FMFM 6-9

Marine Artillery Support

U.S. Marine Corps

PCN 139 000509 00

DEPARTMENT OF THE NAVY
Headquarters United States Marine Corps
Washington, DC 20380-0001

29 June 1993

FOREWORD

1. PURPOSE

Fleet Marine Force Manual (FMFM) 6-9, *Marine Artillery Support*, sets forth the doctrine, tactics, techniques, and procedures to be employed in operations and training within Fleet Marine Forces.

2. SCOPE

This manual is a bridge between institutional training (formal schools and technical manuals) and standing operating procedures. It is arranged in three parts. Part I provides artillery doctrine that describes what artillery is and what support it provides to the MAGTF. Part II provides techniques and procedures for the artillery unit to accomplish its mission. Part III contains operational and environmental considerations influencing the tactics for the artillery battery, battalion, and regiment.

3. SUPERSESSION

FMFM 7-4, *Field Artillery Support*, dated 20 February 1981.

4. CHANGES

Recommendations for improving this manual are invited from commands as well as directly from individuals. Forward suggestions using the User Suggestion Form format to—

Commanding General
Doctrine Division (C 422)
Marine Corps Combat Development Command
2042 Broadway Street Suite 212
Quantico, Virginia 22134-5021

5. CERTIFICATION

Reviewed and approved this date.

BY DIRECTION OF THE COMMANDANT OF THE MARINE CORPS

C. C. KRULAK
Lieutenant General, U.S. Marine Corps
Commanding General
Marine Corps Combat Development Command
Quantico, Virginia

DISTRIBUTION: 139 000509 00

USER SUGGESTION FORM

From:

To: Commanding General, Doctrine Division (C 422), Marine Corps Combat Development Command, 2042 Broadway Street Suite 212, Quantico, Virginia 22134-5021

Subj: RECOMMENDATIONS CONCERNING FMFM 6-9, *MARINE ARTILLERY SUPPORT*

1. In accordance with the Foreword to FMFM 6-9, which invites individuals to submit suggestions concerning this FMFM directly to the above addressee, the following unclassified recommendation is forwarded:

Page	Article/Paragraph No.	Line No.	Figure/Table No.

Nature of Change: ☐ Add ☐ Delete ☐ Change ☐ Correct

2. Proposed new verbatim text: (Verbatim, double-spaced; continue on additional pages as necessary.)

3. Justification/source: (Need not be double-spaced.)

NOTE: Only one recommendation per page.

(reverse blank)

Record of Changes

Change No.	Date of Change	Date of Entry	Organization	Signature

Marine Artillery Support

Table of Contents

Page

Part I. Organization and Fundamentals

Chapter 1. Organization of Marine Corps Artillery

1001	Fire Support System	1-3
1002	Mission of Marine Artillery	1-3
1003	Artillery Regiment	1-4
1004	Artillery Battalion	1-8
1005	Firing Battery	1-10

Chapter 2. Organization for Combat

2001	Allocation of Artillery	2-1
2002	Command Relationships	2-1
2003	Tactical Missions	2-3
2004	Associated Terms	2-6
2005	Fundamentals of Organization for Combat	2-8
2006	Organization for Combat for MAGTF Operations	2-9
2007	Supporting Commander's Role	2-10

Chapter 3. Artillery Commander and Staff

3001	Coordination	3-1
3002	Artillery Officer (FMF, MAGTF)	3-1
3003	Artillery Regimental Commander	3-1
3004	Artillery Battalion Commander	3-2
3005	Artillery Staff	3-2
3006	Artillery Firing Battery	3-6

Page

Chapter 4. Artillery as a Fire Support System

4001	Understanding Artillery	4-1
4002	Artillery Weapons	4-1
4003	Artillery Ammunition	4-2
4004	Fire Delivery	4-3
4005	Observation and Target Acquisition	4-10
4006	Effects of Artillery Fires	4-12
4007	Supporting Fires	4-16

Part II. Employment

Chapter 5. Artillery Planning

5001	Overview	5-3
5002	Artillery Staff Estimates	5-3
5003	Artillery Fire Plan	5-4
5004	Artillery Operation Order/Plan	5-4

Chapter 6. Communications

6001	Overview	6-1
6002	Means of Communication	6-1
6003	Other Systems and Equipment	6-2
6004	Communications of the Artillery Regiment	6-3
6005	Communications of the Artillery Battalion	6-7
6006	Communications of the Firing Battery	6-8

Chapter 7. Artillery Intelligence and Targeting

Section I. Organization and Processing

7101	Artillery Intelligence	7-1
7102	Intelligence Agencies	7-1
7103	Sources of Information	7-2
7104	Processing of Information	7-3
7105	Dissemination	7-4

Page

Section II. Observation and Targeting

7201	Observation	7-6
7202	Employment of Artillery Target Acquisition Assets	7-6
7203	Observation Posts	7-9
7204	Counterbattery Radar Platoon	7-9

Section III. Counterfire

7301	Purpose and Description	7-15
7302	Counterfire Activities	7-18
7303	Counterintelligence Activities	7-30
7304	Intelligence Documents	7-32

