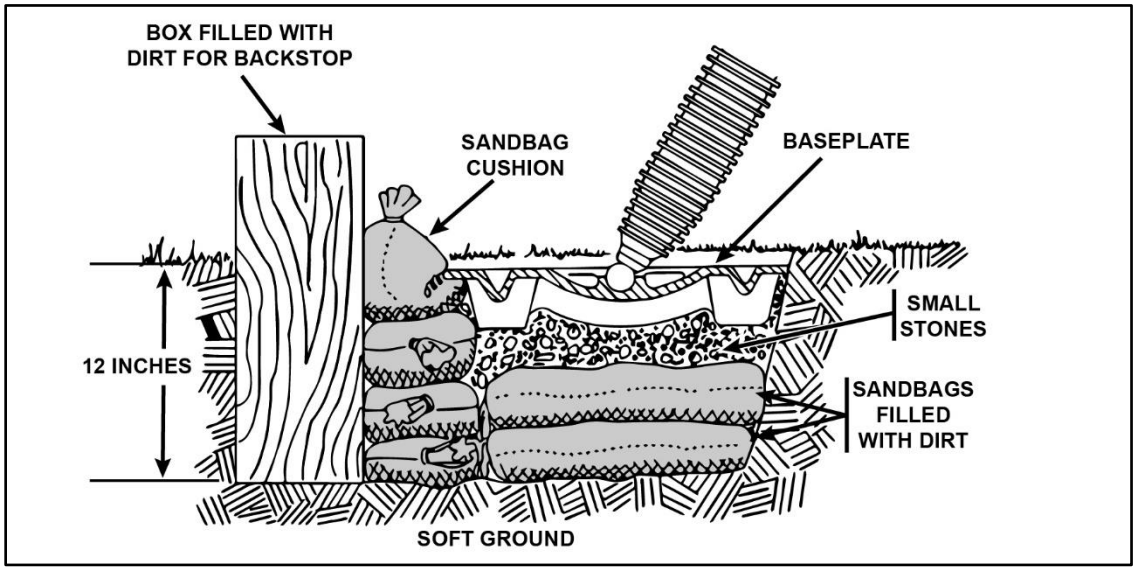


Figure 5-6. Sandbag stability method

STAGE I—BASIC MORTAR PIT

5-32. After a leader selects a general location, a crew marks the exact baseplate position and begins construction. A mortar pit for 81-mm or 60-mm mortars is approximately 3-meters wide and a maximum of 1½-meters deep. A mortar pit for a 120-mm mortar is about 4-meters wide. The important thing is for the width of a mortar pit to allow operations to be conducted while minimizing the exposed area.

5-33. All aboveground walls or parapets are at least 1-meter thick for protection against small-arms fire and shell fragments. Soil-filled wire and fabric or metal containers, sandbags, logs, 55-gallon drums, dirt-filled ammunition boxes, timber, or other materials can be used. A gunner must be able to see the aiming posts or the distant aiming point through all deflection and elevation settings.

STAGE II— BASIC MORTAR PIT WITH ADDED PERSONNEL SHELTERS

5-34. When time allows, protection is increased by constructing personnel shelters with overhead cover. Personnel shelters are constructed perpendicular to the principal direction of fire with firing ports positioned as determined by assigned small-arms sectors of fire. Shelters are built at the same depth (1½ meters) as the pit, 1½-meters wide, and 2½-meters long on opposite sides of the pit with a minimum of ½ meter of overhead cover. There is a blast barrier of at least two sandbags in thickness separating personnel shelters from the mortar pit.

5-35. Firing ports can be made using wooden ammunition boxes with the bottoms knocked out or improvised with available materials. Personnel use sandbags to adjust the opening to the smallest usable size. Corrugated metal culvert halves covered with earth make good personnel shelters (see figure 5-7). Whatever design is selected, it never supports the weight of the overhead cover on sandbags. Timber or some other structurally sound material is used.

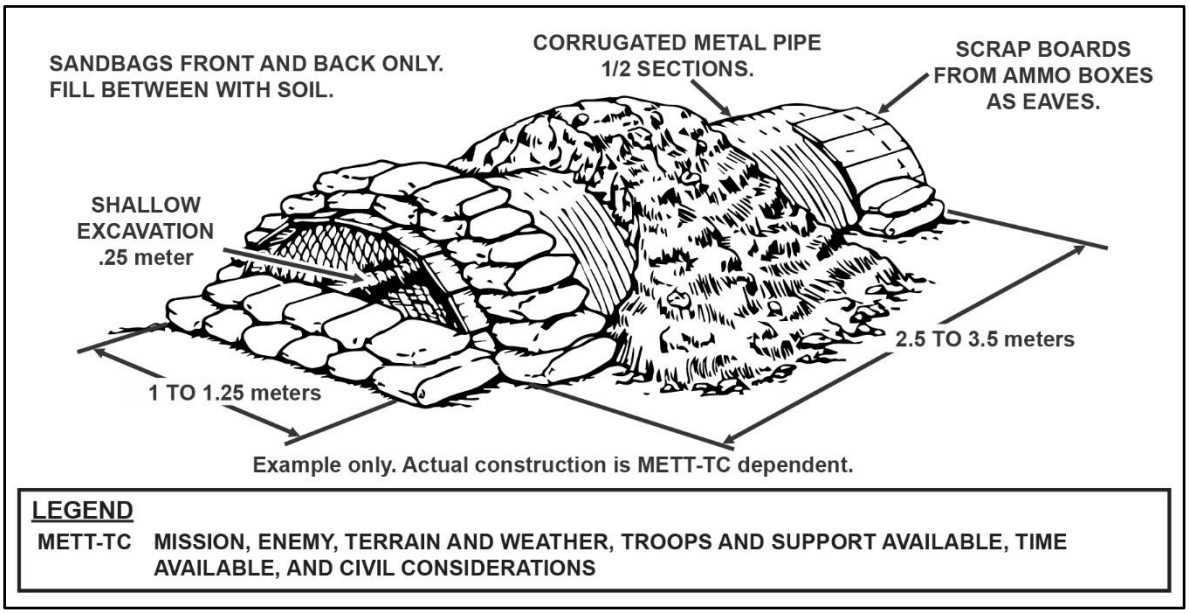


Figure 5-7. Example of fighting position with corrugated metal culvert halves

STAGE III— BASIC MORTAR PIT WITH PERSONNEL SHELTERS, AMMUNITION BUNKERS, AND VEHICLE POSITION

5-36. As position improvement continues, bunkers are constructed for ready ammunition. A bunker is approximately 2-meters wide, 1 ammunition box (length) deep, and 2 ammunition boxes (stacked on their sides) high. Bunkers are divided into four sections separated by the ammunition boxes stacked on their sides (see figure 5-8 on page 5-12). Ammunition boxes can be used for tonnage to protect ammunition from moisture. Support stringers are placed across the stacked boxes to provide a base on which to place additional dirt-filled ammunition boxes for the top. Boxes are filled with dirt to increase stability and add protection. A canvas tarpaulin or plastic sheet is placed on the top of the ammunition boxes and covered with dirt and sandbags to form at least an 18-inch layer over the bunker. A tarpaulin is draped over the opening to a bunker to protect ammunition. Sandbags on top add stability and protection while reducing the danger of wooden splinters.

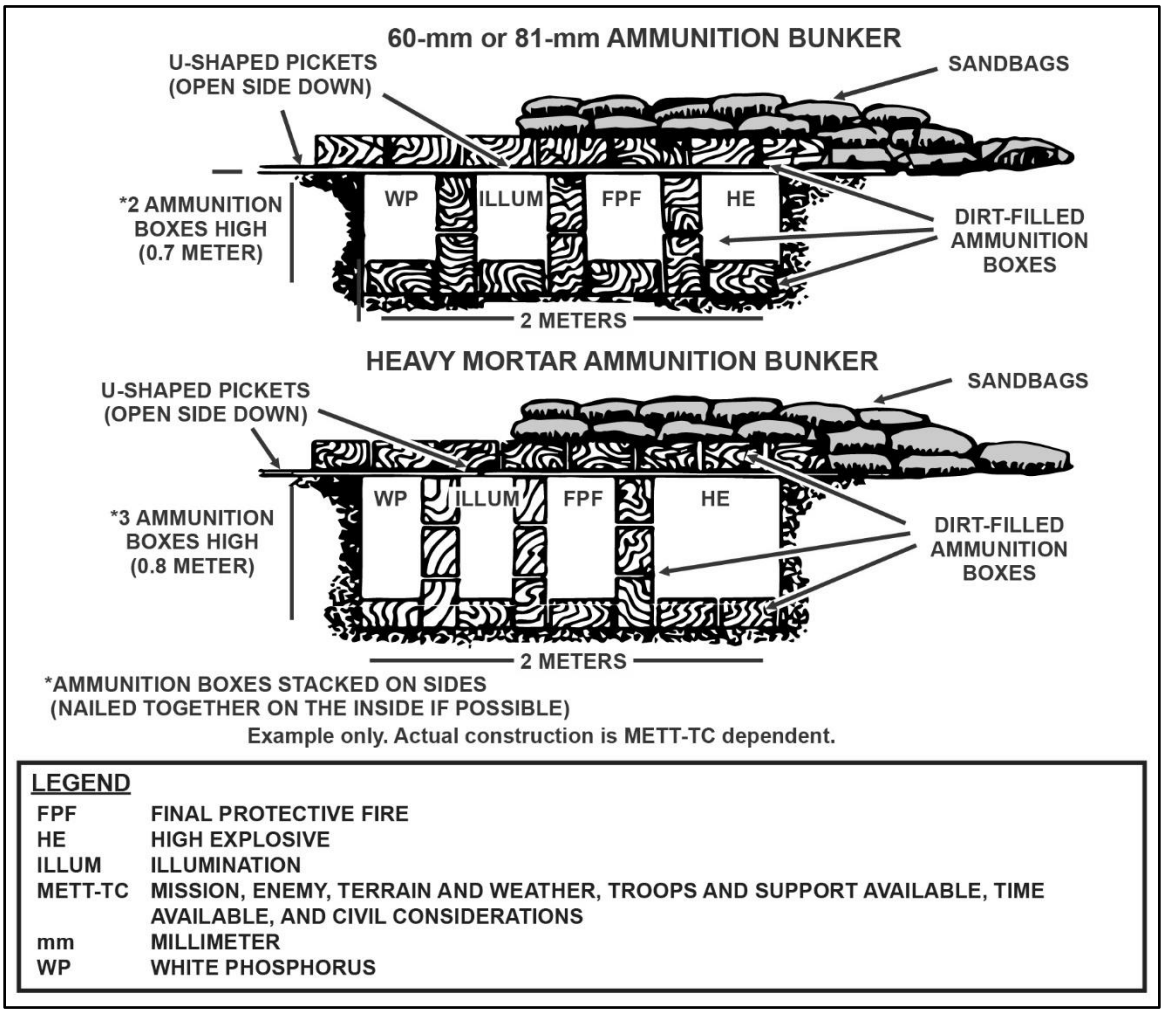


Figure 5-8. Example of an ammunition bunker (front view)

5-37. Once a mortar position is completed to Stage III, a crew will—

- Add another sight area (preferably towards the back azimuth of direction of fire) to allow 360-degree traverse.
- Dig grenade sumps (at least one) in the circular pit. They are dug against the wall of the pit, using the trench-style pit as shown in TC 3-21.75.
- Add an entry with a 90-degree blast baffle. This can enter either the circular pit or one of the personnel shelters. Eventually, it connects with a crawl trench toward the FDC.
- Dig a hole outside the circular pit, near the ammunition bunker, for placing excess charges until disposal. Personnel place an empty ammunition box in this hole; a cover protects excess charges from flash fires. Sandbags are placed on the box lid when not placing charges into it.
- For a gunner's quick reference, place stakes around the rim of the circular pit or mark the sides corresponding to priority targets. Personnel also mark a stake corresponding to the FPF with a distinctive mark. These stakes are also useful for illumination targets since precise lay of the mortar is not required. Their use makes mortars more responsive in countering enemy direct and indirect fires. Stakes are put in securely and not disturbed.
- Install alternate wire lines from the mortar positions to the FDC and tag the alternate and primary lines. All communications wire is buried at least 4 inches below ground.

- Sandbag the base of the aiming posts without disturbing them. This protects them from being blown over by enemy fire.
- Continue to improve the position by providing overhead cover for ammunition handlers to prepare rounds for firing.

5-38. A Stage III ground-mounted mortar position takes from 30 to 40 man-hours if dug by hand, depending on the type soil and the tools used. If engineer equipment is used to make the initial pit and bunkers, this time can be shortened. The amount of material required depends on the depth of the excavation and the type of material used. (See ATP 3-37.34 and GTA 90-01-011 for more information.)

5-39. As time permits, personnel add sandbag layers to increase protection. These sandbags must be properly supported. Poorly supported overweight bunkers can collapse under enemy fire, killing or injuring personnel inside. Figure 5-9 on page 5-14 is an example of a completed stage III position with added improvements.

Note. There is no standard ground-mounted mortar position. Mission variables and materials available are considered when constructing positions. The amount of time a mortar position will last is considered when planning construction. The time variable could dictate the use of readily available material compared to semipermanent material.

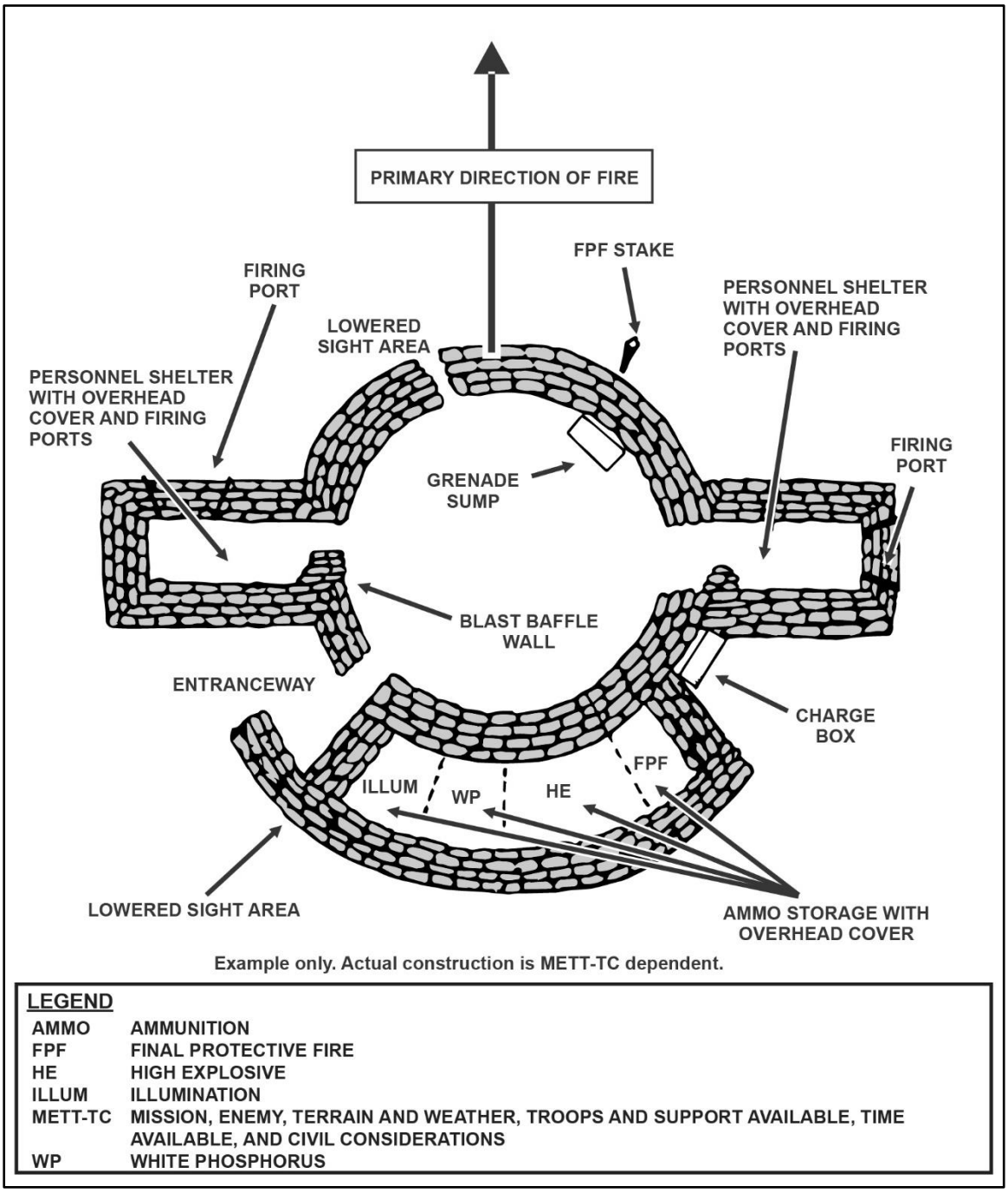


Figure 5-9. Stage III mortar position with refinement

FIRE DIRECTION CENTER BUNKERS

5-40. There is no standard FDC bunker design. When constructing FDC bunkers (see figure 5-10), also known as protective positions, units—

- Construct to proper engineering standards and ensure adequate shoring material is used.
- Dig down as much as possible.
- Fill sandbags to 75 percent and interlock sandbags for double-wall construction and corners.

- Rivet excavations in sandy soil and use wire and fabric containers when possible.
- Inspect the safety of bunkers daily, after a heavy rain, and after receiving enemy fires.
- Maintain, repair, and improve positions continuously.
- Camouflage positions.

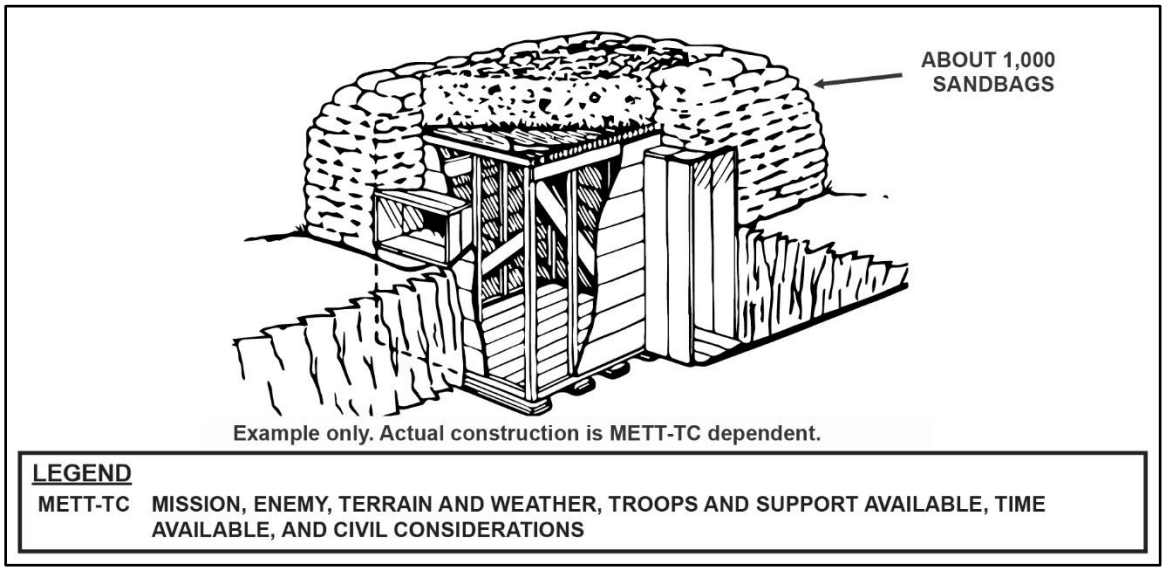


Figure 5-10. Example of a fire direction center bunker

5-41. When constructing FDC bunkers, never—

- Fail to supervise construction.
- Use sand or sandbags for structural support.
- Drive vehicles within 6 feet of an excavation.
- Overfill sandbags.
- Omit lateral bracing on stringers.
- Take shortcuts in construction safety.
- Build above ground unless absolutely necessary.

Note. Refer to ATP 3-37.34 for examples of protective positions.

PREFABRICATED PROTECTION MATERIALS

5-42. Prefabricated barrier material is increasingly available and has some important advantages over more traditional material. Side and overhead cover built with sandbags can provide sufficient protection but are labor-intensive and require constant maintenance. Prefabricated materials, such as wire and fabric containers, metal shipping containers, and modular reinforced concrete walls, are commonly used to build walls and barriers in semipermanent positions. Reinforced concrete or other types of semipermanent shelters can be constructed to house an FDC.

5-43. The three general construction stages listed in the construction of the standard dug-in position are also used in the construction of positions using prefabricated materials.

WIRE AND FABRIC CONTAINER

5-44. Wire and fabric containers, of which one example can be seen in figure 5-11 on page 5-16, consist of a series of large, linked, self-supporting cells. Tests have shown that a 2-foot thickness is adequate to stop all fragments from 60-mm mortar through 122-mm rocket and 155-mm artillery rounds. Each cell consists of

collapsible wire mesh lined with fabric. Cells can expand from a compact, folded storage configuration. Advantages are that they provide a rigid vertical wall and can be transported collapsed and upon arrival expanded and filled.



Figure 5-11. Wire and fabric container revetment

5-45. Wire and fabric containers come in a variety of sizes. The sizes that are probably best suited in the construction of mortar fighting positions are the 2- or 4½-feet-high versions. The national stock number for this version is 5680-99-968-1764 (beige) and 5680-99-001-9397 (green). Wire and fabric container cells provide excellent all-around protection, but they are not designed to provide overhead cover. Other construction materials can be used as stringers and then covered with a protective layer of overburden so the final position provides not only protection from nearby ground bursts but also protection from proximity bursts and plunging fires. Wire and fabric barriers must be arranged so that not only is the position protected but the members of a mortar crew can defend the position against ground assault.

5-46. Each shipment of wire and fabric container cells comes with detailed guidance for construction. It is important to follow these instructions as closely as possible to ensure that the position is stable, long lasting, and requires minimal maintenance. During site selection and construction, personnel—

- Select a site with a level, firm surface with good drainage to support the structure.
- Place containers in the desired location and orientation before expanding them.
- Fill containers with a dry mixture of sand and gravel.

5-47. Wire and fabric containers can be used in arduous terrain. An example of arduous terrain could be in mountain or rocky terrain or a high water table is present. Figure 5-12 is an example of a stage III mortar position utilizing wire and fabric containers.

