

HEADQUARTERS
DEPARTMENTS OF THE ARMY
AND THE AIR FORCE

FIELD MANUAL 23-90
TECHNICAL ORDER 11W2-5-13-21

MORTARS

DISTRIBUTION RESTRICTION: Approved for public release; distribution is unlimited.

MORTARS

CONTENTS

	Page
PREFACE	ix
 CHAPTER 1. INTRODUCTION	
Section I. General Doctrine	1-1
1-1. Effective Mortar Fire.....	1-1
1-2. Mortar Positions	1-2
Section II. Indirect Fire Team.....	1-2
1-3. Applications	1-2
1-4. Team Mission.....	1-3
Section III. Safety Procedures	1-3
1-5. Duties of the Safety Officer and Supervisory Personnel.....	1-3
1-6. Ammunition Care and Handling	1-9
1-7. Field Storage of Ammunition.....	1-10
 CHAPTER 2. SIGHTING AND FIRE CONTROL EQUIPMENT	
Section I. Compass, M2	2-1
2-1. Characteristics	2-1
2-2. Description	2-2
2-3. Use.....	2-2
Section II. Aiming Circles, M2 and M2A2	2-5
2-4. Characteristics	2-5
2-5. Description	2-5
2-6. Use.....	2-5
2-7. Accessory Equipment.....	2-8
2-8. Setup and Leveling of Aiming Circle	2-9
2-9. Declination Constant.....	2-11
2-10. Orienting of the Instrument on Grid North to Measure Grid Azimuth to Objects	2-14
2-11. Measurement of Horizontal Angle Between Two Points.....	2-14

DISTRIBUTION RESTRICTION: Approved for public release, distribution is unlimited.

*This publication supersedes FM 23-90/TO 11W2-5-13-21, 19 September 1990; and TC 23-18, 24 August 1967.

		Page
	2-12.	Orienting of the 0-3200 Line on a Given Grid Azimuth..... 2-15
	2-13.	Orienting of the 0-3200 Line on a Given Magnetic Azimuth..... 2-16
	2-14.	Verifying the Lay of the Platoon 2-16
	2-15.	Orienting by Orienting Angle..... 2-17
	2-16.	Disassembly of Aiming Circle 2-18
	2-17.	Care and Maintenance..... 2-18
Section	III.	Sightunits 2-19
	2-18.	Sightunit, M53-Series 2-19
	2-19.	Operation of M53 Sightunit 2-21
	2-20.	Care and Maintenance of M53 Sightunit 2-22
	2-21.	Sightunit, M64-Series 2-23
	2-22.	Sightunit, M67 2-26
Section	IV.	Boresights..... 2-27
	2-23.	Boresight, M45-Series..... 2-27
	2-24.	Boresight, M115..... 2-28
	2-25.	Principles of Operation 2-29
	2-26.	Installation..... 2-29
	2-27.	Sight Calibration 2-30
	2-28.	Boresight Method of Calibration 2-30
	2-29.	Calibration for Deflection Using the M2 Aiming Circle 2-32
Section	V.	Other Equipment 2-34
	2-30.	Instrument Light, M53E1 2-34
	2-31.	Aiming Posts, M14 and M1A2 2-36
	2-32.	Aiming Post Lights, M58 and M59..... 2-37
Section	VI.	Laying the Section..... 2-38
	2-33.	Reciprocal Laying 2-39
	2-34.	Reciprocal Laying on a Grid Azimuth 2-40
	2-35.	Reciprocal Laying on a Magnetic Azimuth..... 2-43
	2-36.	Reciprocal Laying Using the Orienting Angle 2-43
	2-37.	Reciprocal Laying Using the Mortar Sights..... 2-43
	2-38.	Reciprocal Laying Using the M2 Compass..... 2-45
	2-39.	Placing Out Aiming Posts 2-45
	2-40.	Alternate Method of Placing Out Aiming Posts 2-46
	2-41.	Correction for Displacement of Sight 2-48
Section	VII.	Loading and Firing..... 2-49
	2-42.	Firing the Mortar..... 2-49
	2-43.	Target Engagement 2-50
	2-44.	Execution of Fire Commands..... 2-50
	2-45.	Arm-and-Hand Signals..... 2-52
	2-46.	Subsequent Fire Commands..... 2-53
	2-47.	Repeating and Correcting of Fire Commands..... 2-54
	2-48.	Reporting of Errors in Firing..... 2-54
	2-49.	Night Firing..... 2-54