Chapter 8. Delivery of Fire

8001	Overview	8-1
8002	Fire Planning	8-1
8003	Fire Direction Center	8-7
8004	The Regimental FDC and Its Functions	8-11
8005	The Battalion FDC and Its Functions	8-14
8006	The Battery FDC and Its Functions	8-17
8007	Fire Orders	8-19
8008	Massing Fires	8-19
8009	Survey and Meteorology	8-20

Chapter 9. Movement and Positioning

Section I. Reconnaissance, Selection, and Occupation of Position

9101	Introduction	9-1
9102	Reconnaissance	9-1
9103	Reconnaissance for Movement of the Regiment	9-2
9104	Reconnaissance for Movement of the Battalion	9-4
9105	Reconnaissance by the Firing Battery	9-10
9106	Selecting the New Position	9-13
9107	Organizing the New Position	9-15

Page

9108 Occupying the Position 9-21
9109 RSOP by Headquarters Batteries 9-25

Section II. Displacement

9201 Introduction 9-28
9202 Considerations for Displacement 9-28
9203 Methods of Displacement 9-29
9204 Execution of Displacement 9-29
9205 Hasty Displacement 9-30
9206 Emergency Displacement 9-30
9207 Survivability Moves 9-31
9208 Tactical Marches 9-31
9209 Control Measures 9-33
9210 Preparing for Movement 9-35
9211 March Discipline 9-37
9212 Immediate Actions 9-38
9213 Other Movements 9-40

Section III. Battery Defense

9301 Keys for a Defensive Plan 9-41
9302 Reconstitution of the Battery 9-51

Part III. Artillery Tactics

Chapter 10. Artillery in Combat

10001 Principles of War 10-3
10002 Considerations 10-4
10003 Combat Tasks 10-4

Chapter 11. Offensive Operations

11001 Offense 11-1
11002 Artillery Support for the Offensive 11-1
11003 Operations to be Supported 11-2
11004 Preparing to Support the Attack 11-2
11005 Movement to Contact 11-2

		Page
11006	Attack	11-6
11007	Exploitation	11-10
11008	Pursuit	11-11

Chapter 12. Defensive Operations

12001	Defense	12-1
12002	Artillery Support for the Defense	12-3
12003	Operations in the Defense	12-4
12004	Withdrawal	12-9
12005	Breakout and Defense of Encircled Forces	12-10

Chapter 13. Operations in Special Environments

13001	Overview	13-1
13002	Cold Weather Operations	13-2
13003	Mountain Operations	13-5
13004	Desert Operations	13-6
13005	Jungle Operations	13-7
13006	Riverine Operations	13-9
13007	River Crossing Operations	13-10
13008	Amphibious Operations	13-11
13009	Helicopterborne Operations	13-12
13010	Built-up/Urban Area Operations	13-13
13011	Artillery Raids	13-15
13012	Fire Base Operations	13-16

Appendixes:

A	Artillery Weapons and Ammunition	A-1
B	Artillery Estimate of Supportability	B-1
C	Artillery Fire Plan	C-1
D	Multiple Launch Rocket System	D-1
E	Nuclear, Biological, and Chemical Operations	E-1
F	Reports	F-1
G	Example of Artillery Execution Matrix	G-1
H	Glossary	H-1
I	References	I-1

Index Index-1

Part I

Organization and Fundamentals

Generating combat power at the decisive time and place achieves victory on the battlefield. Success at every level is contingent on the proper *mix* of units and weapons to produce this combat power. At the highest level, the Marine Air-Ground Task Force (MAGTF) generates combat power by employing the ground combat element (GCE), the aviation combat element (ACE), and the combat service support element (CSSE). The MAGTF commander employs these elements to create a combined arms effect in deep, close, and rear operations. In deep operations, the MAGTF employs sophisticated target acquisition and weaponry to isolate and shape the battlespace. These fires create weaknesses in the enemy forces. During close operations, the MAGTF exploits these enemy weaknesses. In the rear area, the requirement for combat power is normally a reaction to an enemy initiative rather than an exploitation of an enemy weakness.

Artillery is an essential part of the MAGTF's combined arms team. Artillery is employed to the extent of its range in deep operations. As the battle progresses, artillery reinforces the organic firepower of maneuver forces engaged in close operations. Its use with other supporting arms to produce complementary and reinforcing effects generates combined arms effects for the MAGTF.

Part I provides doctrine for Marine artillery. The organization and functioning of the artillery regiment and its elements are discussed. Additionally, the duties of the various artillery billets are addressed. Finally, part I includes a descriptive discussion to enhance the understanding of artillery as a fire support system.