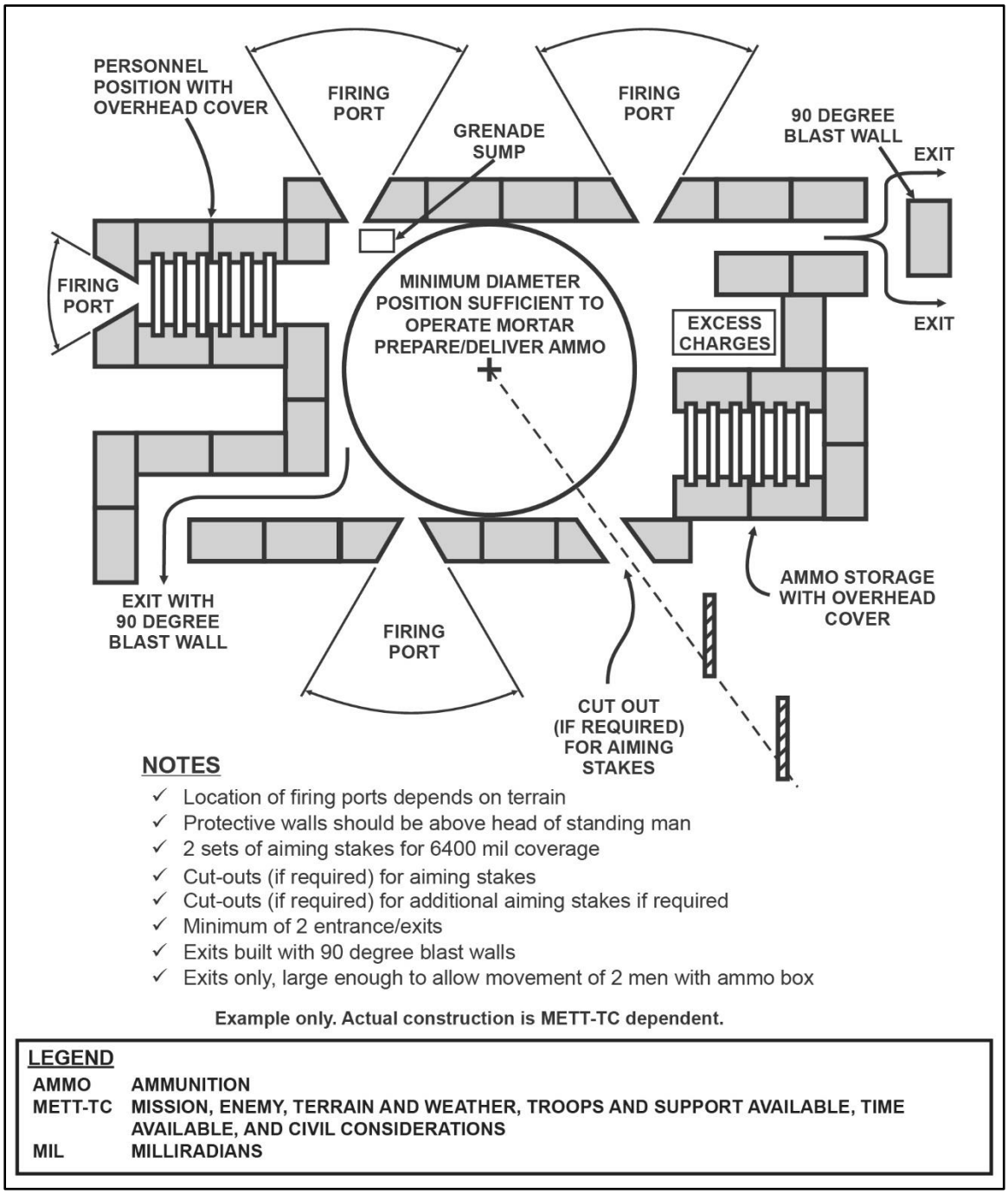


Figure 5-12. Stage III mortar position with wire and fabric containers

REINFORCED MATERIAL

5-48. Personnel bunkers made of reinforced material (for example, reinforced concrete, corrugated metal revetment material, or timber) can be built either above or below ground. They offer excellent protection against direct and indirect fire and, if properly constructed with appropriate collective protection equipment, they provide protection against chemical and biological agents.

5-49. Military personnel functioning on large operating bases have used a type of highly protective reinforced-concrete bunker successfully (see figure 5-13). This bunker is generally constructed with reinforced concrete sections with concrete, plastic, or fabric modular barriers placed across each end. Additionally, in some situations standard 20-foot-long International Organization for Standardization shipping containers can be adapted for use as personnel shelters, either covered with sandbags or dug into the earth.

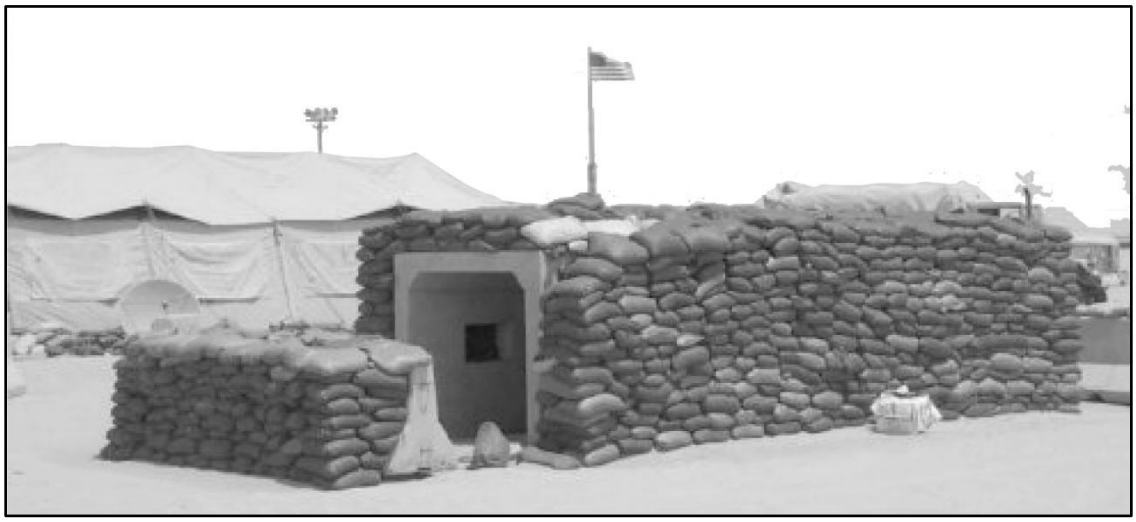


Figure 5-13. Properly sandbagged concrete shelter

METAL SHIPPING CONTAINER SHELTER

5-50. Large metal shipping containers, such as MILVANs, can be used to make effective shelters. These box-shaped containers, with 8-foot long, 6-foot wide, and 6-foot tall internal dimensions, are easily converted into protective CPs, communications shelters, troop shelters, or aid stations (see figure 5-14). The shelter can be constructed aboveground, but it is most effective when constructed belowground and covered with soil and sandbags. When constructing this type of buried shelter, it is critical that the container express roof and walls are reinforced to support the weight of the additional load from soil or sandbags. Because the container's floor is stronger than its roof, inverting it will allow the container to better support the overhead cover. GTA 90-01-011 provides additional design and construction information for such structures.

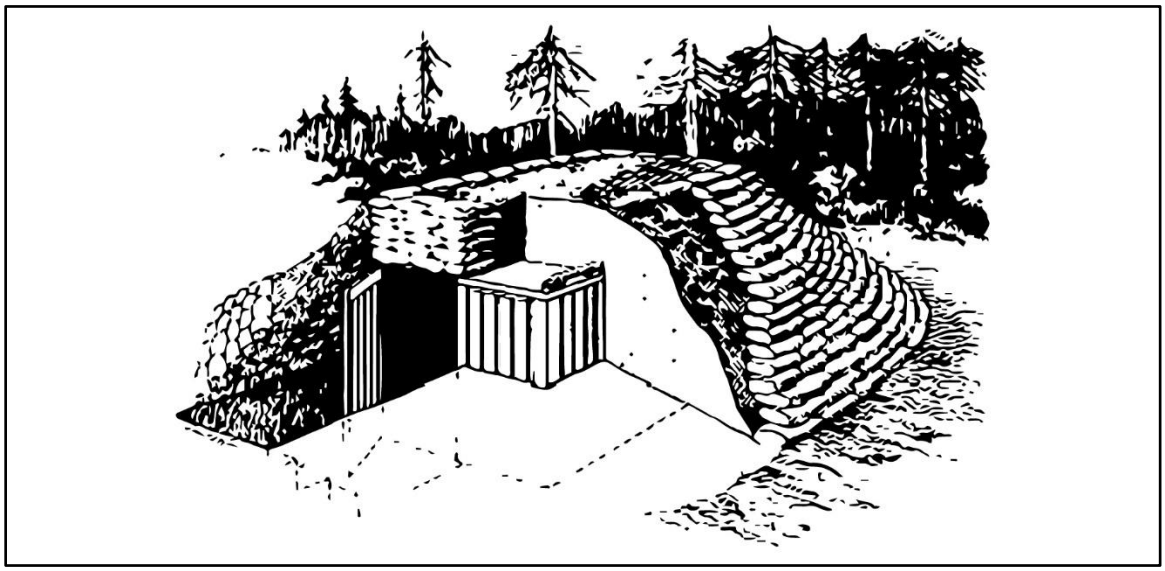


Figure 5-14. Metal shipping container shelter

SECTION V – MOUNTED MORTAR POSITIONS

5-51. Even though mortar carriers provide protection against small-arms weapons and most shell fragments, they can be penetrated by heavy shellfire. As with ground-mounted mortars, it is best to select firing positions with natural defilade. If that is not available, mortar carriers are dug-in (deliberate) or have protective barriers erected around them (hasty).

HASTY

5-52. Hasty fighting positions for combat vehicles take advantage of natural terrain features or are prepared with a minimum of construction effort. A frontal berm, as high as practical without interfering with the vehicle's weapon systems, shields from frontal attack and provides limited concealment if properly camouflaged. Protection is improved if the position is made deeper and the berm extended around the vehicle's sides. Because of the false sense of security provided by berms against kinetic energy and hypervelocity projectiles, hasty vehicle fighting positions with berms are not recommended for tanks, Infantry-fighting vehicles, or Stryker mobile gun systems. Hasty fighting positions do offer protection from HE antitank projectiles and provide limited concealment if properly camouflaged. As the tactical situation permits, hasty positions for combat vehicles are improved to deliberate positions. (See ATP 3-37.34 for more information).

5-53. A protective position for a tracked mortar carrier is too large to be dug by hand; engineer support from the horizontal construction squad is normally required. Some work with hand tools is necessary to finish the position. As an alternative, wire and fabric containers can be used to construct revetments into which the vehicle can be driven.

5-54. Bulldozers, deployable universal earthmovers, or other vehicles can build a hasty fighting position for a mortar carrier. A M1064A3 mortar carrier requires a position that is approximately 20-feet long (with entranceways at one end), 10-feet wide, and 6-feet deep high. A Stryker mortar carrier requires a position to be 25-feet long, 13-feet wide, and a minimum of 9-feet deep or high. The carriers must be able to move into the position. The spoil is spread out to avoid a distinct hump of fresh dirt, and the floor of the position is leveled (see figure 5-15 on page 5-21).

5-55. As time permits, this firing position can be improved. The sides can be widened slightly to allow movement around the track to perform maintenance. An ammunition bunker can be dug into one side of the position to store additional ammunition. In loose, sandy soil, the sides of the position are reverted to prevent a cave-in.

DELIBERATE

5-56. Deliberate fighting positions are required to protect a vehicle from kinetic energy and hypervelocity projectiles. Deliberate vehicle fighting positions are holes in the ground, which provide cover and concealment, reducing the target signature. The position is constructed in four parts: hull defilade, turret defilade, concealed access ramp or route, and hide location. Positions formed by natural terrain are best because of easy modification; however, if preparation is necessary, extensive engineer support is required. Each position is camouflaged with either natural vegetation or a camouflage net, and the spoil is flattened out or hauled away. (See ATP 3-37.34 for more information.)

5-57. Since lack of time usually limits the full construction of a deliberate position, only some parts of the position's construction are prepared. For example, the complete fighting position for a mortar carrier requires the construction of a hull defilade, a concealed access ramp or route, and a hide location—all within the same fighting position. The mortar leader instructs engineer earthmoving assets and usually constructs fighting position parts in the following order:

- Hull defilade. This position leaves the vehicle’s mounted machine gun (if equipped) above ground, allowing it to observe and engage targets.
- Hide location. The hide location allows the vehicle to be concealed away from the firing position and includes overhead concealment, when possible.
- Concealed access ramp or route. A concealed route, either natural or constructed, allows the vehicle to move from its hide position to its fighting positions.

Note. Deliberate positions can serve as a hide and shoot for mortar platforms, which is discussed later in this chapter.

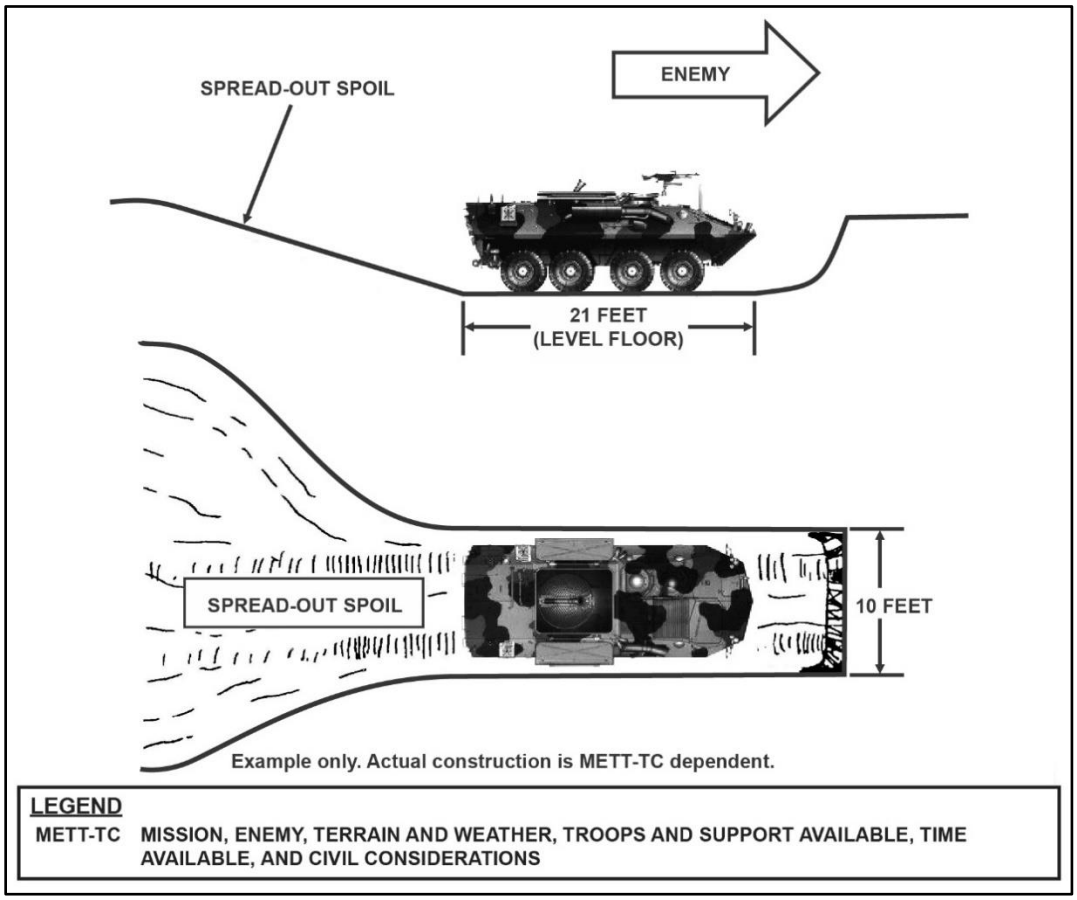


Figure 5-15. Deliberate firing position with a United States Marine Corps Light Armored Vehicle–Mortar

WARNING

Army RMS6-L 120-mm mortar systems fired out of the Stryker mortar carrier vehicle and M121 120-mm mortar systems fired out of the tracked mortar carrier vehicle do not fire over the front of the vehicle. Army mortar carrier vehicles generally back into mounted firing positions, allowing the mortar system to face the enemy.

MORTAR POSITIONS IN A STRONGPOINT

5-58. Mortars in a strongpoint position must continue to provide close and continuous fire, even when under attack. All mortar positions must be completed to stage III. The FDC must be protected by earth and overhead cover. Ammunition storage areas, communications trenches, and wire lines must all be protected. Even if the enemy masses fires against a strongpoint, mortars can survive and continue to fight if they are properly dug-in.

5-59. Each high-survivability mortar position consists of two bunkers with a circular pit between them. The crew bunker holds the squad leader, the gunner and assistant gunner, and equipment for communication with the FDC and to platoon headquarters. The ammunition bunker holds the ammunition bearer and the

ammunition. The gun pit and bunkers are sited so that the long axis of the emplacement is perpendicular to the primary direction of fire.

5-60. Material for construction is limited only by the ingenuity of the mortar crew and the items found in the surrounding area. Items that can be used are logs, railroad rails or ties, planking, corrugated iron roofing, doors, woven straw mats, rice bags, sandbags, and stones. The gun pit is circular with a diameter of 8 feet.

5-61. The pit is about 3-feet deep with a parapet around it. Beneath the baseplate, several layers of rock and logs are placed to ensure stability of the mortar during sustained fire and to prevent the baseplate from sinking. The 180 degrees of the gun pit, facing the primary azimuth of fire, has logs 6–8 inches in diameter placed vertically behind the baseplate. This prevents the baseplate from digging in or skidding back during prolonged firing. The sides of the pit can be strengthened with woven wire or branches. The gun pit has no overhead cover. However, a camouflage net can be draped on poles over the pit and removed before firing.

5-62. The crew bunker, a trapezoid about 7-feet long and 5-feet deep, is also the squad CP. It connects directly with the gun pit. The bunker widens out at the rear to provide space for the crew. This shape gives maximum protection. Telephone communication and some system of lighting for night firing are necessary. The rectangular ammunition bunker, larger than the crew bunker, measures 16-feet long. This bunker has a fire step with a 2½-foot wide parapet between it and the gun pit. This allows the ammunition bearer to remain within the bunker, to set charges and fuzes, and yet be able to pass the round to the assistant gunner for firing.

5-63. The opening over the fire step is not covered, allowing the ammunition bearer to work freely between the gun pit and bunker. There is an entrance for ammunition and removal of empty ammunition containers at the rear of the bunker. Ammunition is laid on dunnage and a sump dug if the position is wet or the drainage poor. A minimum of 3 feet of logs, stone, and solidly compacted earth forms the overhead cover of a heavy mortar, high-survivability position. No more than 4 feet of overhead cover can be used if the mortar is to have mask clearance when traversed to the right or left of its primary azimuth.

5-64. The first layer consists of logs about 8 inches in diameter, laid closely together on a timber sill, and extending at least 18 inches beyond each side of the hole. The second layer consists of closely aligned and interlocked sandbags or mats or any other covering, such as dirt. More logs are then laid crosswise to the first layer of logs. Another layer of sandbags or earth is put on followed by a layer of stone. The top layer is packed earth with a layer of stone just beneath.

SECTION VI – OTHER SURVIVABILITY TECHNIQUES

5-65. To support a commander’s intent for mortar fires, a mortar unit must survive an enemy's efforts to eliminate it. Survival requires mortars to avoid detection as long as possible, confuse an enemy as to their true location, and to defend themselves against enemy attacks. When protected positions are not feasible, other measures are used to protect the mortar unit in operations.

SHOOT-AND-HIDE POSITIONS

5-66. Shoot positions are positions from which mortars fire. Hide positions are located in a covered and concealed area and are occupied by mortar crews when not firing. The use of shoot-and-hide positions is an effective technique when covered and concealed firing positions are unavailable or when enemy counterfire is anticipated. For example, if the only place mortars can shoot from is on a roadway, a hide position adjacent to the road and under some trees is optimal; the crew could occupy the position until receipt of a fire mission. Baseplates can be left in the shoot position, or stakes can be used to mark positions. Aiming posts and the aiming circle may be left set up. Units with an MFCS can be particularly effective using this technique.

5-67. Another example of shoot-and-hide is when a mortar is employed in a base defense plan. A mortar unit could be in a protected position with the baseplate and aiming post left in place while the cannon and bipod are in a protected position. When a request for fire is initiated, the mortar squad emplaces the cannon and bipod into the baseplate that is already in position.

Note. This method can reduce response times for a call-for-fire request. Mission variables and risk mitigation need to be accounted when employing a mortar in this capability. Rehearsals and mortar unit training must be maintained while forward deployed to reduce response time.

CAMOUFLAGE

5-68. Camouflaging a position is accomplished during all stages of construction. Erecting camouflage netting, when available, is accomplished before beginning construction to conceal the work effort. The lightweight camouflage screen system is the standard Army and USMC camouflage net currently available.

5-69. When utilizing camouflage netting with equipment, a minimum of 2 feet of distance is required from the lightweight camouflage screen system to camouflage equipment to defeat enemy radar signals. For more information regarding the lightweight camouflage screen system and camouflage techniques, see ATP 3-37.34.

5-70. Camouflage is critical to prevent the identification of mortar positions by the enemy, especially those that use unmanned aerial system in conjunction with ground reconnaissance. Presence of a threat unmanned aerial system is often an indicator of an impending artillery barrage and so remaining unseen by the unmanned aerial system allows the mortar position to remain in its current position longer.

FIRING LOWEST CHARGE AND ELEVATION

5-71. Firing the lowest charge and elevation reduces the chance of mortar rounds being detected by radar because of reduced trajectory and time in flight. Also, responsiveness of fires is increased by reducing time of flight.

Note. When employing precision munitions, ensure to risk mitigate enemy counterfire capabilities.

FREQUENT DISPLACEMENT

5-72. Frequent displacement enhances survivability from enemy counterfire but can also degrade the ability of mortars to provide immediate massed fires. To aid continuous fire support, employment and displacement by section and squad may be necessary.

5-73. The timing and number of moves are critical to survival and are based on the maneuver commander's guidance, the tactical situation, and enemy target acquisition and counterfire threat. Frequent displacement reduces the time available to properly prepare positions and increases crew fatigue.

OFFSET REGISTRATION

5-74. Offset registration reduces the vulnerability of the primary position when one mortar fires adjustment rounds from offset locations. It also increases control problems and relies on radio communications to transmit firing data.

ROVING MORTAR

5-75. A roving mortar can conduct registrations and fire missions from a number of supplementary positions. This assists in concealing a platoon's primary position and in confusing the enemy as to the number of mortar sections or tubes employed. A platoon vacates these supplementary firing positions upon completion of a specific mission.

Note. Once a roving mortar squad conducts a registration mission, the registration will not be valid once the roving mortar moves position.