		Page
CHAPTER 3. 60-mm MORTAR, M224		
Section	I. Squad and Section Organization and Duties	3-1
	3-1. Organization	3-1
	3-2. Duties	3-1
Section	II. Components	3-1
	3-3. Tabulated Data	3-2
	3-4. Cannon Assembly, M225	3-4
	3-5. Baseplate, M7	3-4
	3-6. Baseplate, M8	3-5
	3-7. Bipod Assembly, M170	3-6
Section	III. Operation	3-7
	3-8. Premount Checks	3-7
	3-9. Mounting of the Mortar	3-7
	3-10. Safety Checks Before Firing	3-8
	3-11. Small Deflection and Elevation Changes	3-9
	3-12. Large Deflection and Elevation Changes	3-9
	3-13. Referring of the Sight and Realignment of Aiming Posts	3-10
	3-14. Malfunctions	3-12
	3-15. Removal of a Misfire	3-12
	3-16. Dismounting and Carrying of the Mortar	3-16
Section	IV. Ammunition	3-17
	3-17. Classification	3-17
	3-18. Color Codes	3-18
	3-19. Preparation of Ammunition	3-19
	3-20. Types of Fuzes	3-19
	3-21. Standard B Ammunition	3-21
	3-22. Care and Handling	3-22
 CHAPTER 4. 81-mm MORTAR, M252		
Section	I. Squad and Section Organization and Duties	4-1
	4-1. Organization	4-1
	4-2. Duties	4-1
Section	II. Components	4-3
	4-3. Tabulated Data	4-4
	4-4. Cannon Assembly, M253	4-5
	4-5. Mount, M177	4-5
	4-6. Baseplate, M3A1	4-6
Section	III. Operation	4-7
	4-7. Premount Checks	4-7
	4-8. Mounting of the Mortar	4-8
	4-9. Safety Checks Before Firing	4-9
	4-10. Small Deflection and Elevation Changes	4-10
	4-11. Large Deflection and Elevation Changes	4-11

		Page
	4-12. Referring of the Sight and Realignment of Aiming Posts Using M64 Sight.....	4-11
	4-13. Malfunctions	4-12
	4-14. Removal of a Misfire	4-12
	4-15. Dismounting of the Mortar.....	4-13
Section	IV. Ammunition	4-14
	4-16. Classification.....	4-14
	4-17. Function.....	4-16
	4-18. High-Explosive Ammunition.....	4-16
	4-19. Red/White Phosphorus Ammunition	4-17
	4-20. Illuminating Ammunition.....	4-18
	4-21. Types of Fuzes	4-18
	4-22. Characteristics of Proximity Fuzes	4-20
	4-23. Fuze Wrench and Fuze Setter	4-21
	4-24. Preparation of Ammunition.....	4-21
	4-25. Care and Handling.....	4-22
CHAPTER 5. 81-mm MORTAR, M29A1		
Section	I. Squad and Section Organization and Duties.....	5-1
	5-1. Organization.....	5-1
	5-2. Duties	5-1
Section	II. Components	5-2
	5-3. Tabulated Data	5-3
	5-4. Cannon Assembly, M29A1	5-4
	5-5. Bipod Assembly, M23A1.....	5-4
	5-6. Baseplate, M3.....	5-5
Section	III. Operation.....	5-6
	5-7. Premount Checks	5-6
	5-8. Mounting of the Mortar.....	5-7
	5-9. Safety Checks Before Firing	5-19
	5-10. Small Deflection and Elevation Changes.....	5-10
	5-11. Large Deflection and Elevation Changes.....	5-10
	5-12. Referring of the Sight and Realignment of Aiming Posts Using M53 Sight.....	5-12
	5-13. Malfunctions	5-12
	5-14. Removal of a Misfire	5-12
	5-15. Dismounting of the Mortar.....	5-13
Section	IV. Ammunition	5-14
	5-16. Function.....	5-14
	5-17. High-Explosive Ammunition.....	5-15
	5-18. White Phosphorus Ammunition.....	5-15
	5-19. Illuminating Ammunition.....	5-16
	5-20. Types of Fuzes	5-16
	5-21. Characteristics of Proximity Fuzes	5-16