(reverse blank)

Chapter 1

Organization of Marine Corps Artillery

1001. Fire Support System

The artillery has three components which function together as a fire support system to provide effective fire support: target acquisition, weapon systems, and a command and control system.

a. Target Acquisition. Targets must be detected, identified, and located in sufficient detail to permit the effective employment of weapons. The artillery obtains targets primarily from its organic forward observers (FOs), weapons locating radars, artillery observation posts (OPs), and other sources; e.g., air observers, unmanned aerial vehicles (UAVs), intelligence, etc.

b. Weapon Systems. A weapon system is the weapon and those components required for its operation. A weapon system consists of a delivery vehicle and weapon combination including all related equipment, materials, services, and personnel required to make the system self-sufficient in its operational environment. Support and sustainment are crucial to the employment of the weapon system. Weapon systems are manned by firing batteries.

c. Command and Control System. The command and control system must have the facilities, equipment, communications, procedures, and personnel to enable a commander to plan, direct, and control operations of assigned forces. Command is exercised at each level of the artillery organization. Control is exercised primarily by the regiment and the battalions. A firing battery exercises control when employed independently.

1002. Mission of Marine Artillery

The mission of artillery in the Marine division is to furnish close and continuous fire support by neutralizing, destroying, or suppressing targets which threaten the success of the supported unit.

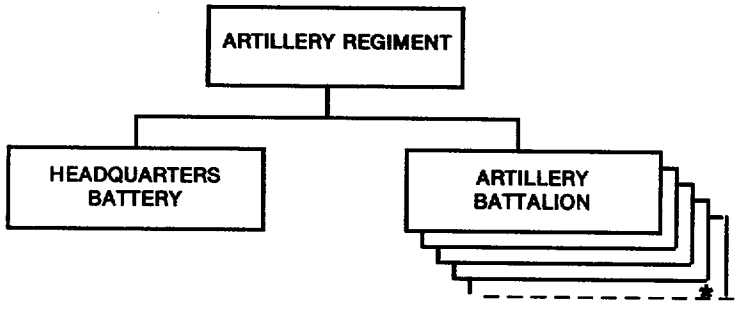
To accomplish its mission, artillery conducts three tasks:

- Provides timely, close, accurate, and continuous fire support.
- Provides depth to combat by attacking hostile reserves, restricting movement, providing long-range support for reconnaissance forces, and disrupting enemy command and control systems and logistical installations.
- Delivers counterfire within the range of the weapon systems to ensure the freedom of action of the ground forces.

1003. Artillery Regiment

a. Organization. The GCE of each MAGTF has an artillery component. At the division level, artillery is organized into an artillery regiment. The artillery regiment and its elements are capable of employing with and supporting the GCE of any size MAGTF. Artillery supports the operations of other MAGTF elements, as required.

(1) For combat, the notional artillery regiment will have a headquarters battery and five artillery battalions to support the GCE of a Marine expeditionary force (MEF). See figure 1-1.



* May be formed for a notional MEF from U.S. Marine Corps Reserve assets or from assets of another MEF.

Figure 1-1. Artillery Regiment.

The headquarters battery has functional staff groupings to assist the regimental commander control the operations, combat service support (CSS), and administrative support of the regiment. See figure 1-2.

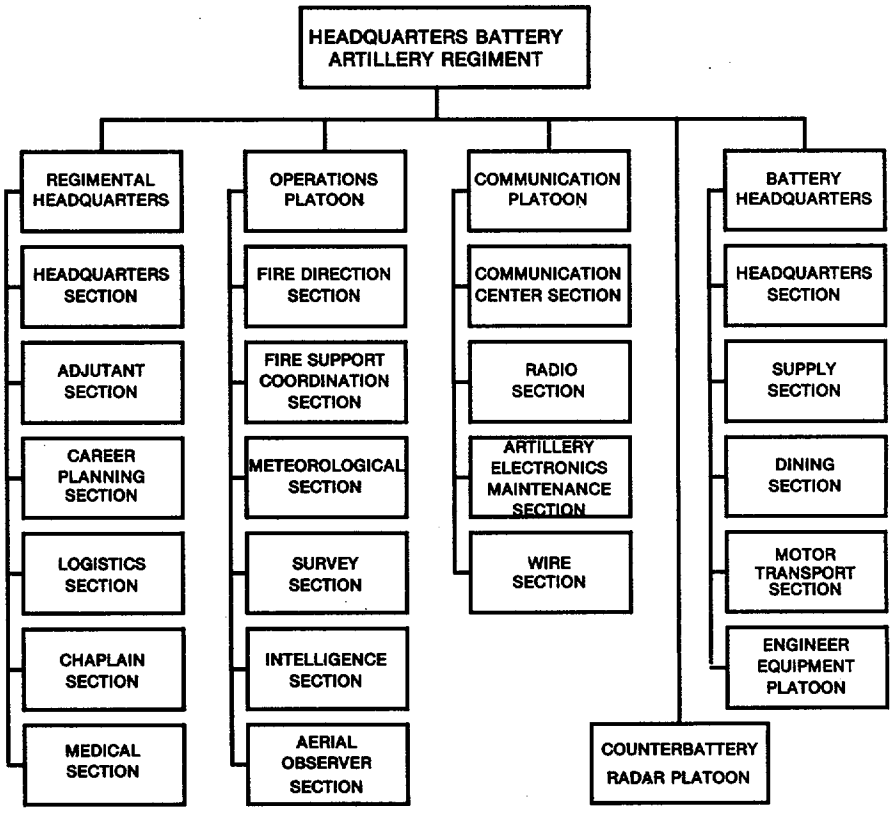


Figure 1-2. Headquarters Battery, Artillery Regiment.