REDUCE THE NUMBER OF ADJUSTING ROUNDS

5-76. Platoons can increase accuracy and reduce adjusting rounds in several ways. All reduce the threat from enemy target acquisition. A few of the means are—

- Position-location devices, such as a GPS or position-azimuth determining system.
- Registrations (abbreviated, regular).
- Computation of meteorological data corrections.
- Hasty survey from known points to eliminate map errors.
- Use of friendly artillery radar to accurately locate firing position (coordinate through FSO/FSC).

5-77. Although these techniques reduce vulnerability, increase effectiveness of fires, and conserve ammunition, they may require support from artillery survey teams. Artillery units can provide radar and meteorological data, and set up a declination station or orienting station and orienting line.

WIRE COMMUNICATIONS

5-78. Platoons can use wire in a static situation and, when time allows, wire is recommended for all positions. It provides reliable communications while reducing the electronic signature that results from using radios. However, emplacing wire takes time and can be cut by enemy artillery, unless it is dug in.

MASSING FIRE

5-79. Massing fires of several sections is a technique to overload enemy target acquisition means. It can also reduce the number of volleys needed on one target. Massing mortar fires can be difficult to control and may require increased radio communications. When possible, sections mass mortar fires by firing time-on-target missions.

TERRAIN MORTAR POSITIONING

5-80. To increase survivability on the battlefield, a mortar unit takes full advantage of the natural cover and concealment afforded by the terrain and existing vegetation. This method is standard procedure for mortar units with operational automated fire direction systems. Units without these systems or operating mortar analog fire control systems use terrain mortar positioning.

MEDICAL SUPPORT

5-81. A mortar element will have at a minimum one combat medic attached when operating independent from other support elements or companies. This is especially common for battalion mortar platoons that may be attached or under OPCON from company to company.

5-82. Attaching a combat medic to the mortar element increases the survival rate for a combat casualty. When attached, the combat medic travels with the platoon sergeant for the mortar platoon or section leader for the company or troop mortar section to aid with casualty stabilization and evacuation.

SECTION VII – GROUND DEFENSE PLAN

5-83. Platoon leaders ensure that a mortar platoon does everything possible for its own security. Regardless of where a mortar platoon, section, or squad is located, defense of the position against a ground attack must be planned, organized, and implemented.

COORDINATION AND SECURITY PLAN

5-84. When there is a high threat of enemy ground attack, a mortar element may have additional personnel to assist in the defense. A mortar element can be positioned near a reserve company or near other friendly forces that can assist in providing security. When a mortar unit is positioned near a friendly unit, it is fully

integrated into the defense. In this way, a unit is able to tailor security measures to assist the mortar element. Coordination includes—

- Location of primary, alternate, and supplementary firing positions.
- Designation of individual sectors of fire.
- Identification of dead space between units and how to cover it with fire.
- The use of visual and audible signals.
- Location of OPs.
- Location and types of obstacles and how to cover them with fire.
- Patrols to be conducted to include size, type, time of departure and return, and routes.

Note. When employing a mortar unit in the ground defense plan, the primary defense capability is the mortar, which can add depth to the defended area. When positioning a mortar unit near friendly forces, consider enemy counterfire abilities.

5-85. Mortar units may be positioned inside perimeters that are defended by other U.S. forces or host country armed forces. A mortar unit leader coordinates with the base defense CP to determine the unit's responsibilities. The unit leader must understand that the protection of the unit is his or her responsibility and establishes procedures for close-in defense and security.

DEFENSE PLAN

5-86. A mortar unit leader's defense plan includes the following tasks that are accomplished based on priority of work with mission variables considered:

- Establishing local security.
- Positioning and laying mortars.
- Establishing digital and analog mortar fire control systems.
- Clearing mask and overhead obstructions.
- Improving mortar positions (continuous).
- Establishing sectors of fire for individual weapons.
- Emplacing obstacles, such as protective wire and tangle foot.
- Emplacing command-detonated claymore mines.

ESTABLISHING SECURITY MEASURES

5-87. A mortar leader establishes security for the unit so that the enemy cannot observe or surprise the platoon. A mortar leader considers the company TACSOP, the orders received from the commander, the enemy situation, and terrain and visibility conditions.

5-88. OPs are situated to provide early warning along enemy avenues of approach. They are covered and concealed and have covered and concealed routes to and from them. If available, the mortar element employs sensors to provide early warning.

5-89. The mortar unit leader establishes security within the mortar unit's firing positions. This is accomplished by—

- Establishing positions that avoid enemy avenues of approach.
- Enforcing noise and light discipline.
- Minimizing electronic transmissions.
- Assigning sectors of observation and fire.
- Placing machine guns along most likely enemy approaches.
- Tying in with adjacent squads and other units, if applicable.
- Positioning OPs.

- Emplacing obstacles.
- Conducting stand-to.

5-90. A mortar element leader designates a set number of platoon members to be alert at all times. The number varies with the enemy situation, terrain, and visibility. Minimally, at least one-fourth of the platoon is alert at all times. When an attack is expected, the entire platoon is alert.

POSITIONING MORTAR SQUADS

5-91. When positioning mortars, a mortar unit leader ensures that mortars can provide effective indirect fire support. Normally, mortar-firing positions are also the positions from which squads defend. If time is available, squads can prepare alternate and supplementary positions. A mortar unit leader gives each squad primary and secondary sectors of fire, and a squad leader gives each individual primary and secondary sectors of fire. Sectors of fire are planned so that adjacent sectors of fire are overlapping.

5-92. All available machine guns and close combat munitions are included in the defense plan. Machine gun positions and sectors of fire cover likely avenues of approach and fire across the platoon's front. Machine gun sectors of fire overlap. Each machine gun sis given primary and secondary sectors of fire.

EMPLACING OBSTACLES AND MINES

5-93. When time permits, a mortar unit improves the security of a mortar position by emplacing protective wire and claymore mines. The placement of obstacles and mines must be coordinated with the senior commander of the defended position.

CONDUCT OF THE DEFENSE

5-94. By understanding the type of missions that a mortar platoon can be expected to perform and by knowing when and how the platoon may be attacked, a mortar leader can tailor the defense based on resources and the threat. During the defense, a mortar leader—

- Continues to provide responsive indirect fire support even while defending the mortar position.
- Supervises to ensure that security is maintained.
- Controls and directs fire.
- Moves troops within the position to counter enemy efforts.
- Monitors ammunition resupply and equipment replacement.
- Reorganizes and reestablishes the defense during lulls in battle.

Chapter 6
Sustainment

Sustainment is the provision of logistics, financial management, personnel services, and health service support necessary to maintain operations until successful mission completion (ADP 4-0). Sustainment operations provide support and services to ensure freedom of action, extend operational reach, and prolong endurance. This chapter describes sustainment operations in support of mortar platoons and sections, specifically the roles and responsibilities, functions, tasks, and activities, and unit relationships throughout high-operating tempo decentralized operations. Sustainment procedures are the same for mortar units as any other combat unit. They differ primarily in the types and bulk of ammunition required. Such supplies are coordinated and distributed through field and combat trains. While the Army utilizes the term "sustainment" and the USMC utilizes the term "logistics," the overall concept for both Services has the same intent.

Note. When the word "sustainment" is used in this manual, it applies to Army sustainment and USMC logistics.

SECTION I – PLANNING CONSIDERATIONS

6-1. Planning sustainment operations is primarily a company- and battalion-level responsibility. While a company commander and XO plan the operation, a mortar leader is responsible for the unit's execution of the plan. During planning, a mortar leader recommends the number and mix of mortar ammunition required for the mission and also provides input.

6-2. Since a mortar unit is usually separated from a headquarters and headquarters company and has unique ammunition requirements, mortar leadership, especially a section leader and platoon sergeant, is heavily involved in its sustainment operations. A platoon sergeant or section leader executes the sustainment plan at squad and vehicle level.

SUSTAINMENT PLAN

6-3. Planning considerations include the development of the sustainment plan that is based on the operational requirements. The sustainment plan addresses—

- Types of support.
- Quantities, especially types and mix of mortar ammunition required for the mission.
- Type of targets and threats.
- Terrain and weather.
- Time and location.
- Requirements.
- Resupply techniques.

INDIVIDUAL RESPONSIBILITIES

6-4. Individual sustainment responsibilities within a mortar unit include—

- A platoon leader or company or troop mortar section leader has overall responsibility for the unit's sustainment. The leader is specifically responsible for planning mortar element sustainment and providing input into the supported unit's plan.
- A platoon sergeant or company and troop mortar section leader is the mortar element's main sustainment operator. The main operator executes the unit's logistical plan based on mortar element and maneuver unit TACSOPs.

SECTION II – AMMUNITION SUPPLY RATES

6-5. The critical factor in the ability of a mortar unit to support a commander's scheme of maneuver and to accomplish its mission is the availability of mortar ammunition. The expenditure of mortar ammunition must be managed based on tactical priorities and ammunition availability.

6-6. Tactical commanders manage and control expenditures by the use of ammunition allocations. Unit combat and sustainment loads are reviewed prior to a deployment to ensure that an adequate amount and type of ammunition is on hand for anticipated usage.

Note. Combat and sustainment loads can be found by unit identification code on the Total Ammunition Management Information System website.

REQUIRED SUPPLY RATE

6-7. A battalion or squadron operations officer in coordination with a mortar unit leader estimates the type and amount of mortar ammunition needed for a particular combat operation. The leader then submits the required supply rate to a BCT or USMC Infantry regiment headquarters.

6-8. A mortar leader assists an operations officer in determining the required supply rates using historical records, rate-of-fire computations, or a combination of both. Once a required supply rate is determined, it is used to plan the transportation requirements for moving a mortar unit's ammunition from an ammunition transfer point to a firing location.

CONTROLLED SUPPLY RATE

6-9. Due to rapidly changing combat situations and problems that may arise in the logistical system, the actual available supply rate of mortar ammunition can be less than the required supply rate. If so, action must be taken to control expenditures.

6-10. Each tactical commander, down to battalion level, announces a controlled supply rate of mortar ammunition, expressed in rounds (by type) per mortar per day. A mortar unit leader considers the controlled supply rate during the planning and execution of fires. A controlled supply rate cannot be exceeded, except in emergencies and then only by the permission of the next higher commander. It is more combat effective to limit the number of mortar missions fired, firing enough rounds for each mission, than to ration rounds.

SECTION III – REQUESTING SUPPORT AND SUPPLIES

6-11. Battalion and company sustainment support are located in their trains. Trains are groupings of sustainment vehicles, equipment, and personnel; they are divided into combat and field trains. Unit combat trains are forward and coordinate the sustainment effort, while unit field trains receive, organize, and distribute supplies.

6-12. Mortar units request supplies through the company or troop XO or the first sergeant or company gunnery sergeant. These requests are sent forward and logistics packages are assembled, moved forward, and distributed. A mortar platoon sergeant, headquarters and headquarters company, and line first sergeants meet

the vehicles carrying logistics packages at the logistic release point and lead them to the platoon and section positions.

BATTALION TRAINS

6-13. Battalion field trains comprise most of a battalion's bulk-loaded ammunition, fuel, food, and other supplies until delivered forward by logistics packages to a company. A battalion combat trains CP receives supply requests from a company, consolidates them, and forwards them. A battalion combat trains consists of a CP, a battalion aid station, maintenance personnel and equipment, and vehicles loaded with the rest of the battalion's combat load and fuel.

COMPANY TRAINS

6-14. Company trains are the focal point for company sustainment/logistics operations. The first sergeant, company gunnery sergeant, or XO positions the trains and supervises sustainment or logistics operations. It is the most forward sustainment or logistics element and provides essential medical treatment and critical resupply support.

6-15. The size and composition of company trains vary depending upon the tactical situation. Trains may consist of nothing more than planned locations on the ground during fast-paced offensive operations, or they may contain two-to-five tactical vehicles during resupply operations.

REQUESTS FOR SUPPORT AND ROUTINE SUPPLIES

6-16. Requesting support and routine supplies is a simple matter for a mortar unit. A heavy mortar platoon sergeant or company mortar section leader submits requests, by hand or electronically via voice radio or FBCB2, to the company CP. A company XO or first sergeant transmits mortar unit requirements through a supply sergeant to a battalion logistics staff officer who directs a support platoon leader to ship supplies.

6-17. In a degraded communication environment, requests for resupply may need to be performed by either a mounted or dismounted runner rather than over any digital mission command platforms. Maintenance and recovery support are requested the same way as supplies. An XO or first sergeant or company gunnery sergeant directs a company's maintenance assets to a platoon.

6-18. During an operation, support is limited to medical and maintenance activities. A first sergeant or company gunnery sergeant performs emergency resupply and continuously monitors the company command net, the FBCB2, then sends medical and maintenance support forward to a mortar unit, when required. The first sergeant or company gunnery sergeant informs combat trains on a continuing basis.

SECTION IV – CLASSES OF SUPPLY AND RESUPPLY

6-19. This section covers classes of supply, miscellaneous items, resupply operations and techniques, logistics packages, and in- and out-position supply techniques. There are few supply items held at a company and battalion, and most resupply originates in a BCT support area. Therefore, accurate and timely requests for supply, maintenance, and other sustainment functions are essential to maintain a mortar unit and its ability to accomplish its mission.

CLASSES OF SUPPLY

6-20. A company commander has the ultimate responsibility for mortar unit sustainment. The XO and the first sergeant are the commander's primary sustainment operators; they work closely with the battalion staff to ensure they receive the required support for the company's assigned missions. These are normally requested in bulk and divided into platoon-sized shipments.

CLASS I: PERISHABLE AND SEMIPERISHABLE SUBSISTENCE ITEMS, WATER, AND GRATUITOUS HEALTH AND COMFORT ITEMS

6-21. Class I supplies consist of rations that are packaged as individual or group meals. Gratuitous health and welfare items are also included.

6-22. A company XO or first sergeant orders rations for a mortar unit based on the number of personnel currently assigned and attached to the mortar element. Hot meals are prepared at a central location (battalion field trains) and trucked forward to a logistical release point. A mortar platoon sergeant or platoon representative meets the vehicle and guides it to the feeding location. Field feeding of hot meals and the delivery of meals, ready to eat can be accomplished in the following two ways:

- Food is brought to the mortar unit Soldiers at their position. To maintain readiness, a feeding plan is necessary. Usually, half of the unit eats, while the other half maintains security and preparedness to fire.
- Crews are moved some distance away, usually several hundred meters, to where the food is served. In such cases, a feeding plan is critical to provide continuous support. Minimally, no more than a third to one-half of the mortar system crews are away from their positions at one time. For the FDC, a minimum of one FDC radiotelephone operator or fire direction computer must maintain radio contact on the net used to receive fire missions and the net used to track friendly and enemy elements. It is also recommended for the FDC or mortar leadership to continue to observe any digital systems, such as FBCB2, during the feeding plan.

6-23. For water, the XO calculates water requirements based on gallons per Soldier per day. Refer to ATP 4-44 for the water planning factor tables. The XO adjusts the standard planning factor based on unique conditions associated with a given operation. The supply sergeant plans for retrograde of waste from the unit during resupply operations.

CLASS II: INDIVIDUAL EQUIPMENT AND GENERAL SUPPLIES

6-24. Class II items consists of common consumable items, such as clothing, individual equipment, tentage, tool sets and kits, unclassified maps, administrative or housekeeping supplies, and CBRN protective equipment. The battalion typically deploys with a minimum load of Class II.

6-25. The company supply sergeant must keep up with company shortages to ensure shortages are ordered in enough time to receive prior to mission. Unclassified maps are obtained by a battalion logistics staff officer based on requirements established by an intelligence staff officer. They are distributed either through battalion supply channels or from an intelligence staff officer to the company headquarters.

CLASS III: PACKAGED - PETROLEUM, OILS, AND LUBRICANTS

6-26. Class III packaged consists of petroleum, oils, and lubricants that can be handled similarly to dry cargo, such as engine oil, grease, fire-resistant hydraulic fluid, and antifreeze. The mortar unit leader anticipates requirements based on the mission and coordinates with the supporting XO for Class III packaged forecasting assistance. Environmental conditions, such as dust, snow, and rain, affect the consumption rates of Class III packaged and are also be taken into consideration.

CLASS III: BULK – GASOLINE, DIESEL, AND AVIATION FUEL

6-27. Class III bulk fuel is gasoline, diesel, and aviation fuel. To properly request Class III bulk, the mortar leader understands the mortar unit vehicles consumption rate and requires a detailed analysis of the maneuver concept of the operation.

6-28. To calculate the estimated fuel usage, take the vehicle or number of vehicles and multiply consumption rate stated in gallons per hour, multiplied by the number of hours that the equipment will be in operation. Traveling cross-country versus traveling across roads and time of vehicle idle affects consumption rates.

Note. Consumption rates of Class III packaged and bulk are especially important when using armored or Stryker vehicles.

CLASS IV: CONSTRUCTION AND ENGINEERING MATERIALS

6-29. Class IV consists of fortification, barrier, and construction materials, such as sandbags, wire and fabric containers, metal containers, and timber material. Typically, a unit will does not have a requirement for Class IV unless in the defense or conducting stability operations. In the defense, sustainment units at higher levels consider prepositioning Class IV as far forward as the mission variables of METT-TC allow.

CLASS V: AMMUNITION

6-30. Unit ammunition basic load is determined by the weapon density, number of Soldiers, and specific mission requirements over time. The planning factor for unit basic loads for a battalion is one with the company, one with the forward support company, and one stored at the brigade's ammunition transfer and holding point.

6-31. The company XO needs to know the current ammunition requirement, ammunition basic load, and mortar unit on-hand ammunition balance when submitting the logistics status report. The XO coordinates with the battalion or brigade logistics staff officer to ensure the distribution concept for Class V includes the capability to rapidly distribute preconfigured ammunition packages and loads. The XO tracks the frequency of logistics packages of munition supply and knows the primary and alternate resupply plan.

CLASS VI: SUNDRY, PERSONAL DEMAND ITEMS

6-32. Class VI supplies are personal demand items, such as toiletry, hygiene, and small recreational items. In most cases, a Soldier deploys with a 30-day supply of health and comfort items.

6-33. Leaders include Class VI into the packing list and include in precombat checks and precombat inspections. After the first 30 days, health and comfort packages are provided at 30-day intervals through Class I channels at the request of the unit commander.

CLASS VII: MAJOR END ITEMS

6-34. Class VII supplies include major end items. This class of supply is intensely managed and controlled through higher command channels.

6-35. Detailed planning at all echelons include recovery operations and battle loss or battle damage replacement operations. The XO is the subject matter expert on what major components are fully mission capable, tracks the operational readiness rate, and reports to the battalion or brigade logistics staff officer.

CLASS VIII: MEDICAL MATERIEL

6-36. Class VIII includes all medical supplies on hand as well as blood, blood products, and repair parts for medical items. Prior to and after any operation, leaders check all medical supplies in the combat lifesaver bag for expiration.

6-37. The supply sergeant with oversight from the XO or first sergeant requests replacement and resupply through the medical platoon. Typically, the medical platoon deploys with a three-day supply of Class VIII to support the battalion. When forecasting Class VIII requirements, the mission, location, projected casualty rates, and available medical assets are taken into consideration.

CLASS IX: REPAIR PARTS

6-38. Crew-replaceable items are requested through a company XO or first sergeant for company and battalion mortar platoons. Repair parts are usually brought forward with Class I, III, and V resupply. Other repair parts required by company and battalion maintenance are either on hand, in a company's prescribed load list, or requested as required. Mortar platoons can carry some mission essential repair parts, such as mortar-firing pins and other crew-replaceable, expendable parts. The link between the unit and the maintenance support is a trained operator and crew who can properly use and maintain their equipment. The continued demand for equipment requires the operator and crew perform timely preventive maintenance checks and services.

6-39. Batteries, other than vehicle batteries and rechargeable batteries, are controlled by a communications section. Like ammunition, each platoon keeps a basic load of batteries, by type, on hand. Replacement batteries are requested and are delivered along with other supplies. The stock, use, and reordering of batteries has become most important with the fielding of more modern devices, such as CBRN alarms, LHMBCs, and handheld thermal and NVDs.

CLASS X: NONMILITARY MATERIEL

6-40. Class X is material to support nonmilitary programs, such as agricultural development, economic development, or civilian supply activities not included in Classes I through IX. If civilian resources in the theater are inadequate, military sources may provide Class X items to the civilian population.

6-41. Requirements for Class X items most often occur once civil affairs personnel, in conjunction with other interagency partners, have completed an assessment of the civilian component, determining required improvements to the essential services and basic human needs within the commander's area of responsibility. In addition, civil agencies of the U.S. government and private charitable organizations may provide supplies for civilian consumption that may or may not be distributed through military channels.

BASIC LOADS

6-42. A commander normally prescribes a standard amount of supplies to be kept on hand, called a basic load. It is the amount of supplies necessary to sustain operations until resupply. The most common basic loads are class I (rations and water), class II (clothing, especially mission-oriented protective posture equipment), class III (petroleum, oils, and lubricants), class IV (protection supplies, especially sandbags and concertina wire), class V (ammunition), and class IX (repair parts, especially batteries). The type and amount of the required basic load is in a unit's TACSOP. Mortar leaders are especially concerned about ammunition and its availability. Ammunition supplies depend on the required supply rate and the length of time before resupply. It is limited by what can be transported but not necessarily in a single lift.

6-43. Ammunition basic loads for a mortar element are examined in detail by a mortar platoon leader, reviewed by an operations staff officer and logistics staff officer, and approved by a battalion commander. Likewise, basic loads for company mortar sections are reviewed by a section leader and approved by a company commander. Basic loads are divided into the combat load (carried on a mortar unit's vehicles or personnel) and the bulk load (carried in a battalion field trains). Planning factors for USMC units are contained in MCO 8000.7A.

6-44. When mortar units are located in firing positions for more than a short period, they may be able to build up stockades of ammunition far in excess of what could be carried as a basic load in the traditional sense. Leaders at all levels must manage ammunition closely. Both too little or too much can present problems for a unit.

6-45. The composition of a particular class V basic load is METT-TC dependent. Class V basic loads for mortars are constantly modified the maneuver commander based on that unit's situation.

6-46. Combat experiences in World War II and Korea have shown that an onboard mix of 70-percent HE, 20-percent white phosphorus or smoke, and 10-percent illumination ammunition is the most flexible. These percentages may need to be modified for stability and other operations because of the ROE and other factors. These percentages are also modified by a commander based on the available supply rate and the mission.

6-47. During fire support planning, consideration is given to ammunition requirements. This makes it essential for a mortar platoon leader or platoon sergeant to be present to advise what types and amounts of ammunition will be required. For example, if a mission is to be an illuminated attack at night, then additional illumination rounds are brought forward to the mortar sites. If a mission is defense (day or night), sufficient HE and white phosphorus rounds are on site. In either situation, a mortar platoon leader contacts supported commanders and advises them of any ammunition constraints.