		Page
	5-22.	Fuze Wrench and Fuze Setter 5-16
	5-23.	Preparation of Ammunition..... 5-16
	5-24.	Care and Handling..... 5-16
CHAPTER 6. 4.2-INCH MORTAR, M30		
Section	I.	Squad and Section Organization and Duties 6-1
	6-1.	Organization 6-1
	6-2.	Duties 6-1
	6-3.	Section Drill and Section Leader Duties 6-2
Section	II.	Components 6-3
	6-4.	Tabulated Data 6-4
	6-5.	Mortar Cannon, M30..... 6-4
	6-6.	Mortar Mount, M24A1..... 6-5
Section	III.	Operation of Ground-Mounted Mortar 6-9
	6-7.	Mounting of the Mortar..... 6-9
	6-8.	Safety Checks Before Firing 6-14
	6-9.	Small Deflection Change 6-15
	6-10.	Large Deflection and Elevation Changes 6-15
	6-11.	Loading and Firing of M329A2 Round..... 6-16
	6-12.	Malfunctions 6-16
	6-13.	Removal of a Misfire 6-17
	6-14.	Dismounting of the Mortar..... 6-22
Section	IV.	Mortar Carriers, M106, M106A1, and M106A2..... 6-22
	6-15.	Description 6-22
	6-16.	Tabulated Data 6-24
Section	V.	Operation of Carrier-Mounted Mortar 6-25
	6-17.	Mortar and Vehicular Mount 6-25
	6-18.	Maintenance 6-27
	6-19.	Placement of Mortar Into Firing Position on Carrier 6-27
	6-20.	Laying for Deflection and Elevation 6-29
	6-21.	Removal of a Misfire (Carrier-Mounted)..... 6-31
	6-22.	Mounting of Mortar on Carrier From Ground-Mounted Position..... 6-33
	6-23.	Dismounting of Mortar From Carrier..... 6-34
	6-24.	Preparation for a March Order From Ground-Mounted Position..... 6-34
	6-25.	Safety Checks 6-36
	6-26.	Measurement of Minimum and Maximum Elevations 6-37
	6-27.	Squad Formations..... 6-37
	6-28.	Dismounted Mortar Squad 6-38
	6-29.	Reciprocally Laying the Mortar Carrier Section 6-39
Section	VI.	Ammunition 6-40
	6-30.	Classification..... 6-40
	6-31.	Types of Fuzes 6-43