The headquarters battery provides the equipment and personnel for the regiment's command echelons. It also provides personnel and equipment to the division fire support coordination center (FSCC). Personnel of the headquarters battery may be employed to reinforce an artillery battalion operating independently of the regiment.

(2) The regimental headquarters may be employed in two echelons: a main echelon which has the necessary staff and equipment to direct tactical operations; and the rear echelon which has the necessary staff and equipment to direct sustainment operations. A forward echelon may be formed from the staff and equipment of the main echelon to facilitate the incremental displacement of the main echelon. Combat operations centers (COCs) are formed at each echelon to plan, direct,

control, and coordinate assigned functions in the name of the commander. The regimental commander positions himself where he can best exercise command and control of the regiment and function as the division artillery officer and fire support coordinator (FSC). The regimental command post (CP) is that echelon where the commander is located.

b. Functions and Employment. The regimental commander organizes the artillery for combat, based on the guidance given by the commander of the GCE of which the artillery regiment is a part. Each artillery battalion is assigned a tactical mission which defines its fire support responsibilities. See chapter 2. The regimental main COC performs tactical fire direction, targeting, and counterfire functions. The hub of artillery operations is the fire direction center (FDC), normally located at the main or forward COC. From there, communications are established with subordinate units and higher/supported unit headquarters. Normally, one of the artillery battalion COCs will be designated as the alternate regimental CP. A regimental COC, with personnel and/or equipment augmentation, may be used as the alternate division CP for a limited period.

c. Combat Service Support Capabilities. The CSS capability of the regiment is the sum of the capabilities of the regimental headquarters battery and the battalions. For detailed discussion on artillery CSS, see FMFRP 6-17, *Combat Service Support for Artillery Units.*

(1) Maintenance. Maintenance is a continual, concentrated effort by all personnel in an artillery unit on a wide spectrum of equipment. Artillery battalions perform organizational maintenance on all equipment except fire control. The regiment does intermediate maintenance (field) on electronics systems within the command and provides maintenance contact teams (MCTs) to support subordinate units. Intermediate field maintenance exceeding the capability of the regiment is obtained from maintenance support teams (MSTs) or maintenance facilities of the force service support group (FSSG).

(2) Supply. The regimental headquarters battery and each artillery battalion perform each supply function to some degree. Particular emphasis is on classes I, III, V, and IX supply. External supply support is obtained from the FSSG. When artillery is attached to another unit, the artillery may obtain supplies from the unit to which attached within that unit's capability.

(3) Transportation. Artillery units can move their personnel, equipment, and limited supplies using organic assets. External support may be required to supplement the artillery's capability for such tasks as hauling class V (ammunition) supplies. Artillery units can be transported by landing craft, transport aircraft, and to a limited extent, by helicopters.

(4) General Engineering. The regiment has limited organic engineering capabilities. Organic engineering assets include utilities equipment (3 to 60 kilowatt generators) and earth-moving equipment (bulldozers). The regimental engineer equipment platoon also has forklifts and decontamination equipment. The regimental commander distributes engineer assets to support artillery operations, as required. The combat engineer battalion of the Marine division and the engineer support battalion of the FSSG provide additional support, as required.

(5) Health Service. Artillery units render limited routine treatment, first-aid, and emergency medical care. Each firing battery has corpsmen assigned. The battalions and regiment have aid stations. The regimental medical section supports the regimental headquarters and provides technical supervision and coordination of all medical activities within the regiment. The FSSG provides medical care exceeding the capability of the aid stations and provides dental care.