6-48. Mortar ammunition is heavy and bulky and takes time to break down and load onto vehicles or distribute to personnel to carry. Mortar leaders plan adequate time and resources to conduct these tasks. Table 6-1 provides data on mortar ammunition weights and dimensions.

Table 6-1. Weights and dimensions of selected mortar ammunition

Ammunition	*Weight of Individual Round (Pounds)*	*Number per Container*	*Container Weight (Pounds)*	*Dimensions L x W x H (Approximate Inches)*
60-mm M720 HE	3.75	16	116	15 x 13 x 20
60-mm M721 ILLUM	3.76	16	116	15 x 13 x 20
60-mm M722 Smoke	3.75	16	116	15 x 13 x 20
81-mm M821A2 HE	9.42	3	53	23 x 14 x 6
81-mm M853A1 ILLUM	9.43	3	58	30 x 14 x 6
81-mm M819 Smoke	10.8	3	63	30 x 14 x 6
120-mm M934 HE	31.2	2	96	12 x 6 x 32
120-mm M983 ILLUM	31.2	2	97	12 x 6 x 32
120-mm M929 Smoke	31.2	2	96	12 x 6 x 32
Legend: HE – high explosive, ILLUM – illumination, L x W x H – length by width by height, mm – millimeter				

RESUPPLY OPERATIONS

6-49. The company XO is responsible for synchronizing resupply operations for subordinate platoons and other units assigned or attached to the company. The XO identifies requirements through daily logistic status report and sustainment planning conducted during TLP. The following paragraphs discuss resupply techniques and delivery methods to sustain the company during operations.

ROUTINE RESUPPLY

6-50. Whenever possible, routine resupply by logistics package is conducted on a regular basis and is the preferred method for the distribution of supplies. Routine resupply, conducted ideally during hours of limited visibility, through logistics packages. The logistics package covers all classes of supply, mail, and any other items usually requested. The logistics package, a grouping of multiple classes of supply and supply vehicles under the control of a single ground convoy commander or through aerial delivery under certain situations, is an efficient method to accomplish routine resupply operations.

6-51. The key feature is a centrally organized resupply operation carrying all items needed to sustain the force for a specific period, usually 24 hours or until the next scheduled logistics package. The forward support company distribution platoon leader oversees logistics package operations and manages the distribution of supplies within the forward support company to individual company logistics release points.

IMMEDIATE RESUPPLY

6-52. Immediate resupply, also referred to as “emergency or urgent resupply,” is the least preferred method for the distribution of supplies. While resupply may be required when combat losses occur, requests for immediate resupply not related to combat loss indicates a breakdown in coordination and collaboration between sustaining and operating forces. Immediate resupply that extends beyond the Infantry battalion’s echelons of support capabilities requires immediate intervention of the brigade support battalion or next higher sustainment echelon capable of executing the support mission.

6-53. When a unit has an immediate need for resupply that cannot wait for a routine logistics package, an immediate resupply may involve class III , class V , and class VIII , and, on occasion, class I . An immediate

resupply by aerial delivery (see below) is dependent the availability of aviation assets. The fastest and most appropriate means of delivery is normally used, although, procedures may have to be adjusted when in contact with the enemy.

CONTINGENCY RESUPPLY

6-54. Contingency resupply is the on-call delivery of prepackaged supplies during the execution phase of an operation. This type of on-call delivery of a prepackaged resupply is generally used to support an operation of limited duration, such as an airborne or air assault or other limited engagement of short duration. Contingency resupply operations for the company are identified during the TLP, normally during war gaming as each course of action is analyzed. Contingency resupply differs from a routine logistics package or immediate resupply, in that, prior to execution, triggers for delivery are developed to tie contingency resupply operations to the ground tactical plan.

6-55. During the planning and preparation phases of the operations process, units develop menus for prepackaged classes of supply to ensure availability for expedited delivery as needed. A contingency resupply package can be as simple as a container or bag filled with a small amount of supplies or a unit basic load prepackaged for delivery when needed. Delivery methods vary between rotary-wing, fixed-wing, and ground-delivery assets.

AERIAL DELIVERY

6-56. Aerial delivery by airland, airdrop, and sling-load operations provide additional capability to resupply the Infantry rifle company when the terrain or enemy situation limits access by ground transportation. Aerial delivery of routine (resupply by logistics package), immediate resupply (emergency or urgent resupply), and contingency resupply provides an effective means to bypass enemy activities and reduces the need for route clearance of ground lines of communications

6-57. When planning aerial delivery operations, the commander considers the enemy‘s ability to locate the delivery and receiving unit by observing the delivery aircraft. Drop zones and landing zones are located away from the main unit in an area that can be defended for a short time unless the resupply is conducted in an area under friendly control and away from direct enemy observation. When delivered, supplies are immediately transported away from the drop zone or landing zone. Six aerial delivery means, common to company resupply operations, include internal and external (sling) loading, speedball, kicker box, Container Delivery System, low cost low altitude, and Joint Precision Airdrop System. (See ATP 3-21.20 for more information.)

Note. In order for aerial delivery to be effective, friendly forces must control the airspace and neutralize enemy ground-based air defenses along the aerial delivery route. FM 3-99 addresses planning considerations for the suppression of enemy air defenses along aerial routes and guidance for selecting landing zones and drop zones. ATP 4-48 describes the planning, preparation, and execution process for aerial delivery and identifies responsibilities in the conduct of aerial delivery.

PRE-POSITION

6-58. Pre-positioning of supplies must be carefully planned and executed at every level when utilized. All leaders must know the exact locations of pre-positioned sites, which they verify during reconnaissance and rehearsals.

6-59. The commander take measures to ensure survivability. These measures may include digging in pre-positioned supplies and selecting covered and concealed positions. The commander must also have a plan to remove or destroy prepositioned supplies, if required.

CACHE

6-60. A cache is a pre-positioned and concealed supply point. Caches are an excellent tool for reducing the Soldier‘s load and can be set up for a specific mission or as a contingency measure. Cache sites have the

same characteristics as an objective rally point or patrol base, with the supplies concealed above or below ground.

6-61. An aboveground cache is easier to get to but is more likely to be discovered by the enemy, civilians, or animals. A security risk always exists when returning to a cache. A cache site is observed for signs of enemy presence and secured before being used as it may have been booby-trapped and may be under enemy observation.

LOGISTICS PACKAGE

6-62. The logistics package technique is a simple, efficient way to accomplish routine resupply operations. The key feature is a centrally organized resupply convoy originating at the unit trains. It carries all items needed to sustain the platoon for a specific period, usually 24 hours or until the next scheduled logistics package. Company and battalion standard operating procedures specify the exact composition and march order of the logistics package.

PREPARATIONS

6-63. The mortar platoon or section must provide supply requests to the company in order to receive supplies. Based on the requests, the supply sergeant then assembles the logistics package. Example logistics packages for the platoon may include the following:

- Class I, class III (bulk and packaged products), and class V supplies from the forward support company. This usually entails employment of one or two fuel heavy expanded mobility tactical trucks and one or two cargo heavy expanded mobility tactical trucks.
- Class II, class IV (basic load resupply only), class VI, and class VII supplies from battalion logistics personnel in the field trains.
- Routine class IX supplies and maintenance documents (as required) from the prescribed load list section in the field trains.
- Replacement personnel and Soldiers returning from a medical treatment facility.
- Vehicles returning to the company area from maintenance.
- Mail and personnel action documents (including awards, finance, and legal documents) from the battalion personnel staff officer.

6-64. When logistics package preparations are completed, the supply sergeant initiates tactical movement to the logistical release point under the supervision of the forward support company support platoon leader. The supply sergeant and logistics package link up with the company element (company XO, first sergeant, or a security element from a platoon) at the logistical release point.

ACTIONS AT THE LOGISTICS RELEASE POINT

6-65. When the company representative arrives at the logistical release point to pick up the company logistical release point, the member updates all personnel and logistical reports and is briefed by the field trains officer in charge on changes to the tactical or support situation. The company representative then escorts the convoy to the company resupply point, providing security during movement from the logistical release point.

RESUPPLY STRATEGY

6-66. The time required for resupply is an important planning factor. Units conduct resupply as quickly and efficiently as possible to ensure operational effectiveness and to allow the company logistics package to return to the logistical release point on time.

6-67. Once the unit completes resupply operations, the unit prepares the logistics package vehicles for the return trip. The company vehicles requiring recovery for maintenance or salvage are lined up and prepared for towing. Cargo trucks, fuel trucks, or damaged vehicles transport those killed in action. Detainees ride in cargo trucks and are guarded by capable, friendly wounded or other capable company personnel. All supply

requests, human resources actions, and outgoing mail are consolidated for forwarding to the field trains, where the appropriate staff section processes them for the next logistics package.

6-68. Company representatives lead the logistics package back to the logistical release point, where they link up with the forward support company support platoon leader. The reunited task force logistics package convoy returns to the field trains together. When METT-TC dictates or when the logistics package arrives too late to rejoin the larger convoy, the company vehicles must return to the field trains on their own. Because only minimal security assets are available, this situation is avoided, whenever possible.

RESUPPLY METHODS

6-69. As directed by the commander or XO, the first sergeant establishes the company's logistics resupply point using the service station method or the tailgate method. The first sergeant briefs each logistics package driver on which method or methods to use. When the resupply point is ready, the first sergeant informs the commander who, in turn, directs each platoon or element to conduct resupply based on the tactical situation.

Service Station Resupply

6-70. With the service station method, vehicles move individually or in small groups to a centrally located resupply point. Depending on the tactical situation, one team or squad (one element within the squad or platoon may be utilized to pick up the resupply for the whole unit to save time) or even an entire platoon moves out of its position, conducts resupply operations, and then moves back into position. When using this method, Soldiers enter the resupply point following a one-way flow, only requiring immediate maintenance stop at the maintenance holding area. This process continues until the entire company has been resupplied (see figure 6-1).

6-71. When mounted, vehicles move through each supply location, with individuals and crews rotating individually to eat, picking up mail and sundries, and refilling or exchanging water cans. When all platoon vehicles and crews have completed resupply, they move to a holding area, where, time permitting, the platoon leader and platoon sergeant conduct a precombat inspection. Whether mounted or dismounted, the company command group (company commander, XO, and first sergeant) can take this opportunity to conduct precombat inspections of each platoon as they pass through the resupply point.

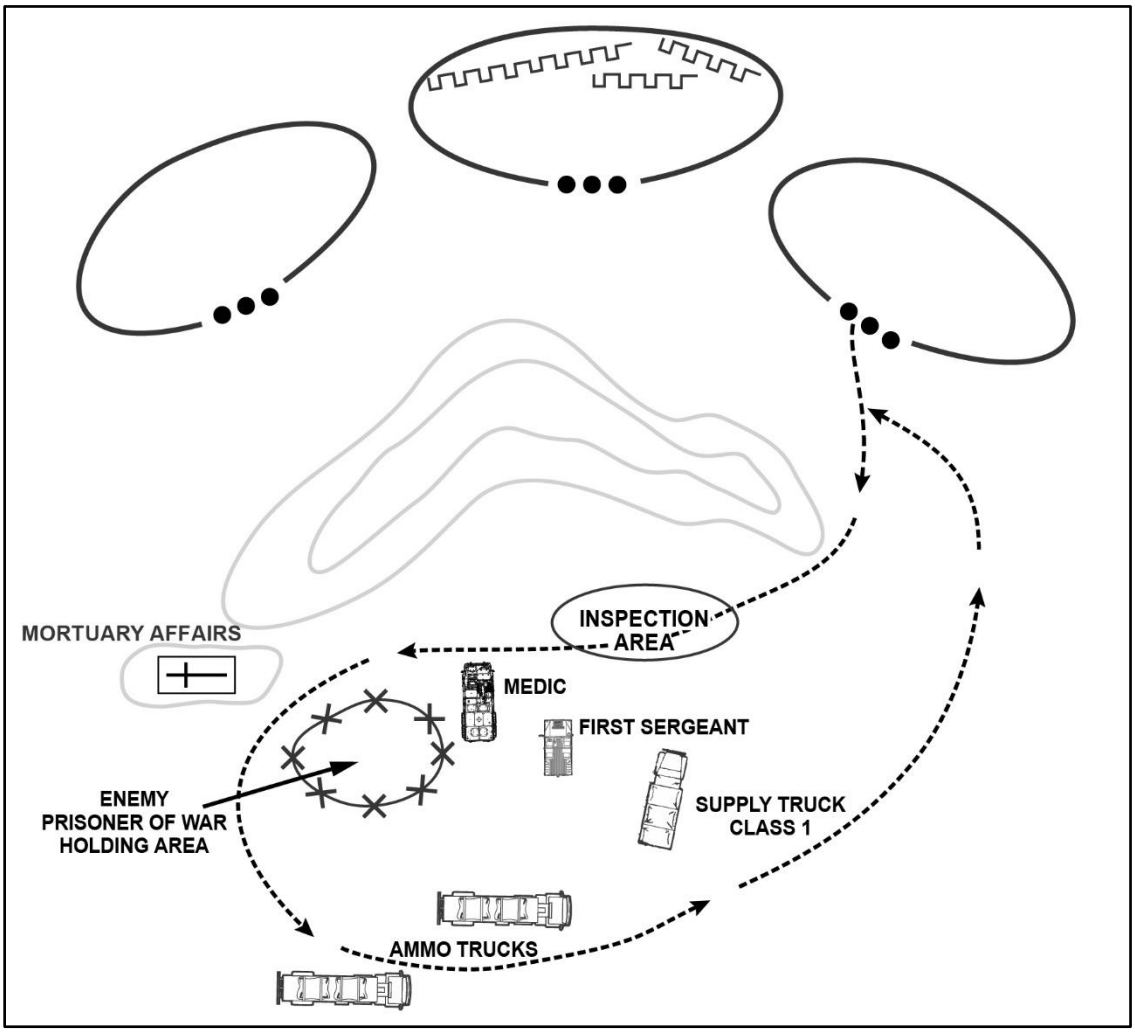


Figure 6-1. Service station method

6-72. ABCT heavy mortars may be ground-mounted before sending mortar carrier vehicles for resupply. This is done when a mission requires all mortars be prepared to fire. However, ABCT ground-mounted mortars lose MFCS capability and must use mortar analog fire control systems.

WARNING

The pointing device must be removed before firing the M121 ground-mounted.

6-73. IBCT heavy mortars may leave the M120A1 mortar system and trailer in place, disconnect power from the prime mover, and send vehicles for resupply while fully maintaining MFCS-D capability. If the level of charge of the MFCS-D portable universal battery supply is unknown, it is recommended to reconnect power to the prime mover within three hours. Alternately, the platoon may conduct digital fire control procedures with the LHMBCs or mortar analog fire control procedures with either the M120A1 mortar systems, the M252A1 81-mm mortar systems, or a combination of both.

6-74. SBCT heavy mortars do not have the capability to be ground-mounted. If the mortar platoon must be prepared to fire and the service station method of resupply is used, the SBCT mortar platoon may emplace the M252A1 81-mm mortar systems at the mortar-firing point and conduct digital fire control procedures using the LHMBCs or mortar analog fire control procedures when sending the mortar carriers for resupply. Alternately, the platoon may resupply in sections.

6-75. If a platoon is required to displace before the return of vehicles, ground-mounted mortars and partial crews are cross-loaded on the remaining vehicles and moved to the next position. Personnel sent back for resupply are briefed on the most likely contingency. They use the platoon displacement plan or FBCB2 to determine the location of the vehicles. Alternately, a platoon may resupply by section or squad.

Tailgate Resupply

6-76. Tailgate resupply usually requires significantly more time than do service station operations. Usually, units use the tailgate method only when the tactical situation allows or dictates. Subordinate units remain in their positions or pull back a short distance to allow trucks carrying class III and class V supplies to reach them. Individuals and crewmen rotate through the feeding area, pick up mail and sundries, and fill or exchange water containers.

6-77. Detainees are processed at the point of capture, and the capturing unit provides security of the detainees until they can be evacuated to a detention facility. (See FM 3-63 for additional information on detainee operations). Soldiers killed in action and their personal effects are brought to the holding area, where the first sergeant takes charge of them (see figure 6-2).

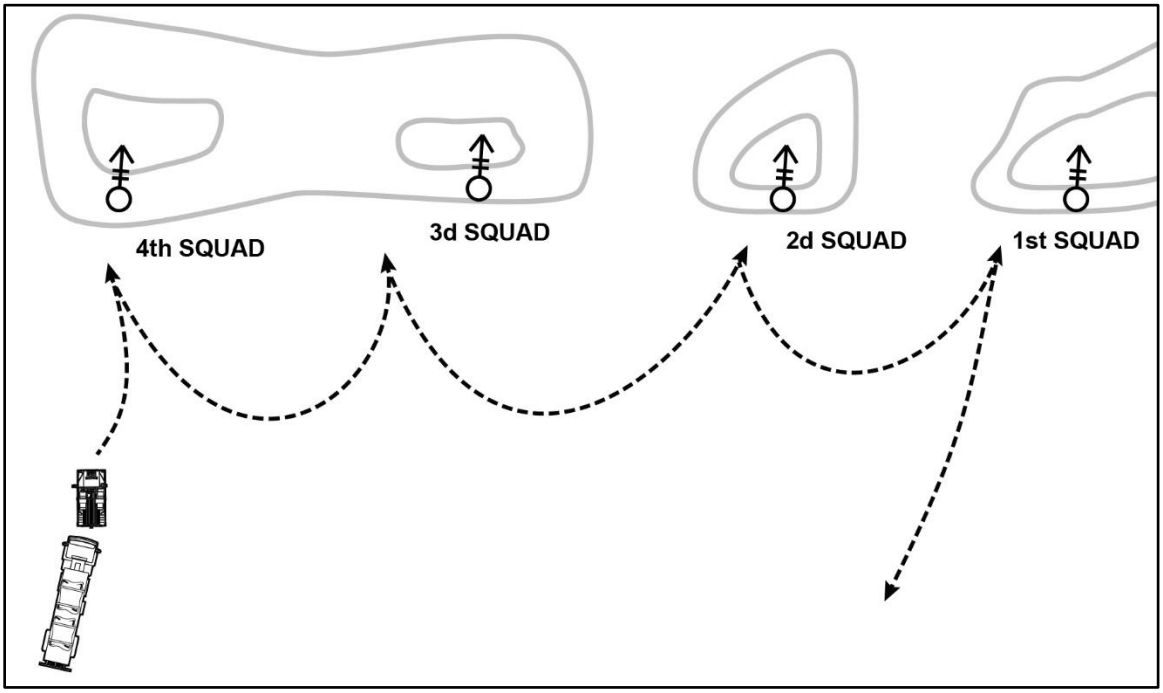


Figure 6-2. Tailgate resupply method

Combination of Service Station and Tailgate Resupply

6-78. The company may select to employ the tailgate resupply method, but selected platoons may have to use the service station resupply method. Selected platoon(s) may use the service station resupply method, and some sections may have to use the tailgate resupply method.

SECTION V – MAINTENANCE

6-79. The maintenance of weapons and equipment within the platoon is continuous. All Soldiers must know how to maintain their weapon and equipment according to the related technical manual. This section addresses the Army's tiered two-level maintenance system and company-and-below-level maintenance considerations and requirements.

TWO-LEVEL MAINTENANCE SYSTEM

6-80. The Army utilizes a two-level maintenance system comprised of field maintenance and sustainment maintenance to preserve combat power and to enable mission accomplishment. Field maintenance is on-system maintenance, repair and return to the user, including maintenance actions performed by operators and crews. Sustainment maintenance is off-system component repair and/or end-item repair and return to the supply system or by exception to the owning unit, performed by national level maintenance providers. (See ATP 4-33 for more information.)

COMPANY-AND-BELOW MAINTENANCE CONSIDERATIONS AND REQUIREMENTS

6-81. Proper maintenance is the key to keeping weapons, equipment, vehicles, and other materials in serviceable condition. Effective maintenance includes inspecting, testing, servicing, repairing, requisitioning, recovering, and evacuating equipment.

6-82. Maintenance functions begin with preventative maintenance checks and services, a daily responsibility for each piece of equipment to include inspection and maintenance forms, such as DA Form 2404 (*Equipment Inspection and Maintenance Worksheet)* or DA Form 5988-E (*Equipment Maintenance and Inspection Worksheet [EGA])* when required. These forms are the primary means through which the company obtains maintenance support or repair parts. The forms follow a pathway from individual and crew level to the higher level of maintenance and back. Per unit standard operating procedure, the company XO or first sergeant supervises the flow of these critical maintenance documents and parts.

6-83. The unit standard operating procedure details when maintenance is performed (at least once a day in the field), to what standards, and who inspects it. The squad leader is often the one who inspects maintenance work, whereas the platoon sergeant, platoon leader, first sergeant, XO, and commander conduct spot-checks. In addition to operator maintenance, selected Soldiers are trained to perform limited maintenance on damaged weapons and battle damage assessment and repair.

6-84. Inoperative equipment is fixed as far forward as possible. When a piece of equipment is damaged, it is inspected to see if it can be repaired on the spot. The company armorer keeps a small-arms repair kit in the company trains or on a company vehicle. If equipment cannot be repaired forward, it is evacuated immediately or returned on the next available means of transportation. Even if the item cannot be evacuated at once, the sustainment system is alerted to prepare for repair or replacement. If a replacement is available from an evacuated Soldier or inoperative equipment, it is sent forward. If not, leaders work around it by prioritizing the use of remaining equipment; for example, they might use a squad radio for the company frequency modulation command net if the platoon radio is broken.

6-85. As maintenance applies to all equipment, items, such as magazines, ammunition, and batteries, are also maintained and inspected. While test firing in an assembly area, mark the magazines of weapons that have stoppages. If a magazine is marked more than twice, the magazine might be causing the stoppages. Inspect the ammunition belts for crew-served weapons along with the weapons. Dirty or corroded ammunition may also cause weapon malfunctions.

6-86. When a vehicle or piece of equipment cannot be recovered or is damaged beyond repair, the platoon reports the situation to the company commander. The commander, in coordination with higher, gives permission for destruction of the materiel if that is the only way to prevent enemy capture. Operators remove all salvageable equipment and parts and take all classified materials or paperwork that could be of intelligence value to the enemy. The platoon then destroys the vehicle or equipment according to established procedures.

6-87. Because the RMS6-L mortar system does not have the capability to be fired outside of the Stryker mortar carrier vehicle, SBCT mortar units must pay special attention and care in maintaining the Stryker mortar carrier vehicle. If the vehicle is not fully mission capable, that unit has lost organic 120-mm mortar fire capability.

SECTION VI – MEDICAL SUPPORT

6-88. This section covers medical support for company or troop mortar sections and battalion mortar platoons, evacuation of casualties, priority of evacuation, and reporting casualties. Procedures are the same as for any maneuver unit, except that company and troop mortar sections usually do not have a medic attached.