		Page
	6-32. Preparation of Ammunition.....	6-44
	6-33. Care and Handling.....	6-49
CHAPTER 7. 120-mm MORTAR, M120		
Section	I. Squad and Section Organization and Duties.....	7-1
	7-1. Organization.....	7-1
	7-2. Duties.....	7-1
Section	II. Components.....	7-2
	7-3. Tabulated Data for the 120-mm Mortar, M120.....	7-4
	7-4. Barrel Assembly, M298.....	7-4
	7-5. Bipod Assembly, M191 (Carrier-/Ground-Mounted).....	7-5
	7-6. Bipod Assembly, M190 (Ground-Mounted).....	7-6
	7-7. Baseplate, M9.....	7-7
Section	III. Operations.....	7-8
	7-8. Placing a Ground-Mounted 120-mm Mortar Into Action.....	7-8
	7-9. Performing Safety Checks on a Ground-Mounted 120-mm Mortar.....	7-10
	7-10. Performing Small Deflection and Elevation Changes on a Ground-Mounted 120-mm Mortar.....	7-10
	7-11. Performing Large Deflection and Elevation Changes on a Ground-Mounted 120-mm Mortar.....	7-11
	7-12. Malfunctions on a Ground-Mounted 120-mm Mortar.....	7-12
	7-13. Performing Misfire Procedures on a Ground-Mounted 120-mm Mortar During Combat.....	7-12
	7-14. Loading and Firing the Ground-Mounted 120-mm Mortar.....	7-15
	7-15. Taking the 120-mm Mortar Out of Action.....	7-16
Section	IV. Mortar Carrier, M1064A3.....	7-17
	7-16. Description.....	7-17
	7-17. Tabulated Data for the M1064A3 Carrier.....	7-19
Section	V. Operation of a Carrier-Mounted 120-mm Mortar.....	7-20
	7-18. Mortar and Vehicular Mount.....	7-20
	7-19. Maintenance.....	7-21
	7-20. Placing Carrier-Mounted 120-mm Mortar Into Action.....	7-21
	7-21. Lay for Deflection and Elevation on a Carrier-Mounted 120-mm Mortar.....	7-22
	7-22. Performing Misfire Procedures on a Carrier-Mounted 120-mm Mortar During Combat.....	7-23
	7-23. Mounting of the Mortar From a Carrier to a Ground-Mounted Position.....	7-26
	7-24. Taking the Mortar Out of Action (Ground-Mounted to M1064A3 Carrier-Mounted).....	7-27
	7-25. Performing Safety Checks on a Carrier-Mounted 120-mm Mortar.....	7-28

		Page
	7-26. Reciprocally Laying the Mortar Carrier Section	7-29
Section	VI. Ammunition	7-30
	7-27. Classification.....	7-30
	7-28. Authorized Cartridges	7-30
	7-29. Preparation for Firing	7-34
	7-30. Loading and Firing	7-35
	7-31. Unfired Cartridges.....	7-35
	7-32. Care and Handling of Cartridges.....	7-36
	7-33. Fuzes	7-36
	7-34. Setting Fuzes	7-37
	7-35. Resetting Fuzes	7-39
CHAPTER 8. FIRE WITHOUT A FIRE DIRECTION CENTER		
Section	I. Fire Procedures.....	8-1
	8-1. Advantages and Disadvantages	8-1
	8-2. Firing Data	8-1
	8-3. Observer Corrections	8-1
	8-4. Initial Fire Commands.....	8-3
	8-5. Fire Commands	8-3
	8-6. Fire Control	8-5
	8-7. Movement to Alternate and Supplementary Positions	8-5
	8-8. Squad Conduct of Fire	8-5
	8-9. Reference Line	8-5
	8-10. Fire Adjustment.....	8-5
	8-11. Squad Use of Illumination and Smoke.....	8-6
	8-12. Attack of Wide Targets	8-6
	8-13. Attack of Deep Targets	8-8
Section	II. Direct-Lay Method	8-9
	8-14. Step 1: Initial Firing Data.....	8-9
	8-15. Step 2: Referring the Sight	8-10
	8-16. Step 3: Bracketing the Target.....	8-10
	8-17. Step 4: Fire for Effect.....	8-10
Section	III. Direct-Alignment Method	8-11
	8-18. Mortar Dismounted	8-11
	8-19. Mortar Mounted	8-11
	8-20. Natural Object Method.....	8-11
Section	IV. Adjustment of Range.....	8-11
	8-21. Range Spottings	8-11
	8-22. Miscellaneous Spottings.....	8-12
	8-23. Bracketing Method.....	8-12
	8-24. Creeping Method of Adjustment.....	8-13
	8-25. Normal Fire Commands	8-14
	8-26. Modified Fire Commands	8-14
	8-27. Fire Control	8-14