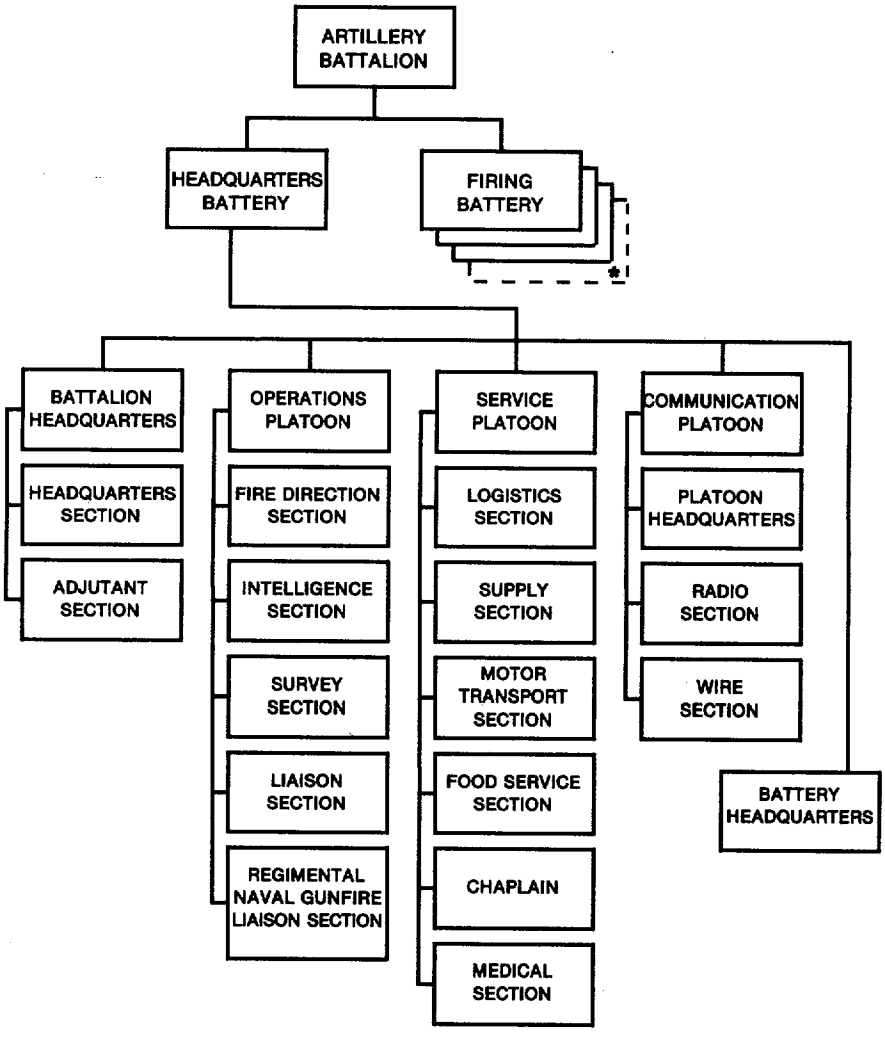
(6) Services. Artillery units receive services such as postal, disbursing, law enforcement, legal, graves registration, civil affairs, exchange, and information systems from the FSSG. Control over these services is decentralized. The artillery unit has limited enemy prisoner of war (EPW) and civil internee handling capability consisting of the collection and evacuation of personnel to the FSSG. When a qualified interrogator is not available, EPWs, foreign nationals, refugees, and repatriates may be questioned by artillery intelligence personnel for information of immediate tactical value.

(7) Messing. Messing capability (i.e., preparing and cooking rations) exists at regimental and battalion levels.

d. Survey and Meteorology. Survey and meteorology (met) data are necessary for accurate artillery support. The regiment and artillery battalions have survey capabilities. The regimental headquarters battery has a meteorological section which provides electronic and visual met data to support artillery operations.

1004. Artillery Battalion

a. Organization. An artillery battalion consists of a headquarters battery and firing batteries. See figure 1-3. The headquarters battery provides the equipment and personnel to assist the battalion commander



* Designated battalions have four firing batteries.

Figure 1-3. Artillery Battalion.

in controlling and supporting his battalion. Like the regiment, the battalion headquarters may be employed in a main and rear echelon configuration. Artillery battalions have three or four firing batteries of six like-caliber howitzers. Batteries may deploy with a mix of calibers, such as during Marine expeditionary unit (MEU) operations. Characteristics of weapons can be found in appendix A and in technical manuals.

b. Functions and Employment

(1) The artillery battalion is the basic tactical unit of the artillery. It has enough firing units to effectively mass its fires and to engage several targets simultaneously. The battalion normally employs as a unit to meet fire support requirements defined by its assigned tactical mission. The battalion maintains communications with its batteries and any attachments, the supported/reinforced unit, and the artillery regiment, as appropriate. When a battalion deploys independently, it is augmented with appropriate support from the regiment; e.g., met.

(2) The battalion FDC exercises tactical fire direction. It maintains a technical fire direction capability through its employment of fire direction personnel.

Fire direction personnel are proficient in all aspects of fire direction. They supervise, advise, and augment battery FDC personnel, as required. Battalion FDC personnel use their knowledge of technical fire direction to enhance tactical fire direction functions and to facilitate fire planning. They also troubleshoot gunnery problems encountered by firing batteries enabling battery FDC personnel to focus on the delivery of artillery fires. The battalion fire direction officer (FDO), assisted by battalion fire direction personnel, trains battery FDC personnel.

(3) Whenever possible, an artillery battalion is habitually associated through training and liaison with a ground combat regiment of the division. Such habitual association fosters efficiency in combat. On deployment, these battalions normally provide artillery liaison officers, FOs, and shore fire control parties to these regiments, as required. Artillery and naval gunfire (NGF) personnel may also be provided to separate maneuver battalions or other units as dictated by the tactical situation and the tactical mission assigned to an artillery unit.

1005. Firing Battery

a. Organization. The firing battery is the firing unit of the artillery battalion. It has the personnel and equipment necessary to move, shoot, and communicate. Its organization includes a battery headquarters and one firing platoon. Figure 1-4 depicts the sections within the battery. Key billets in the battery table of organization (T/O) include a battery commander, executive officer, liaison officer, fire direction officer, assistant executive officer, three forward observers, battery first sergeant, battery gunnery sergeant, and a local security chief. The T/0 includes sufficient fire direction personnel to establish an FDC and a battery operations center (BOC). Each artillery section has one howitzer and crew.