MEDICAL EVACUATION VERSUS CASUALTY EVACUATION

6-89. *Medical evacuation* (MEDEVAC) is the timely and effective movement of the wounded, injured, or ill to and between medical treatment facilities on dedicated and properly marked medical platforms with en route care provided by medical personnel (ATP 4-02.2). Medical evacuation (MEDEVAC) is the key factor to ensuring the continuity of care provided to our Soldiers by providing en route medical care during evacuation and facilitating the transfer of patients between medical treatment facilities to receive the appropriate specialty care. This ensures that scarce medical resources (personnel, equipment, and supplies [to include blood]) can be rapidly transported to areas of critical need on the battlefield.

6-90. Casualty evacuation (CASEVAC) is what nonmedical units use to refer to the movement of casualties aboard nonmedical vehicles or aircraft without en route medical care. Refer to ATP 4-02.2. CASEVAC is the transport or movement of casualties by nonmedical assets without specialized trauma care. For the purposes of this discussion, CASEVAC means what is done when moving casualties from the point of injury to the platoon or company casualty collection point. Ideally, casualties are transferred from a casualty collection point to a MEDEVAC asset. When this is not possible, the casualty is moved from the casualty collection point, when required to move, aboard a nonmedical asset to a MEDEVAC asset or medical treatment facility.

CASUALTY CARE

6-91. Effective casualty care has a positive impact on the morale of a unit. Casualties are cared for at the point of injury (or under nearby cover and concealment) and receive self- or buddy aid, advanced first aid from the combat lifesaver, or emergency medical treatment from the trauma specialist (platoon or company medic).

6-92. During the fight, casualties remain under cover where they received initial treatment (self- or buddy aid). As soon as the situation allows, casualties are moved to the platoon casualty collection point. From the platoon area, casualties are normally evacuated to the company casualty collection point and then back to the battalion aid station or other facility in the battalion or brigade support area. Unit standard operating procedures address these activities, to include the marking of casualties in limited visibility operations. Small, standard, or infrared chemical lights work well for this purpose. Once the casualties are collected, evaluated, and treated, they are prioritized for evacuation back to the company casualty collection point. Once they arrive at the company casualty collection point, the above process is repeated while awaiting evacuation back to the support area(s).

COMBAT MEDICS

6-93. Combat medics are assigned to the medical platoon tasked to support the battalion or squadron. Combat medics are allocated to the companies and troops on the basis of one combat medic per platoon (excluding tank and mobile gun system platoons) and one senior combat medic per company and troop. The location of the combat medic is of extreme importance for rapid medical treatment of casualties.

6-94. The platoon combat medic usually locates with, or near, the element leader. When the platoon moves on foot in the platoon column formation, the combat medic positions him- or herself near the element leader. If the platoon is mounted, the combat medic usually rides in the same vehicle as the platoon sergeant.

6-95. The company senior combat medic collocates with the company trains. When a casualty occurs, the combat lifesaver renders first aid or first aid is provided through self-aid or buddy aid. The platoon combat medic or the company senior combat medic then goes to the location of the casualty or the casualty is brought to the combat medic at the casualty collection point. The casualty collection point combat medic makes assessments, administers initial medical care, initiates a DD Form 1380 (*Tactical Combat Casualty Care [TCCC] Card*), and then requests evacuation or returns the individual to duty.

COMPANY AND TROOP MORTAR SECTION MEDICAL CARE

6-96. Company and troop mortar sections are not usually allocated a combat medic. They must rely on medical support from the rifle or scout platoon's combat medic or from the senior combat medic for the company or troop. It is, therefore, imperative that all Soldiers in the mortar section are combat lifesavers and have gone through a unit's tactical combat casualty care program. It is recommended that at least one Soldier from the mortar section receives training in more advanced trauma treatment.

SECTION VII – INDIVIDUAL PERFORMANCE

6-97. This section discusses methods for sustaining the mortar section's performance during prolonged combat. In any conflict, combat operations are continuous and are at a high pace. Mortar platoons and sections must fight without stopping for long periods. Under these conditions, unit performance suffers. The mortar leader uses several methods to conserve and prolong Soldier combat effectiveness.

TYPES OF OPERATIONS

6-98. Mortar units routinely conduct continuous operations and may be required to conduct sustained operations. Because of the ratio of maneuver platoons compared to organic mortar elements, during continuous operations, the organic mortar element may conduct sustained operations even when the other maneuver elements within the unit are not.

6-99. Continuous operations are possible by the mechanization of land combat forces and by technology that permits movement at night, in poor weather, and in other low-visibility conditions. Combat continues around the clock at the same level of high intensity for long periods. Armies now have the potential to fight without stopping. The reasons that battalions were forced to pause—darkness, resupply, regrouping—have been overcome by technological advances.

6-100. Sustained operations are used when the same Soldiers and small units engage in continuous operations with no opportunity for the unit to stand down and little opportunity for the Soldiers to catch more than a few minutes of sleep. Continuous operations do not always involve sustained operations if enough units or individuals within units are available to allow everyone to get adequate rest.

STRESS IN COMBAT

6-101. The confusion, stress, and lethality of the modern battlefield place a burden on Soldier's endurance, courage, perseverance, and ability to perform in combat. Soldiers conducting combat operations in mortar units perform complex collective and individual tasks without adequate sleep and under stress.

6-102. Stress in combat is caused by the following:

- Fear. All experience the fear of death or being wounded or the fear of failing in the eyes of one's comrades.
- Limited visibility and low-light levels. Smoke, darkness, fog, rain, snow, ice, and glare make it hard to see. The extended wear of night vision goggles, protective masks, or laser protective lenses causes stress.

- Disrupted wake/sleep cycle. Performance suffers during normal sleeping hours due to the disruption of the normal schedule.
- Decision-making. Mental stress results from making vital decisions with little time and insufficient information and increases during times of great confusion and exposure to danger.
- Physical fatigue. Working the muscles faster than they can be supplied with oxygen and fuel can cause individuals to function poorly without rest.
- Physical discomfort. Extreme cold, heat, wet, hunger, or thirst adds greatly to the level of individual stress.

FATIGUE

6-103. As sustained operations continue, all individuals begin to show effects of general fatigue and lack of sleep. Unless this is counteracted, mortar performance declines rapidly. Mortar units can conduct sustained operations from 24 to 48 hours, extending 72 hours when required. Extensive training and standardization, plus cohesion and esprit de corps, allow limited sustained operations beyond 72 hours. All units experience serious degradation of combat effectiveness that quickly rises after 72 hours. A rule of thumb is to expect 25-percent degradation in performance for every 24 hours without sleep. Under the extreme demands of combat, units historically have conducted sustained operations for a maximum of 120 hours. The result was a total deterioration of combat effectiveness. Operations in mission-oriented protective posture, level four cause faster degradation of combat effectiveness.

6-104. Though essential for endurance, sheer determination cannot offset the cumulative effects of sustained sleep loss. A unit subjected to extensive sustained operations requires a long period of rest and recuperation to regain combat effectiveness.

6-105. Extensive Army studies on the effects of sustained operations on combat effectiveness show that the performance in all duty positions does not degrade the same. Performance in fire direction personnel where there is a heavy load of mental tasks (determining, calculating, thinking, decision-making) degrades faster than the performance of the mortar gun crews where tasks are mainly physical (firing, lifting, digging). Taking into account—

- Platoon leaders and platoon sergeants plan fires, integrate communications and plans, establish positions, and coordinate tactics. They show the effects of lack of sleep faster than the members of mortar platoon squads.
- Fire direction personnel perform mentally demanding and complex tasks. The Soldier's ability to continue performing these tasks degrades severely over a period. For example, adjusting multiple missions can become difficult, and firing calculations are likely to be wrong as well as slow. Self-initiated tasks, such as eating or resting, are especially likely to be forgotten.
- Company and troop mortar section leaders and company squad leaders have the heaviest load of mental tasks. They perform the fires planning, tactical employment, and fire direction operations for their section. They show the effects of lack of sleep faster than any other mortar duty position.
- Long sustained combat degrades the fighting performance of all Soldiers, teams, and units. The adverse factors affect everyone. If leaders at all levels perform without rest, they are likely to degrade faster than their troops.

EFFECTS OF CONTINUOUS OPERATIONS

6-106. Continuous operations cause a slower, but no less serious, degradation of combat effectiveness. Whether a task is degraded by loss of sleep depends on many interacting and sometimes counteracting factors. Complicated tasks are more stimulating to the brain and require more training to master. A simple task requires less training to do but can be boring. A high level of alertness is required to perform a task well after sleep loss.

6-107. The following factors are interactive:

- Task complexity or ambiguity. Fire direction computers perform the most complex tasks and are usually the first to show the effects of sleep loss. Simpler, clearer tasks are less affected by sleep loss; complicated or ambiguous tasks suffer from fatigue and loss of sleep. This applies to both

physical and mental tasks. Simple lifting, digging, or marching can be stable. The fine hand-and-eye coordination needed to lay a mortar can suffer, and reasoning and problem solving can be difficult.

- State of alertness. The extent to which the Soldier's brain is aroused and active depends on both physical and mental stimulation. Noise, light, muscular movement, and speech keep the brain alert. Increased loss of sleep requires more stimulation to keep the brain awake. Too little or too much arousal can impair the Soldier's performance. Combat operations are conducted at such a fast pace that a high state of arousal is maintained. However, even the most aroused Soldiers are susceptible to crashing. This commonly occurs early during combat after as little as 24 hours of intense stress and sleeplessness. The body abruptly stops producing the high levels of adrenaline needed to sustain the initial activity. The result can be severe drowsiness, leading to near unconsciousness. Soldiers who are alert and aroused for 24 hours during the marshaling, loading, and insertion phase of an operation can suffer from intense fatigue, which starts after dawn of the first day of combat. Only good leadership, motivation, and rest can overcome this effect.
- Level of training. Extensive training delays the degradation of a task caused from lack of sleep. Training does not prevent lack of sleep from eventually affecting the performance of a task, but repetitive, stressful, realistic training can delay and moderate these effects.
- Physical training. Good physical training prepares the individual for sustained operations. It also allows an individual to recover quicker after a short rest than someone who is in poor physical condition. A good diet and healthful life style prepares the Soldier to cope with the physical stress of sustained operations.

TECHNIQUES TO SUSTAIN OPERATIONS

6-108. To maintain effectiveness, Soldiers must overcome adverse conditions. The rate of performance degradation must be slowed. The methods mortar leader can use to slow degradation and to prepare to fight sustained operations are—

- Prepare individuals. Preventive measures are often more effective for keeping groups healthy and active. They include improving or maintaining good physical condition, balanced nutrition, good personal hygiene, and immunizations.
- Provide good leadership. Good leadership is the key to sustained unit performance. Leaders must bring out the best efforts of their subordinates.
- Set high standards. Success during sustained operations demands the highest standards of military expertise.
- Develop individual and unit confidence.
- Establish good communication channels. In combat, knowledge of the situation and the status of both enemy and friendly units sustain men.
- Cross-train. Extensive cross-training in the mortar platoon provides flexibility. Critical tasks, such as operating digital and analog fire direction control systems and aiming circle operations, must be cross-trained.
- Develop coping skills. All members experience and learn to cope with adverse factors, especially stress and lack of sleep.
- Develop good physical fitness. Whether moving heavy weapons, carrying large loads, or digging, physically fit Soldiers can use their strength reserves to recover after only a brief rest.
- Build stamina. Each member must develop aerobic fitness to work more and withstand the stress of sustained operations.
- Practice pacing while extending physical limits. All Soldiers must be trained to pace themselves to work at their maximum range without degradation.
- Foster a spirit and attitude of winning. In combat, winning depends on skill and dedication. Especially in sustained operations, a dedicated Soldier demonstrates the extra strength needed to win.

- Foster cohesion, esprit, morale, and commitment. Mutual trust based on personal face-to-face interaction is called cohesion. Esprit de corps is identifying with the unit and with its history and ideals: the company, battalion, division, Infantry branch, and U.S. Army. Cohesion holds units together; esprit keeps them dedicated to the mission.
- Guarantee and encourage the free exercise of the Soldier's faith. Regardless of religious background, most Soldiers are reassured and calmed if the leader encourages them to exercise faith or spirituality.

TECHNIQUES TO SUSTAIN COMBAT PERFORMANCE

6-109. Several techniques can be used to sustain combat performance, including—

- Share physical and mental burdens among all members of the unit.
- Rotate boring tasks often.
- Share tasks by assigning two or more Soldiers to perform them.
- Crosscheck all fire direction control calculations, sight settings, and map coordinates among other members of the unit.
- Avoid using strong artificial stimulants. The use of amphetamines or other strong stimulants has risks that outweigh the benefits.
- Learn to recognize the signs of serious performance degradation in others. The least affected Soldiers perform the most important combat tasks.
- Learn to recognize signs of serious degradation in yourself. Leadership requires thinking, judging, calculating, determining, recognizing, distinguishing, and decision-making. These abilities degrade quickly in sustained operations.

UNIT SLEEP PLAN

6-110. The mortar leader must ensure that the mortar unit can conduct sustained and continuous operations. The only way a mortar unit can conduct continuous operations over long periods is to ensure all Soldiers and leaders get enough sleep.

6-111. The mortar element leader devises and enforces a work-rest-sleep plan for the element. The squad leaders enforce this plan. The plan must include provisions for leaders and Soldiers to sleep. The plan allows Soldiers at least 4 hours of sleep each 24 hours, preferably uninterrupted and ideally between 2400 and 0600.

IMPORTANCE OF SLEEP

6-112. Sleep is vital for health, performance, and well-being. Sleep sustains the brain’s capabilities for success on and off the battlefield. With quality sleep, Soldiers prepare themselves to excel mentally and physically.

6-113. Sleep is a biological need for brain function. Soldiers require 7–8 hours of quality sleep every 24 hours to maintain their mental edge. When Soldiers do not get enough sleep, mental acuity suffers, putting themselves and fellow Soldiers at risk for making errors that lead to accidents and mishaps. Insufficient sleep is a safety risk and a threat to mission success.

6-114. Getting enough quality sleep helps to maintain your physical and psychological health, quality of life, and safety. Sleep is the only time when the brain can recover from the wear and tear of daily life; the brain cannot recover during wakefulness, even if you are resting.

6-115. The brain needs sleep to restore and repair, grow new brain connections to work efficiently, form memories, and process new information. Leaders consider sleep when planning for training or when their Soldiers learn a new skill or task. Sleeping well before learning helps the Soldier with attention and understanding. Sleeping well after learning improves the Soldier’s ability to remember and use newly acquired skills and information.

6-116. The effects of sleep deprivation are accumulative. If three Soldiers do their part of a task at 50-percent effectiveness, the chances that the whole task will be accomplished correctly is less than 50 percent. In fact, it is about 12 percent (0.5 x 0.5 x 0.5 = 0.125). Army studies on the effects of individual sleep deprivation on artillery FDC personnel and gun crews show that 7 hours of sleep for each Soldier in 24 hours can maintain effectiveness indefinitely. Five to six hours of sleep in 24 hours can maintain acceptable performance for 10 to 15 days, and 4 hours of sleep in 24 hours can maintain acceptable performance for only 2 to 3 days. Less than 3 hours of sleep in 24 hours is almost the same as not sleeping at all.

PRIORITY FOR SLEEP

6-117. Priority for sleep goes to Soldiers computing mortar fire direction data, drivers, Soldiers responsible for monitoring incoming radio or digital communications, actively manning crew-served weapons, and others whose judgment and decision-making are critical to mission accomplishment. Even with an average of four hours of sleep a night, Soldier performance gradually degrades.

CONTINUITY OF SLEEP

6-118. The continuity of sleep is also important. Soldiers sleep in a quiet, safe place away from radios and conversations in order for sleep to be of the most value. Sleeping in a corner of the FDC amid the noise of radios, generators, and talking is of little value. Soldiers do not sleep deep enough to gain much restorative value. As a mitigating factor, mortar leaders enforce the use of soft foam earplugs and a sleep mask to block noise and light.

6-119. Twelve-hour shifts are the most effective during continuous operations. Rotating shifts are difficult for most Soldiers to adjust to and are avoided when possible.

6-120. During sustained operations, shorter rotations are generally necessary. Mortar leaders must consider the time it takes Soldiers to wake up, get ready, and be prepared to assume their shift when making a shift roster. If the tactical situation permits, do not have Soldiers or leaders on shifts with a duration of less than two hours in order to minimize time wasted immediately before, during, and after shift changes.

QUALITY OF SLEEP

6-121. The quality of sleep is important. Four hours of sleep in a protected, comfortable position at a comfortable temperature are much more helpful than a longer but uncomfortable period.

6-122. Soldiers use their issued sleeping mat as a thermal barrier or cushion when sleeping on the ground or inside vehicles, especially armored or Stryker mortar carrier vehicles. Alternately, Soldiers may use personally procured parachute-style nylon hammocks (subdued color) at the discretion of mortar element leaders and their commanders. Hammocks are effective in improving Soldier comfort, which directly influences quality of sleep, especially within the confines of the armored or Stryker mortar carrier vehicle.

SPECIAL CONSIDERATIONS FOR CREW-SERVED WEAPONS

6-123. Special considerations are necessary for Soldiers in vehicles with a crew-served weapon, such as mortar squads in the ABCT and SBCT. If the tactical situation permits and when Soldiers are well-rested, the Soldier manning the machine gun may also monitor the radio.

6-124. When Soldiers are not well-rested, one Soldier monitors the radio while the other mans the machine gun. To maximize the Soldier's time off shift, rotate each Soldier through radio watch, then man the crew-served weapon, then off shift.

DUTY MORTAR

6-125. One method for allowing mortar crews to rest, which has proven successful in combat, is the designation of a duty mortar squad. One mortar squad is designated as being responsible for answering all initial calls for fire. This squad remains awake near its mortar system during the entire tour of duty. The other squads can sleep without having anyone awake to respond immediately to fire missions.

6-126. All mortars in the section must be laid on the priority target, if one has been designated. A minimum amount of ammunition is prepared to fire the priority mission. Local security is established, and there are at least two Soldiers awake and performing fire direction control duties: a radiotelephone operator and a fire direction computer. An easily initiated and effective signal for the whole mortar section to wake up and join in the fire mission must also be established. This may have to be a runner, since history has shown that exhausted mortar crews do not wake up, even when the mortar next to them begins to fire. After several days of sleep deprivation, the body does not respond to the sounds of outgoing fire.

SLEEP DEPRIVATION COUNTERMEASURES

6-127. To achieve maximum sleep in a continuous operating environment, several strategies can be used to counter the effects of sleep deprivation. These include sleep banking, taking naps, or using caffeine.

SLEEP BANKING

6-128. Up to two weeks prior to operations or the start of mission, Soldiers can pay down their sleep debt and bank sleep by getting eight or more hours of sleep in each 24-hour period. This helps Soldiers start the mission with a full bank.

TAKING NAPS

6-129. The same considerations for continuity and quality of sleep apply to Soldiers napping, only for a shorter duration. To use naps effectively—

- Take naps to achieve 7–8 hours of sleep every 24 hours. A nap improves alertness and performance, reducing mistakes and accidents.
- Be as comfortable as the tactical situation permits; remove helmet and body armor or loosen boots.
- Be removed from noise, light, and traffic or use foam earplugs and a sleep mask.
- Urinate prior to napping to prevent sleep interruption.
- Sleep inertia (grogginess upon awakening) is almost never a problem for most people and is not a good reason to avoid napping.
- If immediate responsiveness is required upon awakening, use caffeine gum to rapidly restore performance.
- Get as much sleep as possible in as large chunks of time as the operational requirement or mission allows.
- Do not use any drugs or medication (prescription or over-the-counter) to help get to sleep unless they are being taken under the guidance of a healthcare provider and the mortar leadership is informed.

USING CAFFEINE

6-130. Caffeine can have positive effects on alertness, observation, and physical performance when used appropriately. Caffeine is the most widely used stimulant in the world. After one hour of ingestion, caffeine peaks in the blood, although caffeine gum can shorten the peak time.

6-131. For effective caffeine use—

- Caffeine doses ranging from 200–400 milligrams are shown to be effective to sustain performance in the context of sleep deprivation, sedation, and sleep restriction.
- Caffeine use is most effective when there is no sleep debt.
- Order caffeine gum through your supply system (national stock number 8925-01-530-1219, Stay Alert Energy Caffeine Gum). One stick contains approximately 200 milligrams of caffeine.
- Caffeine does not replace sleep.
- Do not take caffeine within six hours of anticipated sleep.
- The effects of caffeine are reduced if it is overused.

SOLDIER LOAD

6-132. Soldier load is an area of concern for Army commanders and subordinate leaders. How much Soldiers carry, how far, and in what configuration are critical mission considerations. Commanders and mortar leaders balance the risk to their Soldiers from the enemy against the risk to mission accomplishment due to excessive loads and Soldier exhaustion and injury. Soldier load is limited to mission essential equipment to sustain continuous operations. Commanders and mortar leaders accept prudent risks to reduce Soldier load based on a through mission analysis.

6-133. Mortar leaders must have a thorough understanding of each of their Soldier's physical capabilities when planning dismounted mortar operations with minimal or no vehicle support. This is especially true for company and dismounted Cavalry troop mortar sections. (See ATP 3-21.18 for more information.)

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Appendix A

Ammunition Effects

Fire support planners determine what targets to hit and when, but they must decide how to attack each target. They must consider the complex relationship between a weapon, a round and fuze combination, type of target, terrain and weather, and the desired effects. Because it is such a complex relationship, there are no definite rules for the number and types of rounds required for a desired effect. An FO's observation and evaluation are critical in determining the effect of fires on a target. FSOs/FSCs, mortar platoon and section leaders, and fire direction chiefs consider all the aspects of target effects when planning fires. This appendix discusses the purpose and effects of mortar HEs, smoke, and illumination fire on targets. More detailed and classified information is found in the U.S. Air Force-published Joint Munitions Effectiveness Manual (JMEM).

SECTION I – METHODS OF FIRE

A-1. The ability of the fire support system to place effective fires on a target depends, in part, on the method of fire and type of ammunition selected to attack the target. Maximum effect can be achieved through accurate initial and massed fires that surprise and shock the enemy.

ACCURATE INITIAL FIRES

A-2. Mortar elements strive for first-round fire for effect. Although not always possible, first-round fire for effect is the goal of fire support planning. First-round fire for effect principals require accurate—

- Firing unit location.
- Location, description, and size of the target.
- Weapon and ammunition information.
- Meteorological information.
- Computational procedures.

MASSED FIRE AND TIME-ON-TARGET FIRE

A-3. Massed fire is fire from many weapons directed at a single point or small area. Massing all available fires enables the mortar unit to inflict maximum effect on a target with a minimum expenditure of ammunition.