	Page
8-28. Establishment of a Reference Line and Shifting From That Line.....	8-15
8-29. Ladder Method of Adjustment.....	8-17
 CHAPTER 9. GUNNER’S EXAMINATION	
Section I. Preparatory Instruction.....	9-1
9-1. Methods of Instruction.....	9-1
9-2. Prior Training.....	9-1
9-3. Preparatory Exercises.....	9-1
9-4. Examining Board.....	9-1
9-5. Location and Date.....	9-2
9-6. Eligible Personnel.....	9-2
9-7. Qualification Scores.....	9-3
9-8. General Rules.....	9-3
Section II. Gunner’s Examination With Ground-Mounted Mortar.....	9-4
9-9. Subjects and Credits.....	9-4
9-10. Equipment.....	9-4
9-11. Organization.....	9-4
9-12. Procedure.....	9-4
9-13. Mounting of the Mortar.....	9-5
9-14. Small Deflection Change.....	9-12
9-15. Referring of the Sight and Realignment of Aiming Posts.....	9-13
9-16. Large Deflection and Elevation Changes.....	9-15
9-17. Reciprocal Laying.....	9-16
Section III. Gunner’s Examination With the Track-Mounted Mortar.....	9-18
9-18. Subjects and Credits.....	9-18
9-19. Equipment.....	9-18
9-20. Organization.....	9-19
9-21. Procedure.....	9-19
9-22. Placement of Mortar Into a Firing Position From Traveling Position.....	9-19
9-23. Small Deflection Change.....	9-21
9-24. Referring of the Sight and Realignment of Aiming Posts.....	9-22
9-25. Large Deflection and Elevation Changes.....	9-24
9-26. Reciprocal Laying.....	9-26
9-27. Support Squad.....	9-27
 APPENDIX A. TRAINING DEVICES.....	 A-1
APPENDIX B. MORTAR TRAINING STRATEGY.....	B-1
GLOSSARY.....	Glossary-1
REFERENCES.....	References-1
INDEX.....	Index-1

PREFACE

This publication prescribes guidance for leaders and crewmen of mortar squads and platoons. It is concerned with the problems of mortar crew training. It presents practical solutions to assist in the timely delivery of accurate mortar fires but does not discuss all possible situations. Local requirements may dictate minor variations from the methods and techniques described herein. However, principles should not be violated by modification of techniques and methods.

The scope of this publication includes mortar crew training at squad and section levels. The 60-mm mortar, M224; 81-mm mortar, M29A1; 81-mm mortar, M252; 4.2-inch (107-mm) mortar, M30; and 120-mm mortar, M120, are discussed herein to include nomenclature, sighting, equipment, characteristics, capabilities, ammunition, and maintenance.

Note: For clarity and simplicity, the artwork in this manual does not show soldiers in BDUs. The words and required art detail cannot be seen due to the camouflage on BDUs.

The provisions of this publication are the subject of international agreements:

QSTAG 900 Characteristics of a Multirole Mortar Fuze (Edition One)

STANAG 2321 NATO Code of Colors for the Identification of Ammunition (Except Ammunition of a Caliber Below 22 millimeters)

The proponent of this manual is HQ TRADOC. Submit changes for improving this publication on DA Form 2028 (Recommended Changes to Publications and Blank Forms) and forward it to US Army Infantry School, ATTN: ATSH-INB-O, Fort Benning, GA 31905-5594.

Unless otherwise stated, whenever the masculine gender is used, both men and women are included.