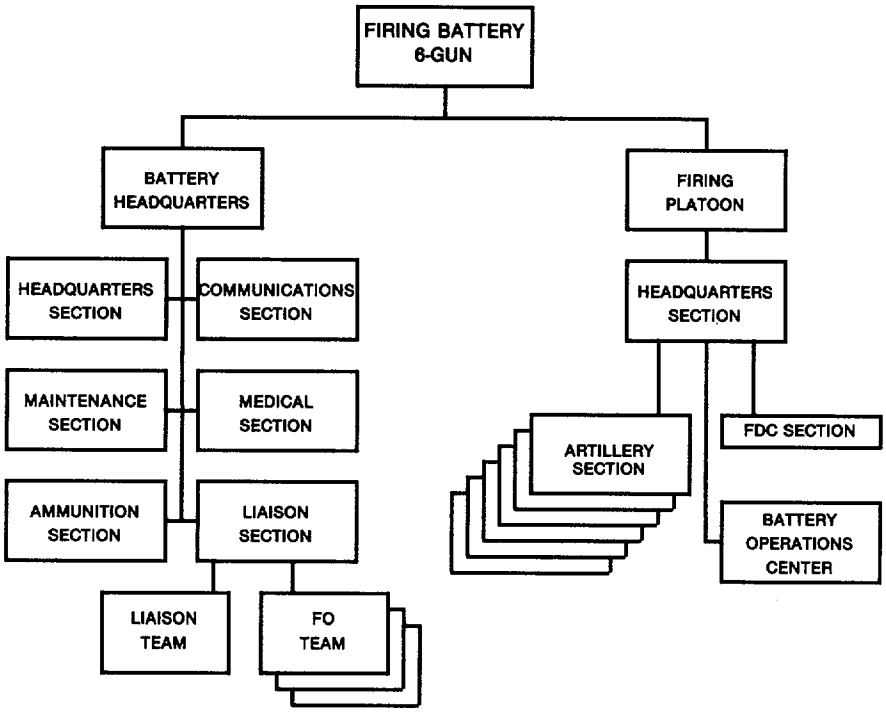


Figure 1-4. Firing Battery.

b. Functions and Employment

(1) Firing batteries normally operate as integral parts of the battalion. The firing battery is not assigned a tactical mission unless operating independent of the battalion. The firing battery can deploy

independently when augmented with appropriate service and support personnel and when supported by the infantry battalion to which attached. It can also function as a provisional rifle company, if required.

(2) Battery operations are conducted from a single firing position. The firing position includes the firing platoon and sections of the battery headquarters, as required.

Through his headquarters section, the battery commander exercises command and control of his battery. The liaison section provides artillery liaison personnel, FOs, and equipment to operate with the FSCC and companies/teams in a designated battalion of the supported regiment. See FMFM 6-18, *Techniques and Procedures for Fire Support Coordination* and FMFM 6-8, *Supporting Arms Observer, Spotter, and Controller*. The ammunition and maintenance sections operate with the firing platoon in the firing position. These sections can also operate from a separate location in situations where the firing platoon must be capable of moving quickly. The FDC evaluates the information received from the FOs and determines firing data. The FDC issues firing data in the form of fire commands to the artillery sections. The FDC is equipped with the battery computer system (BCS), backup computer system (BUCS), and communications equipment necessary to conduct fire direction. The BOC is established to serve as an alternate FDC and as the battery COC. The BOC is also equipped with BCS/BUCS and communications equipment necessary for a fire direction capability. During displacement, the BOC displaces forward with the advance party as discussed in chapter 9.

(reverse blank)

Chapter 2

Organization for Combat

2001. Allocation of Artillery

The allocation of artillery is accomplished by a process called organization for combat. Organization for combat places an artillery unit within an organization (i.e., establishes a command relationship) and assigns the unit a tactical mission. The higher artillery commander uses this process to allocate artillery assets to meet the needs of the force as a whole and the needs of the force's subordinate units. He receives guidance from the commander of the GCE of which the artillery is a part. The organization for combat is established during the planning phase. It is changed as the tactical situation dictates.

2002. Command Relationships

Command relationships define the degree of authority exercised by one commander over another. They are based primarily on the factors of METT-T (mission, enemy, terrain and weather, troops and support available-time available). The commander of the GCE exercises control of artillery in his organization through the commander of the artillery unit. For example, the decision to employ an artillery unit for a specific mission is made by the commander of the GCE; the selection of the specific artillery unit to perform the mission is made by the artillery commander. The command relationship given (or inherent) to an artillery unit may be organic, assigned, attached, operational control, or administrative control.

a. Organic. Organic means assigned to and forming an essential part of a military organization. The artillery regiment is organic to the Marine division.

b. Assigned. Assigned means to place units or personnel in an organization where such placement is relatively permanent, and/or where such organization controls and administers the units or personnel for the primary function, or greater portion of the functions, of the unit

or personnel. Assignments are made by the Joint Chiefs of Staff, Headquarters USMC, or Headquarters, Fleet Marine Force (FMF). These assignments are made in strategic tailoring to meet specific requirements of a theater of operation or a contingency plan. Artillery is part of such assignments.

c. Attached. Attach means to place units or personnel in an organization where such placements are relatively temporary. Attachments are established by tactical tailoring. The commander receiving the attachment will exercise the same degree of command and control over attachments as he does over the units and personnel organic to his command subject to the limitations stated in the attachment order. An attachment order should specify supply and maintenance requirements in terms of what the receiving unit and parent unit will provide. The responsibility for transfer and promotion of personnel will normally be retained by the parent formation, unit, or organization. Although attachment places the artillery unit within the organization, the unit must still be assigned a tactical mission. The higher artillery commander loses some capability to meet fire support requirements by attachment. Attachment may apply to artillery in several situations.