A-4. Time-on-target fires are a form of massed fires. *Time on target* identifies the actual time at which munitions impact the target (JP 3-09.3). Time-on-target fire reduces a unit's vulnerability to enemy target acquisition devices by providing multiple firing signatures that overload the enemy target acquisition system. It gives an enemy little time to react and seek protection. Time-on-target fire ensures maximum effect in attacking targets that can easily change their protective posture. For example, dismounted enemy in the open can easily become a more difficult target by lying prone, seeking overhead cover, or moving out of the impact area.

A-5. Massed and time-on-target fire a now much more feasible because of the automation of the fire direction process. Automated firing systems and digital communications quickly and accurately provide firing solutions and transmit firing commands and hang times directly to the mortars.

A-6. Artillery units, mortar units, or a combination of the two execute massed fires. It is important that control of all the firing units involved are assigned to a single FDC. If a combination of artillery and mortars are used, the controlling fire support element can execute an At My Command method of control to allow the units to fire with impacts close to the same time.

SECTION II – JOINT MUNITIONS EFFECTIVENESS MANUALS

A-7. The joint technical coordinating group for munitions effectiveness publishes the JMEMs for all surface-to-surface weapons, including mortars. These manuals provide detailed data concerning the expected fraction of casualties to personnel targets or, given the number and type of rounds fired, damage to materiel targets. The data in JMEMs are taken from test firings, actual combat performance, and mathematical modeling.

A-8. The JMEMs are normally classified as confidential. A battalion personnel staff officer can establish the classified document's account with the Air Force to receive these manuals, and an intelligence staff officer can store them when they are not being used.

A-9. It takes time to extract usable attack data from JMEMs. JMEMs are used during training to develop TACSOPs and during deliberate planning, rather than during calls for fire.

A-10. The JMEMs provide effective data for many fuze or shell combinations, target size, personnel posture, fortification, and terrain. They can be used to determine how many rounds to fire during each mission to cause a predetermined amount of enemy casualties. (See table A-1 for general guidance.)

Note. Although users can refer to the JMEMs for more exact guidance on the number of rounds to use for a planned effect, an FO calling the fires determines the actual effect of the fires on a target. The fire direction chief determines how many rounds and fuze settings will be fired for the mission. Considerations are applied to how many rounds are on hand, the resupply rate, priority targets, and other situations.

Table A-1. Ammunition expenditure guide to neutralize platoon-sized targets

Target	*Terrain*	*Target Posture*	*Rounds of High Explosive*		
			60-mm	*81-mm*	*120-mm*
Trucks*	N/A	N/A	28	10	6
Armored**	N/A	N/A	Suppress	45	35
Personnel	Open	Attacking	14	8	4
Personnel	Open	Defending w/o fighting positions	40	10	6
Personnel	Open	Defending w/ fighting positions	60	20	12
Personnel	Forest/Jungle	Attacking	18	25	10
Personnel	Forest/Jungle	Defending w/o fighting positions	60	27	15
Personnel	Forest/Jungle	Defending w/ fighting positions	40	50	25
* Neutralization fire may not totally defeat; be prepared to repeat the fire mission. **Mortar fire cannot destroy armored vehicles, however it forces crews to close hatches and damages the exterior.					
Legend: HE – high explosive, mm – millimeter, N/A – not applicable, w – with, w/o – without					

SECTION III – FUZE SETTINGS

A-11. The position of an enemy determines the fuze setting used. The following are enemy target positions and the fuze setting that are most effective for that position:

- Standing targets. Impact or near-surface burst fuze settings effectively engage exposed enemy troops who are standing. The round explodes on, or near, the ground. Shell fragments travel outward perpendicular to the long axis of the standing target (see figure A-1).

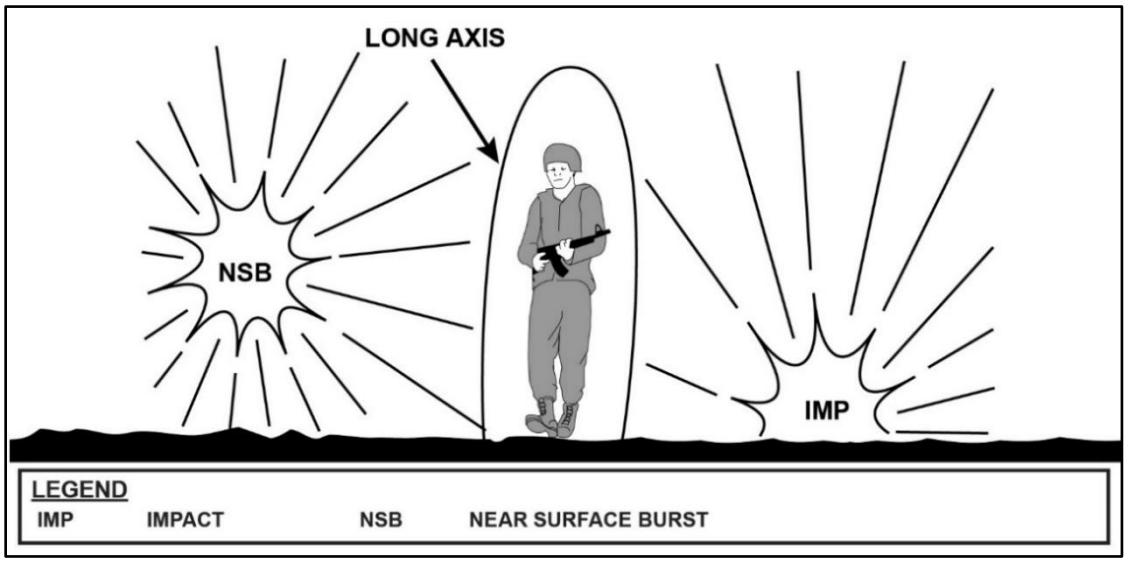


Figure A-1. Standing target effects

- Prone targets. If exposed enemy troops are lying prone, the proximity fuze setting is most effective. The rounds explode above the ground and the fragments coming downward are once again traveling perpendicular to the long axis of the targets (see figure A-2).

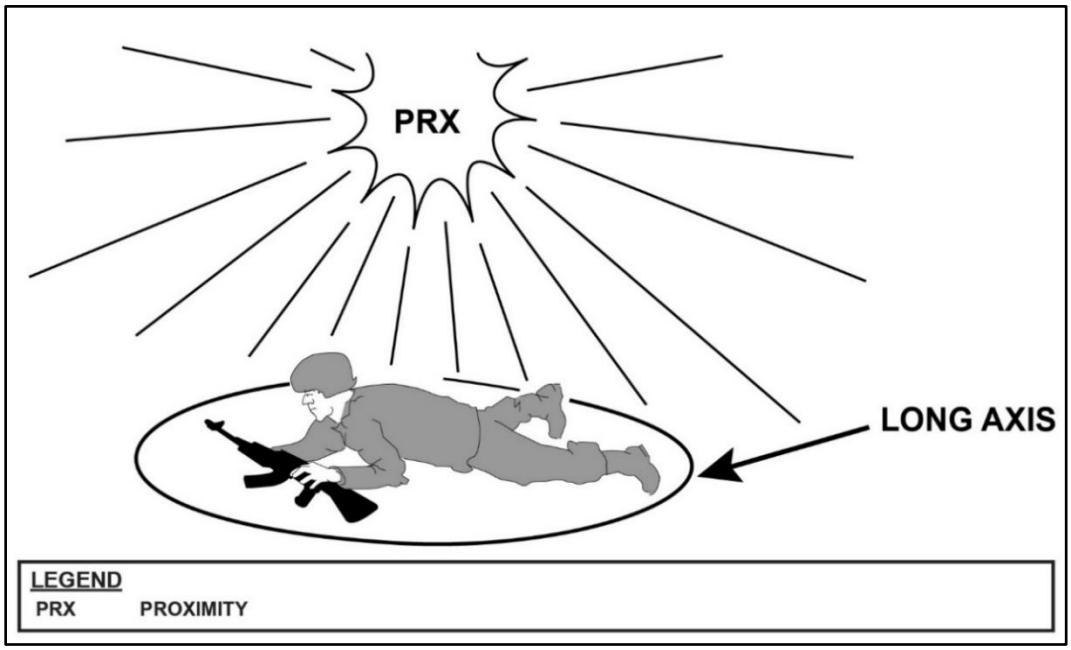


Figure A-2. Prone targets

- Targets in open fighting positions. The proximity fuze setting is the most effective if an enemy is in open fighting positions without overhead cover. However, even proximity settings do not always produce effects if the positions are deep (see figure A-3).

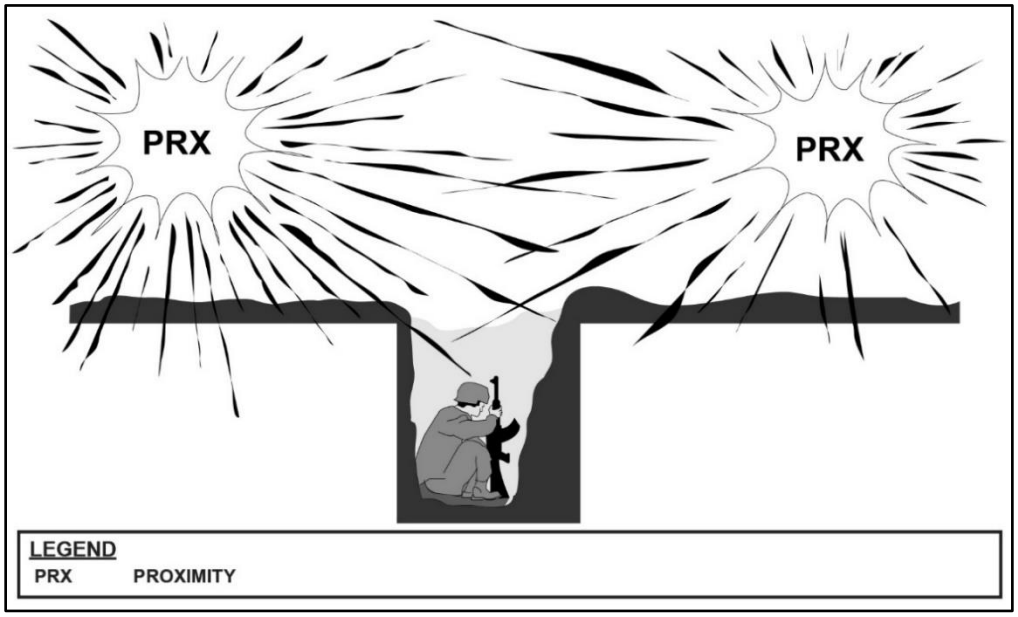


Figure A-3. Targets in open fighting position

- Targets with overhead cover. The delay-fuze setting is most effective when an enemy is below triple-canopy jungle or in fighting positions with overhead cover. Light mortars have little effect against overhead cover; even medium mortars have limited effect. Heavy mortars can destroy a bunker with a hit or a near miss (see figure A-4).

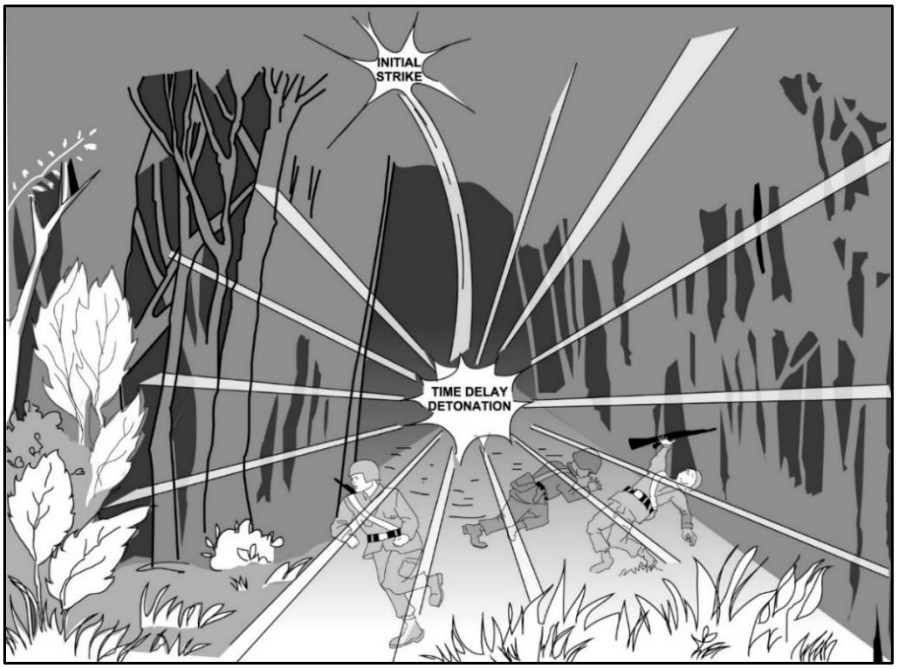


Figure A-4. Target under triple-canopy jungle

SECTION IV – FUZE AND AMMUNITION COMBINATIONS

A-12. Mortar leaders and fire direction control personnel must understand what combinations of fuzes and ammunition have the greatest effects on targets. Mortar leaders advise the maneuver commander and FSO how best to attack a target with mortar rounds.

PLANNING CONSIDERATIONS

A-13. The following guidelines are useful during the planning of mortar fires. As the battle progresses, the actual results are reviewed and the guidelines are modified, as needed.

ENEMY

A-14. Considerations for enemy positions are as follows:

- If an enemy is unwarned and standing in the open, fire one impact-fuzed HE round from each mortar. Then fire the following rounds as proximity-fuzed.
- If an enemy is prone or crouching in open fighting positions, fire all rounds as proximity-fuzed.
- If an enemy's status is unknown, fire all proximity-fuzed rounds.

A-15. Considerations for enemy locations are as follows:

- If an enemy is in bunkers, fire half the rounds with point-detonating fuzing and half with delay fuzing.
- Do not depend on light or medium mortar fires to damage heavy bunkers or buildings.
- Expect heavy mortar fire to destroy some heavy bunkers and damage others, but expect to fire large amounts of ammunition.

TERRAIN

A-16. Considerations for the type of ground are as follows:

- If the ground in the target area is soft, swampy, or covered in deep snow, fire proximity-fuzed or near-surface burst rounds.
- On rocky and hard soil, fire a 50-percent mixture of proximity-fuzed and impact-fuzed rounds.
- If soil type is unknown, fire all proximity-fuzed rounds.

A-17. Considerations for the type of vegetation are as follows:

- If the target is within forest, fire point-detonating fuzes for all rounds.
- In extremely dense forest or jungle, fire point-detonating fuzes mixed with 50-percent delay fuzes.

VEHICLES

A-18. Normally, mortar fires by themselves are not effective against vehicles, especially armored vehicles, but they can be most effective when combined with direct fires of antitank weapons. Mortar fires force the armored vehicle crewmen to close hatches, reducing visibility and preventing them from firing the heavy machine guns mounted outside the vehicle. This allows dismounted Infantry to use antiarmor weapons. Mortar fire channels enemy vehicles into prepared engagement areas and antiarmor kill zones.

A-19. Field artillery, close air support, and close combat attack are generally more effective against moving tracked vehicles. The 120-mm heavy mortar has a moderate capability against wheeled and tracked mechanized Infantry vehicles. Mortar fragments from smaller mortars can damage exterior components of lightly armored vehicles, antitank guided missile launchers, or self-propelled antiaircraft guns, reducing effectiveness. Firepower or mobility kills are difficult to achieve without expending large amounts of mortar ammunition.

Note. Resupply rates and capabilities have a major deciding factor when engaging with any mortar system at a target that consumes high amounts of ammunition.

A-20. Against heavily armored moving vehicles, such as tanks or tracked mechanized Infantry fighting vehicles, mortar fires, at best, force the crew to close their hatches. Against stationary tanks or tracked mechanized Infantry fighting vehicles, bursting phosphorus rounds from medium and heavy mortars can be effective. These rounds must make almost a direct hit on the target to cause any damage. Mortar fire, however, may damage or destroy weapons sighting and communications systems.

A-21. Point-detonating rounds are the most effective against trucks. Their low-angle fragments do the most damage to tires, wheels, and engines. Bursting phosphorus rounds are effective if mixed with HE rounds.

HIGH-EXPLOSIVE FIRES

A-22. When mortar rounds impact, they throw fragments in a pattern that is not truly circular and may even be irregular, based on their angle of fall, slope of the terrain, and type of soil. However, for planning purposes, each mortar HE round is considered to have a circular lethal bursting area. (See figure A-5 for a scale representation of the lethal bursting areas of mortar rounds.)

Note. Because newer ammunition has greater lethality, the effects of HE fires discussed below are approximations and for planning purposes only.

A-23. Images shown in figure A-5 can be used to develop the mortar ammunition required supply rate. Planners determine the size of the target or objective area, and then divide the lethal areas of the mortar round into this image to determine the number of rounds needed to cover the target with lethal fragments. This gives an idea of the least number of rounds needed to cover the target area once. JMEM data can be used to refine this number and to estimate the total number of rounds required.

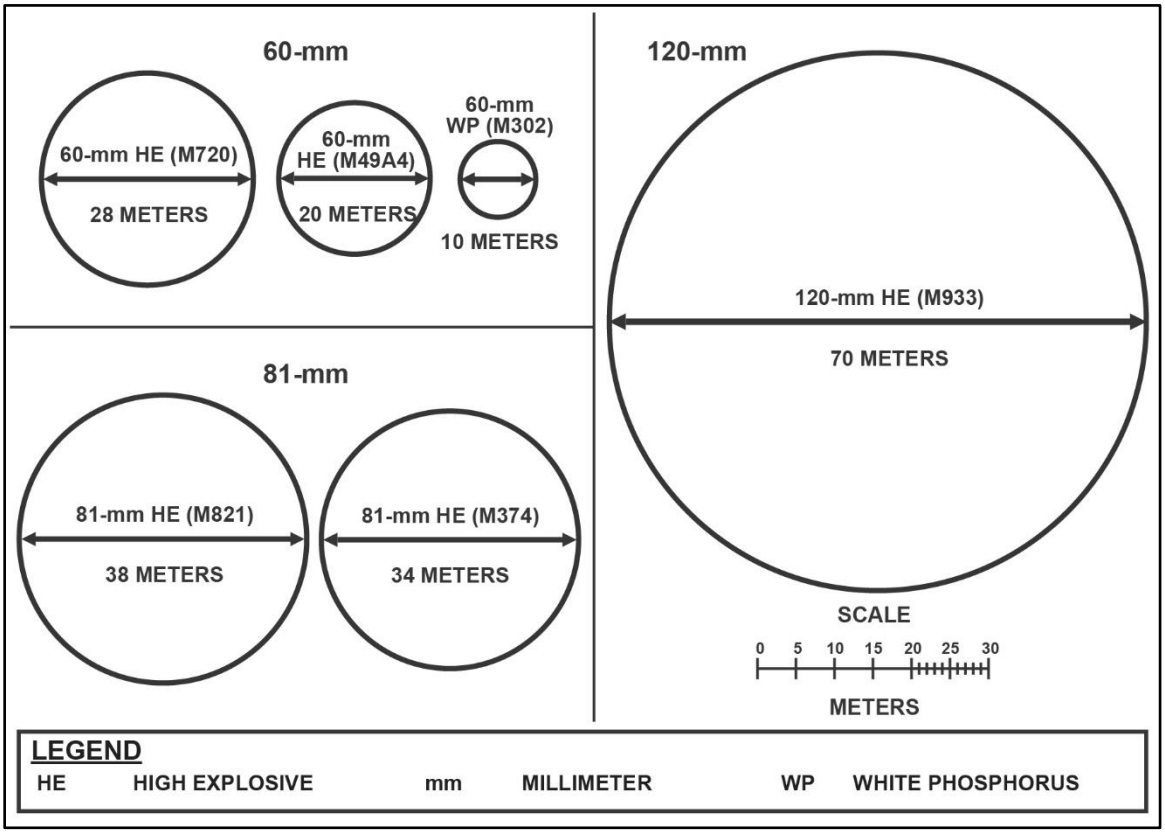


Figure A-5. Comparison of average lethal bursting areas for United States mortar rounds

A-24. Impact-fuzed rounds are normally the best for adjusting fire. If dense foliage prevents observation of the impact-fuzed round, near-surface burst or proximity settings will cause the round to explode near the top of the trees where the burst can be better observed. If there is a combination of snow cover and fog in the target area, making adjusting rounds difficult to see, the delay setting can be used for adjustments. This causes a plume of dirt or exposes the earth at the point of impact. The dark soil contrasts with the fog and snow, making adjustment easier.

Note. When adjusting fire within danger close of friendly Soldiers, fuzes are set to delay to reduce the amount of shrapnel.

EFFECTS OF TERRAIN ON HIGH-EXPLOSIVE ROUNDS

A-25. HE fires are the most common for destruction, neutralization, and suppression. Most mortar HE rounds can be fired with the M734 series multioption fuze. This fuze enables HE rounds to detonate above the target surface, on the target surface, or after a short delay. Older ammunition that cannot use the multioption fuze uses single- or dual-option fuzes to achieve almost the same effects. These effects vary depending on the ground, target, and mortar size.

A-26. Soft ground limits the effectiveness of surface-burst HE rounds for light, medium, and heavy mortars (light mortars being limited the most). One foot of soft ground, mud, or sand, or 3 feet of snow can reduce the effectiveness of surface-burst HE rounds by up to 80 percent. Light mortar rounds can land close (within a few yards) to a target on this type ground and still have no effect.

A-27. Hard, rocky soil and gravel increase the effectiveness of surface-burst HE rounds. Rock fragments are picked up and thrown by the blast, adding to an enemy's casualties (heavy mortars throw the most rock fragments).

A-28. Dense woods cause impact-fuzed HE rounds to detonate in trees, producing airbursts. These airbursts can be dangerous to exposed troops since large wood splinters are added to the round's metal fragments. Wounds caused by large wooden splinters are often severe. Extremely dense woods, such as triple canopy jungle, cause most impact-fuzed HE rounds to detonate high in trees without much of an effect at ground level.

EFFECTS OF COVER ON HIGH-EXPLOSIVE ROUNDS

A-29. Enemy forces are normally standing or prone. They may be in the open or protected by varying degrees of cover. Each of these changes target effects of mortar fire.

A-30. Surprise mortar fire is always more effective than fire against an enemy that is warned and seeks cover. Recent studies have shown that a high-casualty rate can be achieved with only two rounds against an enemy platoon standing in the open. The same studies required 10 to 15 rounds to duplicate the casualty rate when a platoon was warned by adjusting rounds and sought cover. If enemy soldiers merely lay prone, they significantly reduce the effects of mortar fire. Mortar fire against standing enemy forces is almost twice as effective as fire against prone targets.