CHAPTER 1 INTRODUCTION

The mission of the mortar platoon is to provide close and immediate indirect fire support for the maneuver battalions and companies.

Section I. GENERAL DOCTRINE

Doctrine demands the timely and accurate delivery of indirect fire to meet the needs of supported units. All members of the indirect fire team must be trained to quickly execute an effective fire mission.

1-1. EFFECTIVE MORTAR FIRE

For mortar fire to be effective, it must be dense enough and must hit the target at the *right* time with the *right* projectile and fuze. Good observation is necessary for effective mortar fire. Limited observation results in a greater expenditure of ammunition and less effective fire. Some type of observation is desirable for every target to ensure that fire is placed on the target. Observation of close battle areas is usually visual. When targets are hidden by terrain features or when great distance or limited visibility is involved, observation can be by radar or sound. When observation is possible, corrections can be made to place mortar fire on the target by adjustment procedures; however, lack of observation must not preclude firing on targets that can be located by other means.

a. Mortar fire must be delivered by the most accurate means that time and the tactical situation permit. When possible, survey data are used to accurately locate the mortar position and target. Under some conditions, only a rapid estimate of the location of weapons and targets may be possible. To achieve the most effective massed fires, a survey using accurate maps should be made of each mortar position, registration points, and targets.

b. The immediate objective is to deliver a large volume of accurate and timely fire to inflict as many casualties as possible on the enemy. The number of casualties inflicted in a target area can usually be increased by surprise fire. If surprise massed fires cannot be achieved, the time required to bring effective fires on the target should be kept to a minimum. The greatest demoralizing effect on the enemy can be achieved by delivery of a maximum number of effective rounds from all the mortars in the shortest possible time.

c. Mortar units must be prepared to accomplish multiple fire missions. They can provide an immediate, heavy volume of accurate fire for sustained periods. Mortars are suppressive indirect fire (high-angle-of-fire) weapons. They can be employed to neutralize or destroy area or point targets, screen large areas with smoke, and to provide illumination or coordinated HE/illumination.

d. In the armor and mechanized infantry battalions, mortars are normally fired from mortar carriers; however, they maintain their capability to be ground-mounted. Firing from the carrier permits rapid displacement and quick reaction.

1-2. MORTAR POSITIONS

Mortars should be employed in defilade to protect them from enemy direct fire and observation, and to take the greatest advantage of their indirect fire role. Although the use of defilade precludes sighting the weapons directly at the target (direct lay), it is necessary for survivability. Because mortars are indirect fire weapons, special procedures ensure that the weapon and ammunition settings used will cause the projectile to burst on or above the target. A coordinated effort by the indirect fire team ensures the timely and accurate engagement of targets.

Section II. INDIRECT FIRE TEAM

Indirect fire procedure is a team effort (Figure 1-1). Since the mortar is normally fired from defilade (where the crew cannot see the target), the indirect fire team gathers and applies the required data. The team consists of an FO, an FDC, and the gun squad.

1-3. APPLICATIONS

To successfully accomplish missions from a defilade position, certain steps must be followed in applying essential information and engaging targets.

- Locate targets and mortar positions.
- Determine chart data (direction, range, and vertical interval from mortars to targets).
- Convert chart data to firing data.
- Apply firing data to the mortar and ammunition.