(1) Artillery is **attached to a supported unit** when artillery requirements cannot be adequately provided by the parent artillery organization and control requirements compel the establishment of a command relationship between the supported and supporting commander. Artillery units are not normally attached to battalion-sized or smaller maneuver units unless distance, communications, or other factors do not allow the parent artillery headquarters to exercise adequate control over the artillery unit. An example of the above is an artillery battery attached to the GCE of a MEU.

(2) Artillery may be **attached to another artillery unit for reinforcement**. For example, an artillery battalion supporting a reinforced infantry regiment may have attached firing batteries, counterbattery radar (CBR) platoon detachment, etc.

(3) When a suitable artillery headquarters is unavailable, an artillery battalion or battery may be attached to another of like size to form an **artillery groupment**. Groupments are temporary formations used when one unit must exercise greater control over another unit than is inherent in a reinforcing mission. Attachment is established for logistical and administrative considerations. The senior commander

of the two units is the groupment commander, and he assigns missions to the subordinate unit. The groupment uses the standing operating procedures (SOPs) of the groupment commander. It also carries the numerical designation of the headquarters of the groupment commander; e.g., 1st Battalion Group, 11th Marines.

d. Operational Control. Operational control refers to the authority given to a commander to organize commands and forces and to employ those forces as the commander in operational control considers necessary to accomplish assigned missions. Operational control does not include control for logistics or matters of administration, discipline, internal organization, or unit training.

Operational control has occasional use in establishing a relationship between artillery units; e.g., an artillery battalion may be given operational control of a radar section. However, it is rarely used to establish a relationship between an artillery unit and a supported unit.

e. Administrative Control. Administrative control is the direction or exercise of authority over subordinate or other organizations in respect to administrative matters such as personnel management, supply, services, and other matters not included in the operational missions of the subordinate or other organizations. Administrative control has occasional use in establishing command relationships for artillery units.

2003. Tactical Missions

A tactical mission defines the fire support responsibility of an artillery unit, normally a battalion, to a supported unit or to another artillery unit. All Marine cannon battalions are capable of performing any tactical mission. An artillery unit assigned a tactical mission remains under the command of the higher artillery commander. The inherent responsibilities in each type of tactical mission are set forth in figure 2-1.

a. Direct Support (DS). The DS mission requires a unit to furnish close and continuous fires to a single supported unit, normally a regiment or separate maneuver battalion. The commander of an artillery unit with a DS mission ensures that his firing units are positioned to deliver fires in the zone of action/sector of the supported unit, that the fires have been planned effectively, and that he has continuous communications with the liaison team and FO teams located with the supported unit.

ARTY UNIT WITH MISSION OF	ANSWERS CALLS FOR FIRE IN PRIORITY FROM	ESTABLISHES LIAISON WITH	ESTABLISHES COMMUNICATIONS WITH	HAS AS ITS ZONE OF FIRE	FURNISHES FORWARD OBSERVERS	IS POSITIONED BY	HAS ITS FIRES PLANNED BY
DIRECT SUPPORT	1. SUPPORTED UNIT 2. OWN OBSERVERS 3. HIGHER ARTILLERY HEADQUARTERS	SUPPORTED UNIT (DOWN TO BATTALION LEVEL)	SUPPORTED UNIT	ZONE OF ACTION OF SUPPORTED UNIT	TO EACH COMPANY SIZED-MANEUVER UNIT OF SUPPORTED UNIT	UNIT COMMANDER AS DEEMED NECESSARY OR ORDERED BY ARTILLERY HEADQUARTERS	DEVELOPS OWN FIRE PLAN IN COORDINATION WITH SUPPORTED UNIT
REINFORCING	1. REINFORCED UNIT 2. OWN OBSERVERS 3. HIGHER ARTILLERY HEADQUARTERS	REINFORCED UNIT	REINFORCED UNIT	ZONE OF FIRE OF REINFORCED UNIT	UPON REQUEST OF REINFORCED UNIT	REINFORCED UNIT, OR ORDERED BY HIGHER ARTILLERY HEADQUARTERS	REINFORCED UNIT
GENERAL SUPPORT	1. HIGHER ARTILLERY HEADQUARTERS 2. OWN OBSERVERS	NO INHERENT REQUIREMENT	NO INHERENT REQUIREMENT	ZONE OF ACTION OF SUPPORTED UNIT	NO INHERENT REQUIREMENT	HIGHER ARTILLERY HEADQUARTERS	HIGHER ARTILLERY HEADQUARTERS
GENERAL SUPPORT REINFORCING	1. HIGHER ARTILLERY HEADQUARTERS 2. REINFORCED UNIT 3. OWN OBSERVERS	REINFORCED UNIT	REINFORCED UNIT	ZONE OF ACTION OF SUPPORTED UNIT TO INCLUDE ZONE OF FIRE OF REINFORCED UNIT	UPON REQUEST OF REINFORCED UNIT SUBJECT TO PRIOR APPROVAL OF HIGHER ARTILLERY HEADQUARTERS	HIGHER ARTILLERY HEADQUARTERS OR REINFORCED UNIT SUBJECT TO PRIOR APPROVAL BY HIGHER ARTILLERY HEADQUARTERS	HIGHER ARTILLERY HEADQUARTERS

Figure 2-1. Tactical Missions (Inherent Responsibilities).