A-31. Proximity burst is usually more effective than surface-burst rounds against targets in the open. The effectiveness of mortar fire against a prone enemy is increased by about 40 percent by firing proximity-fuzed rounds rather than surface-burst rounds. The steeper the angle of the fall of the round, the more effective it is.

A-32. If an enemy is in open fighting positions without overhead cover, proximity-fuzed mortar rounds are about five times as effective as impact-fuzed rounds. When fired against troops in open fighting positions, proximity-fuzed rounds are only 10 percent as effective as they would be against an enemy in the open. For the greatest effectiveness against troops in open fighting positions, the charge with the lowest angle of fall is chosen. It produces almost two times as much effect as the same round falling with the steepest angle.

A-33. If an enemy has prepared fighting positions with overhead cover, only impact-fuzed and delay-fuzed rounds have much effect. Proximity-fuzed rounds can restrict the enemy's ability to move from position to position, but they cause few, if any, casualties. Impact-fuzed rounds cause some blast and suppressive effects. Delay-fuzed rounds can penetrate and destroy a position but must achieve a direct hit. Only a 120-mm mortar with a delay-fuze setting can damage a heavily constructed bunker.

EFFECTS OF TERRAIN ON PROXIMITY-FUZED HIGH EXPLOSIVE ROUNDS

A-34. A proximity fuze functions best over open, firm soil. Figure A-6 is an example of a proximity-fuzed HE round detonating over open terrain. Snow or sand can cause it to function low or on impact. Water or frozen ground can cause it to function early. If proximity set, multioption-fuzed rounds are functioning high, they can still be effective. The height of burst can be reduced by using the near-surface burst setting on the fuze. It cannot be increased, except by choosing the steepest angle of fall possible.



Figure A-6. 120-mm proximity-fuzed high explosive detonating over open terrain

A-35. Proximity-fuzed rounds fired over built-up areas can detonate if they pass close by the side of a large building. They can function too high to be effective at street level. Impact fuzes are the most effective in heavily built-up areas.

A-36. In dense jungle or forest, proximity fuzes detonate too early and have little effect. Impact fuzes achieve airbursts in dense forests, and delay fuzes allow rounds to penetrate beneath the heavy canopy before exploding.

Note. Refer to TC 3-22.90 for more information on the M734 multioption fuze.

SUPPRESSIVE EFFECTS OF HIGH EXPLOSIVE MORTAR MUNITIONS

A-37. Suppression from mortar fire is not as easy to measure as the target effect. Suppression is an effect produced in the mind of an enemy that prevents them from returning fire or maneuvering. Inexperienced or surprised enemy troops are more easily suppressed than experienced, warned enemy troops. Enemy troops in the open are much more easily suppressed than those with overhead cover. Suppression is most effective when mortar fires first begin; as they continue, the suppressive effects lessen. HE rounds are the most suppressive, but bursting white phosphorus mixed with HE has a great psychological effect on the enemy. Figure A-7 shows suppressive effects derived from live-fire studies and combat observations.

A-38. For example, if a—

- 60-mm mortar round lands within 20 meters of a target, the target will probably be suppressed, if not hit.
- 60-mm mortar round lands within 35 meters of a target, there is a 50-percent chance it will be suppressed. Beyond 50 meters, little suppression takes place.
- 81-mm mortar round lands within 30 meters of a target, the target will probably be suppressed, if not hit.
- 81-mm mortar round lands within 75 meters of a target, there is a 50-percent chance that the target will be suppressed. Beyond 125 meters, little suppression takes place.
- Heavy mortar round (proximity-fuzed) lands within 65 meters of a target, the target will probably be suppressed, if not hit.
- Heavy mortar round (proximity-fuzed) lands within 125 meters of a target, there is a 50-percent chance the target will be suppressed. Beyond 200 meters, little suppression takes place.

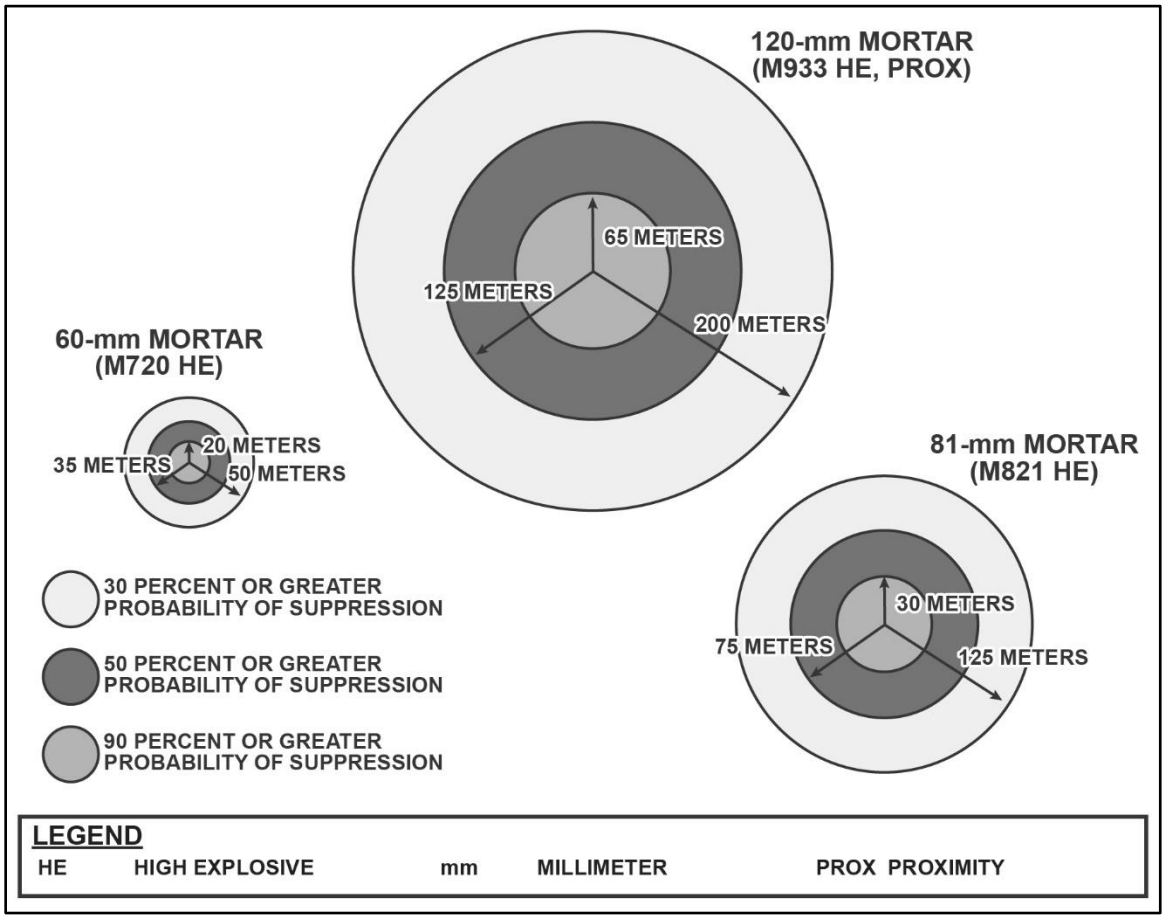


Figure A-7. Suppressive effects of common United States mortar munitions

Note. The information stated above is based off commonly used munitions. This is general information with effects, and distance may change with different nomenclature of cartridge fired.

SECTION V – MORTAR SMOKE OPERATIONS

A-39. Smoke missions are important functions for mortar platoons or sections. Atmospheric stability, wind velocity, and wind direction are the most important factors when planning target effects for smoke mortar rounds. The terrain in a target area affects smoke rounds.

Note. All mortar systems only have phosphorus munitions to conduct smoke missions. Mission and Operational Variables need to be considered before employment of mortar smoke missions.

EMPLOYMENT OF SMOKE

A-40. Smoke can significantly reduce an enemy's effectiveness both in daytime and at night. Smoke reduces the ability of an enemy to deliver effective fires, conduct operations, and observe friendly units. Smoke reduces the effectiveness of laser beams and inhibits electro-optical systems.

TYPES OF MISSIONS

A-41. Smoke missions that mortar units conduct are—

- Immediate. The primary requirement for an immediate smoke mission is speed. When engaging a planned target or a target of opportunity that has taken friendly forces under fire, units can call for immediate smoke. Response is more important than accuracy, and the delivery of fires is performed as quickly as possible. Immediate smoke missions are not intended as screening missions. The purpose of immediate smoke is to obscure an enemy's vision for short periods so that maneuver elements can break contact or evade enemy direct fire.
- Quick. A quick smoke mission is preplanned and requires a substantial amount of ammunition. The objective of quick smoke is to obscure an enemy's vision or to screen maneuver elements. An effective quick smoke mission typically takes more ammunition than most mortar elements carry on hand known as a combat load. (See TC 3-22.91 for more information.) A quick smoke mission is normally conducted in three phases:
  - Adjustment. Conducted with HE munitions and confirmed with phosphorus before establishment.
  - Establishment. No less than a total of 12 rounds fired to establish.
  - Maintenance. Will be determined based on weather conditions, area to be screened, and for how long to be screened.

APPLICATIONS

A-42. Smoke has obscuration, screening, deception, and signaling and marking applications on the battlefield.

Obscuration

A-43. Obscuration smoke is employed on or against an enemy to degrade vision both within and beyond their location. Red phosphorus smoke is more effective at degrading enemy weapons using thermal sights. Smoke delivered on an enemy antitank guided missile position can prevent the system from acquiring or subsequently tracking targets, thereby reducing its effectiveness.

A-44. Employment of obscuration smoke on an attacking armored force can cause it to vary its speed, inadvertently change its axis of advance, deploy prematurely, and force it to rely on less effective nonvisual means of control. (See TC 3-22.91 for more information.)

Screening

A-45. Screening smoke is employed in friendly operational areas or in areas between friendly and enemy forces to degrade enemy ground and aerial observation and to defeat or degrade enemy vision systems. Screening smoke from mortars is used to conceal friendly ground maneuver, breaching, and recovery operations.

Deception

A-46. Deception smoke is employed to create the illusion that a tactically significant event is occurring to confuse or mislead the enemy. Deceptive smoke from mortars can be used in river crossings, withdrawals, and air assault operations.

Signaling and Marking

A-47. Signaling and marking smoke missions are used to relay prearranged communications on the battlefield and to enemy locations. Occasionally, phosphorus mortar rounds can be used to signal the end of a preparation on a target and the beginning of an assault. When using mortar smoke munitions, consider using ground burst illumination to reduce damage to terrain, equipment, civil and other considerations.

PLANNING CONSIDERATIONS

A-48. All U.S. mortar smoke rounds are filled with either white phosphorus or red phosphorus. The bursting white phosphorus or red phosphorus round provides a screening, incendiary, marking, and casualty-producing effect. They both produce localized, instantaneous smoke clouds by scattering burning phosphorous particles. Red phosphorous reduces the effectiveness of thermal sights. Smoke is used to—

- Deny an enemy information by screening or obscuration.
- Reduce effectiveness of enemy target acquisition systems.
- Restrict nap-of-the-earth and contour approaches for enemy aircraft.
- Disrupt an enemy's movement, operations, and ability to control its forces.
- Deceive an enemy as to the intent of friendly forces.

Note. Technical information regarding ammunition and the employment of smoke is contained in applicable mortar technical manuals and training circulars.

A-49. A bursting smoke round can be used to produce casualties between exposed enemy troops and to start fires. The casualty-producing radius of the smoke round is much less than that of the HE round. Generally, more casualties can be produced by firing HE ammunition than by firing white phosphorus or red phosphorus. However, the burst of a smoke round causes a significant psychological effect, especially when used against exposed troops. A few smoke rounds mixed into a fire mission of HE rounds may increase the suppressive effect of the fire.

A-50. Although there has been confusion between leaders, it is not a violation of FM 6-27 to use white phosphorus ammunition against an enemy as long as all normal considerations for using lethal military force are met. White phosphorous rounds, or any mortar round, are not used in such a manner as to cause unnecessary pain and suffering against inappropriate targets or under inappropriate circumstances.

A-51. White phosphorous rounds can be used to mark targets, especially for attack by aircraft. Base-ejecting smoke rounds, such as the 81-mm M819 red phosphorus smoke round, produce a dispersed smoke cloud that is too indistinct for marking targets.

TACTICAL CONSIDERATIONS

A-52. Normally, a commander makes the decision of when to fire smoke missions. The following tactical factors are considered when employing smoke:

- Effects of smoke on adjacent friendly units.

- Effects of smoke on friendly supporting fires.
- Time required to fire the mission.
- Observation required to conduct the smoke mission.
- Size of the area to be obscured.
- Characteristics of ammunition fuzes.
- Availability of ammunition.
- Time length of desired obscuration.
- Capability of resupply.
- Desirability of dual effect of obscuring and producing casualties.
- Closure rates of moving vehicles (see table A-2).

Table A-2. Rates of closure (in minutes)

Distance Travelled (Meters)	*Vehicle Speed (Kilometers per Hour)*					
	5	**10**	**15**	**20**	**25**	**30**
3000	36	18	12	9	7.2	6
2500	30	15	10	7.5	6	5
2000	24	12	8	6	4.8	4
1500	18	9	6	4.5	3.6	3
1000	12	6	4	4	2.4	2

A-53. Obtaining the best combination of smoke effects at the right time requires knowledge of a given type of round. Once the type of smoke to use is decided, the number of rounds required to build and maintain the smoke can be calculated.

A-54. If HE and smoke are to be mixed, it may be desirable to use two separate sources to deliver the rounds. For example, one section of battalion mortars provides obscuration, and the company mortars provide HE. This can increase the effect of the mission and can reduce the problems of FOs who are adjusting both types of rounds on one radio net. Detailed coordination is required for this type mission.

A-55. Normally, a mortar unit carries only a limited number of smoke rounds. This number and the capability of the load must be made known to commanders. Special requests for smoke or changes in smoke round allowances can be made, but they must be prepared in advance and submitted before the required mission.

WEATHER AND GROUND CONSIDERATIONS

A-56. Weather and ground are major considerations for the employment of smoke. Weather determines the effectiveness of smoke missions, the placement of rounds, and storage requirements. (See TC 3-22-91 for more information.) Ground conditions are also critical for mission effectiveness: wind, temperature, and atmospheric stability.

A-57. The effects of weather and ground conditions on smoke missions are as follows:

- Wind. Wind speed and direction are critical factors for smoke missions. The higher the wind velocity, the more effective bursting phosphorous rounds are and the less effective burning smoke rounds from field artillery become. Ideal wind conditions are when the direction is across the target and wind speed is between 5 and 15 knots.
- Temperature. All bulk-filled white phosphorus or red phosphorus ammunition needs special care when temperatures are high. A phosphorous filler liquefies at temperatures of 100 degrees Fahrenheit. Since phosphorous does not fill all the space in the cartridge, the result is a hollow space in the upper part of the cartridge filler cavity. This causes the round to be unbalanced and, therefore, unstable in flight. White phosphorous ammunition is protected from direct sunlight, if possible. When stored at high temperatures, it is stacked with the fuze up. Keeping the phosphorous ammunition under cover, digging ammunition bunkers, opening only as many rounds as needed, maintaining proper storage, and monitoring the ambient temperature reduce the chances of firing unstable ammunition. In extremely high temperatures, phosphorous ammunition is fired

only if taken directly from vertical storage. This does not apply to the M252A1 mortar's base-ejecting red phosphorus smoke rounds. They do not require special storage.

- Atmospheric stability. The effects of atmospheric stability can determine whether mortar smoke is effective. If effective, how much ammunition will be needed due to the stability situation of the atmosphere. These determinations are as follows:
  - During unstable conditions, mortar smoke rounds are almost ineffective. The smoke does not spread but often climbs straight up and quickly dissipates.
  - Under moderately unstable atmospheric conditions, base-ejecting smoke rounds are more effective than bursting white phosphorus rounds. An M819 red phosphorus smoke round is the only base-ejecting smoke round currently in inventory and has a screening effect of over 2½ minutes.
  - Under stable conditions, both red phosphorus and white phosphorus rounds are effective. The higher the humidity, the better the screening effects of mortar rounds.
  - An M819 red phosphorus smoke round loses up to 35 percent of its screening ability if the ground in the target area is covered with water or deep snow. During extremely cold and dry conditions over snow, up to four times the number of smoke rounds may be needed than expected to create an adequate screen. The higher the wind velocity, the more effective bursting white phosphorus rounds are and the less effective burning smoke rounds become.

GROUND CONDITIONS

A-58. If the terrain in a target area is swampy, rain-soaked, or snow-covered, then burning smoke rounds may not be effective. These rounds produce smoke by ejecting felt wedges soaked in red phosphorus. These wedges then burn on the ground, producing a dense, long-lasting cloud. If the wedges fall into mud, water, or snow, they can be extinguished.

A-59. Shallow water can reduce the smoke produced by these rounds by as much as 50 percent. The terrain in the target area affects bursting phosphorous rounds very little, except that deep snow and cold temperatures can reduce the smoke cloud by about 25 percent. Although bursting phosphorus rounds are not designed to cause casualties, the fragments of the shell casing and bits of burning phosphorus can cause injuries.

AMMUNITION

A-60. Smoke missions require many rounds to establish and maintain the effect. For a planned mission, leaders calculate the number of rounds required and request them well in advance. They may be loaded on vehicles, if available, or pre-positioned at the firing point.

SMOKE IN SUPPORT OF OFFENSIVE OPERATIONS

A-61. Specific ways that smoke can be used in offensive operations are as follows:

- Blind enemy observers/gunners. This technique is effective when conducting a movement to contact or when enemy contact is likely. Mortars can fire smoke directly on all suspected or known enemy observer or gunner positions. They can also fire smoke between known or suspected enemy observer or gunner positions and the supported unit. The smoke cloud must be maintained until the attacking unit reaches its objective or passes the danger area.
- Screen an attack. This technique covers a unit while moving forward in an attack. A smoke screen to the attacking unit's front conceals maneuver. Ideally, the screen is maintained continuously along the axis of advance. It is terminated for mounted forces about 500 to 800 meters short of the objective to allow for maximum visibility during the final assault. For dismounted forces, this distance is about 100 to 200 meters. By using this technique, a unit can move behind smoke without being effectively engaged. If necessary, the flanks or rear of the supported unit can also be screened.
- Conceal a bypass. The two ways to conceal a bypass are—

  - Screen the bypassing unit while it is moving around the enemy. A smoke cloud is fired in front, to the left, or to the right of the enemy position. When the smoke is in position, the bypassing unit moves around the screened flank towards its objective.
  - Make an enemy believe it is the object of an attack by firing smoke and HEs directly on its position. With the smoke cloud in place, the bypassing unit moves around the enemy to its objective.
- Cover a breaching operation. This technique is employed by mortars (and/or artillery) generating two smoke clouds at the same time. One cloud is fired directly on an enemy. The other is fired between an enemy position and a breaching force. Continuous smoke is maintained in both areas because obstacles are normally covered by direct and indirect fires.
- Obscure vehicles from enemy direct fire gunners. This technique is used to degrade the capability of enemy antitank guided missile gunners. Once a vehicle commander realizes that the vehicle is being engaged by enemy missiles, the vehicle commander employs vehicle smoke or smoke hand grenades and directs the driver to take evasive action. To further degrade the enemy gunner's vision, mortar smoke is also requested. Mortar smoke can be fired on enemy gunners or between them and friendly vehicles. This prevents enemy gunners from tracking vehicles and guiding missiles to the vehicles.

SMOKE IN SUPPORT OF DEFENSIVE OPERATIONS

A-62. Specific ways that mortar smoke can be used in support of defensive and retrograde operations are—

- Force enemy infantry to dismount from vehicles. Ideally, this technique employs mortar and artillery smoke, HE ammunition, and the family of scatterable mines or chemicals together. Smoke is fired to the front of an attacker and may force an enemy to dismount. The smoke is fired beyond the range of direct fire weapons to give friendly forces more time to engage targets. The family of scatterable mines (if available) and HE are then fired into the smoke.
- Slow the advance of attacking forces. This technique causes an attacker to reduce speed, slowing the momentum of the attack. It is employed by firing smoke across the front of an advancing enemy. HE rounds are also fired with smoke to make an enemy close the hatches of the tanks and personnel carriers. Vehicles are also silhouetted as they emerge from the smoke, making them easier to track and destroy.
- Separate and isolate attacking echelons. This technique is employed by firing smoke between two echelons of an attacking enemy force. The smoke visually separates the two echelons and prevents the second echelon from seeing and supporting the first when it is engaged. The second echelon is also slowed by the smoke. This gives a defender more time to fire at targets in the first echelon without being engaged by the enemy in the second. It also provides a defender with silhouetted targets as the second echelon emerges from the smoke.
- Cover displacement. This technique fires smoke in front of a defensive position for a supported unit to move without being observed. When the initial smoke screen begins to dissipate, more smoke is fired between an enemy and a displacing unit. Smoke is also fired on suspected enemy locations and routes.
- Expose enemy helicopters. This technique makes enemy helicopters vulnerable to air defense systems because smoke forces them to fly at higher altitudes. It may occur as a result of mortar smoke that has already been employed in fighting enemy ground forces. In addition, smoke can be employed in a specific location, such as a flank, to prevent enemy helicopters from attacking undetected by flying nap-of-the-earth. When helicopters fly above the smoke to engage targets, they are engaged by air defense weapons.

SECTION VI – ILLUMINATION

A-63. Illumination rounds disclose enemy formations, signal, or mark targets. All U.S. mortars have both visible and infrared illumination rounds. Infrared light illumination is used in conjunction with personnel equipped with NVDs.

MORTAR ILLUMINATION ROUND OPERATIONS

A-64. In the offense, visible illuminating rounds are planned to burst above the objective to put enemy troops in the light. If illumination is behind the objective, enemy troops could be in shadows rather than light. In the defense, illumination can be planned to burst behind friendly troops to put them in shadows and place enemy troops in light. Buildings reduce the effectiveness of illumination, but continuous illumination requires close coordination between the FO and fire direction control personnel to produce the proper effect by bringing illumination over defensive positions as enemy troops approach buildings.

A-65. Infrared illuminating rounds are used in the same manner as visible-light illuminating rounds. When employing infrared illumination, leaders and FOs consider whether an enemy has NVDs. Figure A-8 shows a demonstration of illumination fire during urban operations.