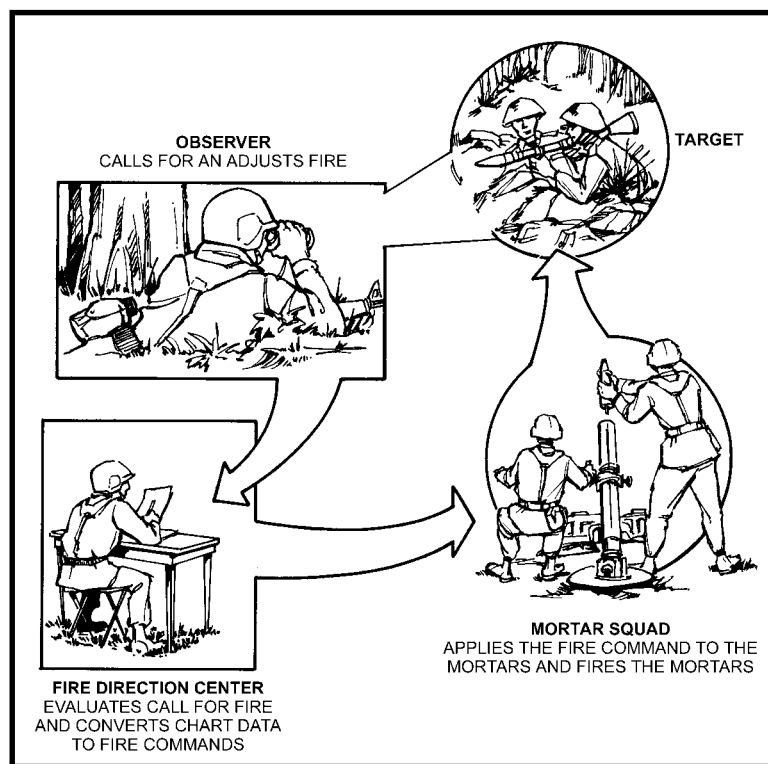


Figure 1-1. Indirect fire team.

1-4. TEAM MISSION

The team mission is to provide accurate and timely response to the unit it supports. Effective communication is vital to the successful coordination of the efforts of the indirect fire team.

a. The forward observer (FO), as part of the fire support team (FIST), is normally provided by a direct support (DS) artillery battalion. One 4-man FO team supports each mechanized infantry company. The light infantry company is supported by a 10-man company-level FO team. The team is composed of a lieutenant, staff sergeant, radio-telephone operator, driver with a HMMWV at company headquarters, and six FOs (one 2-man team for each infantry platoon in the company). The FO's job is to find and report the location of targets, and to request and adjust fire.

b. The fire direction center (FDC) has two computer personnel who control the mortar firing. They convert the data in a call for fire from the FO into firing data that can be applied to the mortars and ammunition.

c. A mortar squad consists of three to five mortarmen, depending on the system. The squad lays the mortar and prepares the ammunition, using the data from the FDC fire command. When those data have been applied, the squad fires the mortar—it must also be able to fire without an FDC.

Section III. SAFETY PROCEDURES

Although safety is a command responsibility, each member of the mortar fire team must know safety procedures and enforce them. Misfire procedures discussed in this field manual are based on peacetime operations. (See ARTEP 7-90-Drill for combat operations.)

1-5. DUTIES OF THE SAFETY OFFICER AND SUPERVISORY PERSONNEL

Safety officers must help commanders meet the responsibility of enforcing safety procedures. The safety officer has two principal duties: first, to ensure that the section is properly laid so that when rounds are fired, they land in the impact area; second, to ensure that all safety precautions are observed at the firing point.

a. **Duties Before Departing for Range.** The safety officer must read and understand the following:

- AR 385-63.
- Post range and terrain regulations.
- The terrain request of the firing area to know safety limits and coordinates of firing positions.
- Appropriate field and technical manuals pertaining to weapons and ammunition to be fired.

b. **Duties of Supervisory Personnel.** Supervisory personnel must know the immediate action to be taken for firing accidents. The following is a list of *minimum* actions that must be taken if an accident occurs.

- (1) Administer first aid to injured personnel, then call for medical assistance.
- (2) If the ammunition or equipment presents further danger, move all personnel and equipment out of the area.
- (3) Do not change any settings on or modify the position of the mortar until an investigation has been completed.

(4) Record the ammunition lot number involved in the accident or malfunction and report it to the battalion ammunition officer. If a certain lot number is suspected, its use should be suspended by the platoon leader.

c. **Mortar Range Safety Checklist.** A mortar range safety checklist can be written for local use. The following is a suggested checklist, which can also include three columns on the right titled “Yes,” “No,” and “Remarks.”

(1) *Items to check before firing.*

(a) Is a range log or journal maintained by the officer in charge?

(b) Is radio or telephone communication maintained with—

- Range control?
- Unit S3?
- Firing crews?
- Forward observers?
- Road or barrier guards?

(c) Are the required emergency personnel and equipment present on the range?

- Properly briefed and qualified medical personnel.
- A wheeled or tracked ambulance.
- Fire-fighting equipment.

(d) Are the following range controls and warning devices available, readily visible, and in use during the firing exercise?

- Barrier/road guards briefed and in position.
- Road barriers in position.
- Red range flag in position.
- Blinking red lights for night firing.
- Signs warning trespassers to beware of explosive hazards and not to remove duds or ammunition components from ranges.
- Noise hazard warning signs.

(e) Are current copies of the following documents available and complied with?

- AR 385-63.
- Technical and field manuals pertinent to the mortar in use.
- Appropriate firing tables.
- Installation range regulations.

(f) Are the following personal safety devices and equipment available and in use?

- Helmets.
- Protective earplugs.
- Protective earmuffs.

(g) Is the ammunition the correct caliber, type, and quantity required for the day's firing?

Are the rounds, fuzes, and charges—

- Stored in a location to minimize possible ignition or detonation?
- Covered to protect them from moisture and direct sunlight?
- Stacked on dunnage to keep them clear of the ground?
- Strictly accounted for by lot number?
- Exposed only immediately before firing?
- Stored separately from ammunition and protected from ignition?

- (h) Has the range safety officer verified the following?
- The mortar safety card applies to the unit and exercise.
 - The firing position is correct and applies to the safety card, and the base mortar is within 100 meters of the surveyed firing point.
 - Boresighting and aiming circle declination are correct.
 - The plotting board or MBC is correct.
 - The FO has been briefed on the firing exercise and knows the limits of the safety fan.
 - The lay of each mortar is correct.
 - The safety stakes (if used) are placed along the right and left limits.
 - Each safety NCO and gunner has been informed in writing of the following:
 - Right and left limits (deflection).
 - Maximum elevation and charge.
 - Minimum elevation and charge.
 - Minimum time setting for fuzes.
 - All personnel at the firing position have been briefed on safety misfire procedures.
 - If the safety card specified overhead fire, firing is IAW AR 385-63.
 - The mortars are safe to fire by checking—
 - Mask and overhead clearance.
 - Weapons and ammunition.
 - Properly seated sights on weapons.
 - Carefully positioned lights on the sights and aiming stakes for night firing.
 - The OIC is informed that the range is cleared to fire and that range control has placed it in a “wet” status.
- (2) *Items to check during firing.*
- (a) Are the unit personnel adhering to the safety regulations?
- (b) Is each charge, elevation, and deflection setting checked before firing?
- (c) Does the safety NCO declare the mortar safe to fire before the squad leader announces, “Hang it, fire”?
- (d) Do all gun settings remain at last data announced until a subsequent fire command is issued by the FDC?
- (e) Are ammunition lots kept separate to avoid the firing of mixed lots?
- (3) *Items to check after firing.*
- (a) Have the gunners and safety NCO verified that no loose propellants are mixed with the empty containers?
- (b) Has the safety NCO disposed of the unused propellants?
- (c) Has the unused ammunition been inventoried and repacked properly?
- (d) Have the proper entries been made in the equipment logbook (DA Form 2408-4).
- (e) Has the OIC or safety officer notified range control of range status and other required information?
- (f) Has a thorough range police been conducted?
- d. **Safety Card.** The safety officer should receive a copy of the safety card from the OIC before allowing fire to begin. He constructs a safety diagram based on the information on the safety card. A safety card should be prepared and approved for each firing position and type