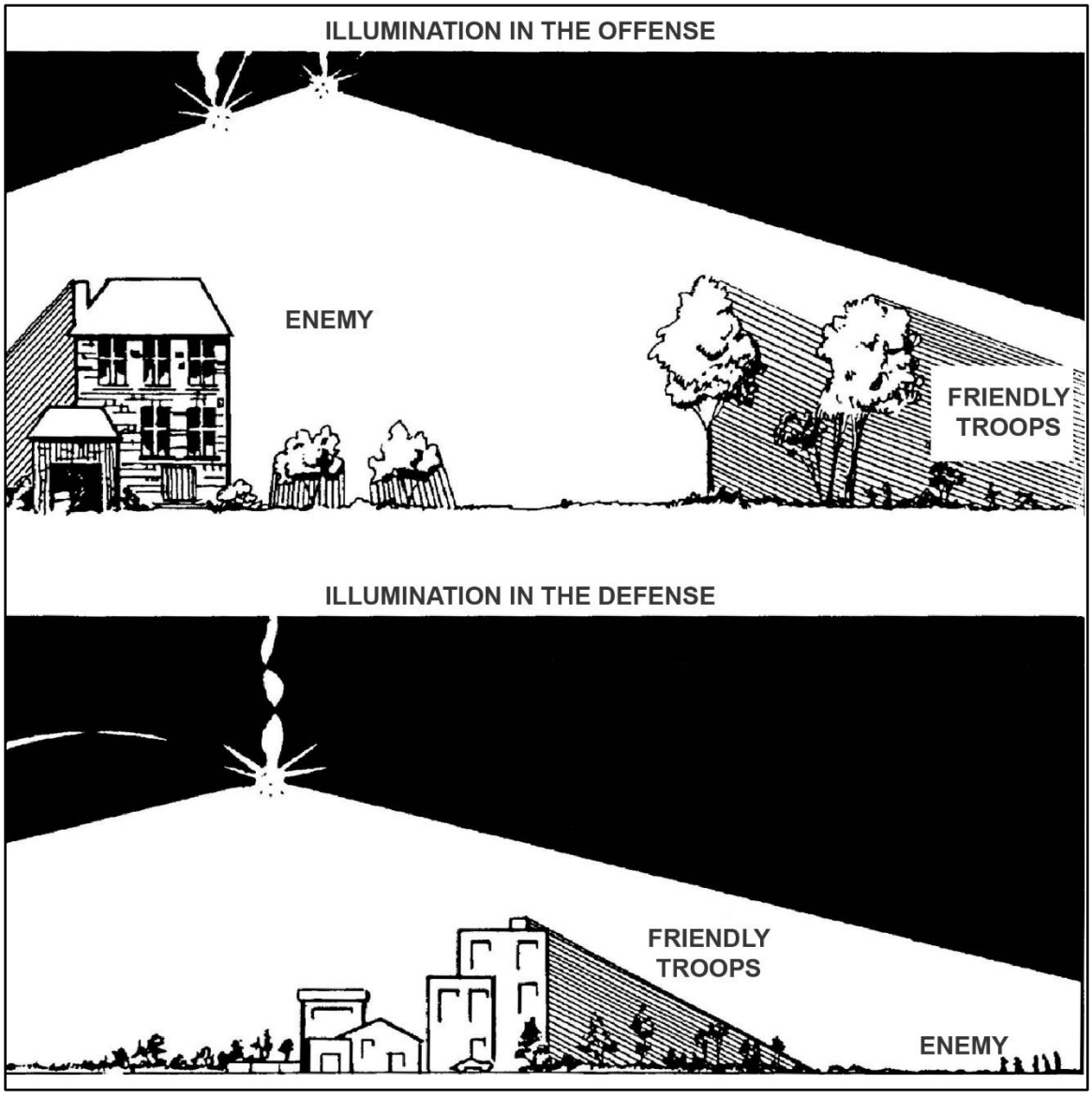


Figure A-8. Illumination employment

MORTAR ILLUMINATION ROUND CHARACTERISTICS

A-66. U.S. mortar illumination rounds provide excellent illumination during limited visibility operations. The period of visible and infrared illumination lasts from 30–40 seconds for the light mortar to about 1 minute for the medium and heavy mortars. The light mortar illumination round provides 250,000 candlepower and the heavy mortar illumination round provides about 1 million candlepower. (See TC 3-22.90 and TC 3-22.91 for more information.)

A-67. The 60-mm illumination round does not provide the same degree of illumination as the rounds of the heavier mortars and field artillery. However, it is sufficient for local point illumination. The small size of the round can be an advantage when illumination is desired in an area, but adjacent friendly forces do not want to be seen. The 60-mm illumination round can be used without degrading the NVDs of adjacent units.

A-68. To prevent friendly or noncombatant casualties, the point of impact of the illumination canister easting and northing is also considered. This is especially important during stability operations and operations in populated areas in the event of a failure to function.

Glossary

The glossary lists acronyms and terms with Army or joint definitions. Where Army and joint definitions differ, (Army) precedes the definition. Terms and acronyms for which ATP 3-21.90 is the proponent are marked with an asterisk (*). The proponent publication for other terms is listed in parentheses after the definition.

SECTION I – ACRONYMS AND ABBREVIATIONS

ACA	airspace coordination area
ACM	airspace coordinating measure
ABCT	armored brigade combat team
ADP	Army doctrine publication
AO	area of operations
ATP	Army training publication
BCL	battlefield coordination line
BCT	brigade combat team
CBRN	chemical, biological, radiological, and nuclear
CFL	coordinated fire line
CP	command post
DA	Department of the Army
DD	Department of Defense form
DS	direct support
FBCB2	Force XXI Battle Command, brigade and below
FDC	fire direction center
FIST	fire support team
FM	frequency modulation
FO	forward observer
FPF	final protective fire
FRAGORD	fragmentary order
FSCL	fire support coordination line
FSCM	fire support coordination measure
FSO	fire support officer
GPS	Global Positioning System
GS	general support
GTA	graphic training aid
HE	high explosive
HMMWV	high multipurpose wheeled vehicle
IBCT	Infantry brigade combat team
JMEM	Joint Munitions Effectiveness Manual

JP	joint publication
LHMBC	lightweight handheld mortar ballistic computer
MCDP	Marine Corps doctrinal publication
MCRP	Marine Corps reference publication
MCTP	Marine Corps training publication
MCO	Marine Corp order
MCWP	Marine Corps warfighting publication
METT-TC	mission, enemy, terrain and weather, troops and support available, time available, and civil considerations
MFCS	mortar fire control system
MFCS-D	Mortar Fire Control System-Dismounted
mil	milliradian
mm	millimeter
NCO	noncommissioned officer
NFA	no-fire area
NSN	national stock number
NVD	night vision device
OP	observation post
OPCON	operational control
OPORD	operation order
RED	risk estimated distance
RMS6-L	Recoil Mortar System 6-Light
ROE	rules of engagement
RTL	restricted target list
SBCT	Stryker brigade combat team
STANAG	standardization agreement
TACSOP	tactical standard operating procedure
TC	training circular
TLP	troop leading procedures
TM	technical manual
U.S.	United States
USMC	United States Marine Corps
WARNORD	warning order
XO	executive officer

SECTION II – TERMS

administrative movement

A movement in which troops and vehicles are arranged to expedite their movement and conserve time and energy when no enemy ground interference is anticipated. (ADP 3-90)

adversary

A party acknowledged as potentially hostile to a friendly party and against which the use of force may be envisaged. (JP 3-0)

air assault

The movement of friendly assault forces by rotary-wing or tiltrotor aircraft to engage and destroy enemy forces or to seize and hold key terrain. (JP 3-18)

air corridor

A restricted air route of travel specified for use by friendly aircraft and established for the purpose of preventing friendly aircraft from being fired on by friendly forces. (JP 3-52)

air movement

Air transport of units, personnel, supplies, and equipment, including airdrops and air landings. (JP 3-17)

airborne assault

Use of airborne forces to parachute into an objective area to attack and eliminate armed resistance and secure designated objectives. (JP 3-18)

airborne operation

Involving the air movement into an objective area of combat forces and their logistic support for execution of a tactical, operational, or strategic mission. (JP 3-18)

ambush

An attack by fire or other destructive means from concealed positions on a moving or temporarily halted enemy. (FM 3-90-1)

approach march

The advance of a combat unit when direct contact with the enemy is intended. (ADP 3-90)

area defense

A type of defensive operation that concentrates on denying enemy forces access to designated terrain for a specific time rather than destroying the enemy outright. (ADP 3-90)

area security

A type of security operation conducted to protect friendly forces, lines of communications, and activities within a specific area. (ADP 3-90)

assessment

Determination of the progress toward accomplishing a task, creating a condition, or achieving an objective. (JP 3-0)

attach

The placement of units or personnel in an organization where such placement is relatively temporary. (JP 3-0)

attack

A type of offensive operation that destroys or defeats enemy forces, seizes and secures terrain, or both. (ADP 3-90)

block

A tactical mission task that denies the enemy access to an area or prevents their advance in a direction or along an avenue of approach. Block is also an obstacle effect that integrates fire planning and obstacle effort to stop an attacker along a specific avenue of approach or to prevent the attacking force from passing through an engagement area. (FM 3-90-1)

boundary

A line that delineates surface areas for the purpose of facilitating coordination and deconfliction of operations between adjacent units, formations, or areas. (JP 3-0)

bounding overwatch

A movement technique used when contact with enemy forces is expected. The unit moves by bounds. One element is always halted in position to overwatch another element while it moves. The overwatching element is positioned to support the moving unit by fire or fire and movement. (FM 3-90-2)

canalize

(Army) A tactical mission task in which the commander restricts enemy movement to a narrow zone by exploiting terrain coupled with obstacles, fires, or friendly maneuver. See also **tactical mission task**. (FM 3-90-1)

clearance of fires

The process by which the supported commander ensures that fires or their effects will have no unintended consequences on friendly units or the scheme of maneuver. (FM 3-09)

command

The authority that a commander in the armed forces lawfully exercises over subordinates by virtue of rank or assignments. (JP-1)

common operational picture

(Army) A display of relevant information within a commander's area of interest tailored to the user's requirements and based on common data and information shared by more than one command. (ADP 6-0)

control

The regulation of forces and warfighting functions to accomplish the mission in accordance with the command's intent. (ADP 6-0)

coordinated fire line

A line beyond which conventional surface-to-surface direct fire and indirect fire support means may fire at any time within the boundaries of the establishing headquarters, without additional coordination but does not eliminate the responsibility to coordinate the airspace required to conduct the mission. (JP 3-09)

coordinating altitude

An airspace coordinating measure that uses altitude to separate users and as the transition between different airspace control elements. (JP 3-52)

coordination level

A procedural method to separate fixed- and rotary-wing aircraft by determining an altitude below which fixed-wing aircraft normally do not fly. (JP 3-52)

cordon and search

A technique of conducting a movement to contact that involves isolating a target area and searching suspected locations within that target area to capture or destroy possible enemy forces and contraband. (FM 3-90-1)

counterattack

An attack by part or all of a defending force against an enemy attacking force, for such specific purposes as regaining ground lost or cutting off or destroying enemy advance units, and with the general objective of denying to the enemy the attainment of the enemy's purpose in attacking. In sustained defensive actions, it is undertaken to restore the battle position and is directed at limited objectives. (ADP 1-02)

counterpreparation fire

Intensive prearranged fire delivered when the imminence of the enemy attack is discovered. (FM 3-09)

cover

(Army) A type of security operation done independent of the main body to protect them by fighting to gain time while preventing enemy ground observation of and direct fire against the main body. (ADP 3-90)

decisive action

The continuous, simultaneous execution of offensive, defensive, and stability operations or defense support of civil authorities tasks. (ADP 3-0)

defensive operation

An operation to defeat an enemy attack, gain time, economize forces, and develop conditions favorable for offensive or stability operations. (ADP 3-0)

defilade

Protection from hostile observation and fire provided by an obstacle such as a hill, ridge, or bank. (JP 3-09)

delay

When a force under pressure trades space for time by slowing down the enemy's momentum and inflicting maximum damage on enemy forces without becoming decisively engaged. (ADP 3-90)

demonstration

(DOD) 2. In military deception, a show of force in an area where a decision is not sought that is made to deceive an adversary. It is similar to a feint, but no actual contact with the adversary is intended. (JP 3-13.4)

depth

The extension of operations in time, space, or purpose to achieve definitive results. (ADP 3-0)

destruction

In the context of the computed effects of field artillery fires, destruction renders a target out of action permanently or ineffective for a long period of time, producing 30-percent casualties or materiel damage. (FM 3-09)

dismounted march

Movement of troops and equipment mainly by foot, with limited support by vehicles. (FM 3-90-2)

disrupt

A tactical mission task in which a commander integrates direct and indirect fires, terrain, and obstacles to upset an enemy's formation or tempo, interrupt their timetable, or cause enemy forces to commit prematurely or attack in piecemeal fashion. (FM 3-90-1)

encirclement operations

Operations where one force loses its freedom of maneuver because an opposing force is able to isolate it by controlling all ground lines of communications and reinforcement. (ADP 3-90)

enemy

A party identified as hostile against which the use of force is authorized. (ADP 3-0)

execution

The act of putting a plan into action by applying combat power to accomplish the mission and adjusting operations based on changes in the situation. (ADP 5-0)

exploitation

A type of offensive operation that usually follows a successful attack and is designed to disorganize the enemy in depth. See also **attack**. (ADP 3-90)

feint

In military deception, an offensive action involving contact with the adversary conducted for the purpose of deceiving the adversary as to the location and/or time of the actual main offensive action. (JP 3-13.4)

final protective fire

An immediately available prearranged barrier of fire designed to impede enemy movement across defensive lines or areas. (JP 3-09.3)

fire support area

An appropriate maneuver area assigned to fire support ships by the naval force commander from which they can deliver gunfire support to an amphibious operation. (JP 3-09)

fire support coordination line

A fire support coordination established by the land or amphibious force commander to support common objectives within an area of operation, beyond which all fires must be coordinated with affected commanders prior to engagement and, short of the line, all fires must be coordinated with the establishing commander prior to engagement. (JP 3-09)

fire support station

An exact location at sea within a fire support area from which a fire support ship delivers fires. (JP 3-02)

fix

A tactical mission task where a commander prevents the enemy from moving any part of their force from a specific location for a specific period. Fix is also an obstacle effect that focuses fire planning and obstacle effort to slow an attacker's movement within a specified area, normally an engagement area. See also **block, disrupt, tactical mission task, turn**. (FM 3-90-1)

fixing force

A force designated to supplement the striking force by preventing the enemy from moving from a specific area for a specific time. (ADP 3-90)

flexibility

The employment of a versatile mix of capabilities, formations, and equipment for conducting operations. (ADP 3-0)

fragmentary order

An abbreviated operation order issued as needed to change or modify an order or to execute a branch or sequel. (JP 5-0)

free-fire area

A specific region into which any weapon system may fire without additional coordination with the establishing headquarters. (JP 3-09)

graphic control measure

A symbol used on maps and displays to regulate forces and warfighting functions. (ADP 6-0)

guard

A type of security operation done to protect the main body by fighting to gain time while preventing enemy ground observation of and direct fire against the main body. See **screen**. (ADP 3-90)

hazard

Condition with the potential to cause injury, illness, or death of personnel; damage to or loss of equipment or property; or mission degradation. (JP 3-33)

hybrid threat

The diverse and dynamic combination of regular forces, irregular forces, terrorists, or criminal elements acting in concert to achieve mutually benefitting effects. (ADP 3-0)

isolate

To separate a force from its sources of support in order to reduce its effectiveness and increase its vulnerability to defeat. (ADP 3-0)

kill box

A three-dimensional permissive fire support coordination measure with an associated airspace coordinating measure used to facilitate the integration of fires. (JP 3-09)

local security

The low-level security activities conducted near a unit to prevent surprise by the enemy. (ADP 3-90)

medical evacuation

The timely and effective movement of the wounded, injured, or ill to and between medical treatment facilities on dedicated and properly marked medical platforms with en route care provided by medical personnel. (ATP 4-02.2)

military decision-making process

An iterative planning methodology to understand the situation and mission, develop a course of action, and produce an operation plan or order. See also **operation order**. (ADP 5-0)

mission orders

Directives that emphasize to subordinates the results to be attained, not how they are to achieve them. (ADP 6-0)

mobile defense

A type of defensive operation that concentrates on the destruction or defeat of the enemy through a decisive attack by a striking force. (ADP 3-90)

mounted march

Movement of troops and equipment by combat and tactical vehicles. (FM 3-90-2)

movement to contact

(Army) A type of offensive operation designed to develop the situation and to establish or regain contact. (ADP 3-90)

neutralization

In the context of the computed effects of field artillery fires renders a target ineffective for a short period of time, producing 10-percent casualties or materiel damage. (FM 3-09)

no-fire area

An area designated by the appropriate commander into which fires or their effects are prohibited. (JP 3-09.3)

occupy

A tactical mission task that involves a force moving a friendly force into an area so that it can control that area. Both the force's movement to and occupation of the area occur without enemy opposition. (FM 3-90-1)

offensive operation

An operation to defeat or destroy enemy forces and gain control of terrain, resources, and population centers. (ADP 3-0)

on-call target

A planned target upon which fires or other actions are determined using deliberate targeting and triggered, when detected or located, using dynamic targeting. (JP 3-60)

operational control

The authority to perform those functions of command over subordinate forces involving organizing and employing commands and forces, assigning tasks, designating objectives, and giving the authoritative direction necessary to accomplish the mission. (JP 1)

operational environment

A composite of the conditions, circumstances, and influences that affect the employment of capabilities and bear on the decisions of the commander. (JP 3-0)

operation order

A directive issued by a commander to subordinate commanders for the purpose of effecting the coordinated execution of an operation. (JP 5-0)

passage of lines

An operation in which a force moves forward or rearward through another force's combat positions with the intention of moving into or out of contact with the enemy. (JP 3-18)

phase line

An easily identified feature in the operational area utilized for control and coordination of military operations. (JP 3-09)

planning

The art and science of understanding a situation, envisioning a desired future, and determining effective ways to bring that future about. (ADP 5-0)

preparation

Those activities performed by units and Soldiers to improve their ability to execute an operation. (ADP 5-0)

priority target

A target, based on either time or importance, on which the delivery of fires takes precedence over all the fires for the designated firing unit or element. (FM 3-09)

pursuit

A type of offensive operation designed to catch or cut off a hostile force attempting to escape, with the aim of destroying it. (ADP 3-90)

raid

An operation to temporarily seize an area to secure information, confuse an adversary, capture personnel or equipment, or to destroy a capability culminating in a planned withdrawal. (JP 3-0)

reconnaissance

A mission undertaken to obtain, by visual observation or other detection methods, information about the activities and resources of an enemy or adversary, or to secure data concerning the meteorological, hydrographical, or geographical characteristics of a particular area. (JP 2-0)

relief in place

An operation in which, by the direction of higher authority, all or part of a unit is replaced in an area by the incoming unit and the responsibilities of the replaced elements for the mission and the assigned zone of operations are transferred to the incoming unit. (JP 3-07.3)

restrictive fire area

Locations in which specific restrictions are imposed and into which fires that exceed those restrictions will not be delivered without coordination with the establishing headquarters. (JP 3-09)

restrictive fire line

(DOD) A line established between converging friendly surface forces that prohibits fires or their effects across that line. (FM 3-09)

retirement

When a force out of contact moves away from the enemy. (ADP 3-90)

retrograde

(Army) A type of defensive operation that involves organized movement away from the enemy. (ADP 3-90)

scheduled target

A planned target upon which fires or other actions are scheduled for prosecution at a specified time. (JP 3-60)

screen

A type of security operation that primarily provides early warning to the protected force. See **guard**. (ADP 3-90)

search and attack

A technique for conducting a movement to contact that shares many of the characteristics of an area security mission. (FM 3-90-1)

simultaneity

The execution of related and mutually supporting tasks at the same time across multiple locations and domains. (ADP 3-0)

spoiling attack

A tactical maneuver employed to seriously impair a hostile attack while the enemy is in the process of forming or assembling for an attack. (FM 3-90-1)

stability operation

An operation conducted outside the United States in coordination with other instruments of national power to establish or maintain a secure environment, provide essential government services, emergency infrastructure reconstruction, and humanitarian relief. (ADP 3-0)

striking force

A dedicated counterattack force in a mobile defense constituted with the bulk of available combat power. (ADP 3-90)

sustainment

The provision of logistics, financial management, personnel services, and health service support necessary to maintain operations until successful mission completion. (ADP 4-0)

synchronization

The arrangement of military actions in time, space, and purpose to produce maximum relative combat power at a decisive place and time. (JP 2-0)

tactical mission task

The specific activity performed by a unit while executing a form of tactical operation or form of maneuver. It may be expressed in terms of actions by the friendly force or effects on an enemy force. See **operation order**. (FM 3-90-1)

tactical road march

A rapid movement used to relocate units within an area of operation to prepare for combat operations. (ADP 3-90)

target

An entity or object that performs a function for the threat considered for possible engagement or other action. (JP 3-60)

target of opportunity

A target identified too late, or not selected for action in time, to be included in deliberate targeting that, when detected or located, meets criteria specific to achieving objectives and is processed using dynamic targeting. A target visible to a surface or air sensor or an observer, that is within range of available weapons and against which fire has not been scheduled or requested. (JP 3-60)

tenets of operations

Desirable attributes that should be built into all plans and operations and are directly related to the Army's operational concept. (ADP 1-01)

threat

Any combination of actors, entities, or forces that have the capability and intent to harm U.S. forces, U.S. national interests, or the homeland. (ADP 3-0)

time on target

The actual time at which munitions impact the target. (JP 3-09.3)

troop leading procedure

(Army) A dynamic process used by small-unit leaders to analyze a mission, develop a plan, and prepare for an operation. (ADP 5-0)

turn

A tactical mission task that involves forcing an enemy force from one avenue of approach or mobility corridor to another. A tactical obstacle effect that integrates fire planning and obstacle effort to divert an enemy formation from one avenue of approach to an adjacent avenue of approach or into an engagement area. See also **tactical mission task**. (FM 3-90-1)

unified action

The synchronization, coordination, and/or integration of the activities of governmental and nongovernmental entities with military operations to achieve unity of effort. (JP 1)

unified action partners

Those military forces, governmental and nongovernmental organizations, and elements of the private sector with whom Army forces plan, coordinate, synchronize, and integrate during the conduct of operations. (ADP 3-0)

unified land operations

The simultaneous execution of offense, defense, stability, and defense support of civil authorities across multiple domains to shape operational environments, prevent conflict, prevail in large-scale ground combat, and consolidate gains as part of unified action. (ADP 3-0)

unity of effort

Coordination and cooperation toward common objectives, even if the participants are not necessarily part of the same command or organization, which is the product of successful unified action. (JP 1)

warning order

(DOD) The preliminary notice of an order or action that is to follow. A planning directive that initiates the development and evaluation of military courses of action by a supported commander and requests that the supported commander submit a commander's estimate. (JP 5-0)

withdraw

To disengage from an enemy force and move in a direction away from the enemy. (ADP 3-90)

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