He is responsible for immediate replacements for casualty losses of the liaison section. Calls for fire are answered in two methods, based on the needs of the supported unit:

- Each firing battery may have its own conduct of fire (COF) net, each monitored by the battalion FDC.
- The battalion FDC may establish multiple COF nets, with firing batteries directed to respond to calls for fire received on a designated net and to fire missions assigned by the battalion FDC.

The fires of a DS unit can be requested for other purposes. However, these fires are not delivered when such action will conflict with the delivery of fires to the supported unit. A supported unit can only have one unit in DS.

b. General Support (GS). The GS mission requires a unit to support the force as a whole and be prepared to support any subordinate element. The fires of a unit in GS are controlled by the higher artillery headquarters. The zone of fire may be either the zone of action/sector of the force as a whole or a specific portion thereof. GS units provide the GCE immediately available firepower to influence the battle or to allocate to subordinate commands in order to influence widely separated actions.

c. Reinforcing (R). A reinforcing mission requires a unit to respond directly to requests for fire from another artillery unit. This mission is used to reinforce the fires of a unit with a DS mission. A DS unit can be reinforced by more than one reinforcing unit; a reinforcing unit can only reinforce one DS unit at a time. Reinforcing artillery remains under the control of the higher artillery commander, but receives its zones of fire and fire missions from the reinforced DS unit. The reinforcing unit commander positions his firing units in the position areas identified by the reinforced unit or as ordered by the higher artillery headquarters.

d. General Support-Reinforcing (GS-R). An artillery unit with this mission will support the force as a whole and answer calls for reinforcing fires from a designated artillery unit in DS. Priority of fires of GS-R artillery units is to the higher artillery commander unless otherwise specified. To increase responsiveness, a designated net (quick-fire channel) may be established between the GS-R unit and the reinforced DS unit. This is the most flexible standard tactical mission.

e. Nonstandard Tactical Mission. When fire support requirements cannot be met or conveyed by one of the standard tactical missions, a nonstandard tactical mission may be assigned. A nonstandard mission amplifies, changes, or limits one or more of the inherent responsibilities of a standard tactical mission. The stipulations should not degrade the ability of a unit to accomplish the inherent responsibilities of the standard mission. The DS mission should not be modified. The nonstandard tactical mission is normally used when there is not enough artillery to cover artillery requirements. The following is an example of a nonstandard tactical mission.

1st Bn 10th Mar (155,T): GS, 2d PCFF LAI Bn
until 031600 AUG

(1st Bn is GS to the division, but 2d priority in calls for fire (PCFF) is to light armored infantry battalion (LAI Bn). The positioning and communications of the battalion are initially established to support LAI Bn as the main effort.)

f. On-Order (O/O) Mission. The O/O mission serves as a warning order to alert a unit of an anticipated change to its tactical mission. The artillery commander plans and initiates the preparation for transition to the new mission. The assignment of an O/O mission must take into account the positioning and ammunition requirements for that mission. Often, the O/O mission has a nonstandard stipulation; e.g., do not expend more than a specified amount of ammunition. An artillery unit with a DS mission is not normally given an O/O DS mission. The higher artillery commander gives his subordinate commanders as much warning as possible of the anticipated time of execution of the new mission. The following is an example of an O/O mission.

1st Bn 14th Mar (155,T): R 2d Bn 14th Mar,
O/O DS 23d Mar

2004. Associated Terms

Terminology and techniques associated with the employment of artillery are discussed in the following paragraphs.

a. Priority of Fires. When required, control of artillery can be further allocated by assignment of priority of fires. Priority of fires is guidance to a fire support planner to organize and employ fire support means according to the importance of the maneuver units' missions. Priority of fires is normally used to strengthen the main effort or the most vulnerable area.

b. Priority Targets. Priority targets are a means of allocating artillery. A priority target is a target which when requested for attack takes priority over all other requests. Priority targets are designated by the maneuver battalion commander, who also provides specific guidance as to when the targets will become priority, munitions to use, accuracy, and desired effects. When not engaged in fire missions, firing units will lay on priority targets with firing data and ammunition prepared and staged for responsiveness. Up to three priority targets can be assigned to a 6-gun battery.

c. Final Protective Fires (FPFs). An FPF is an immediately available prearranged barrier of fire designed to impede enemy movement across defensive lines or areas. (Joint Pub 1-02) An FPF is a priority target in the defense. An artillery FPF is normally fired as a barrage by the entire battery at the maximum rate of fire until the FPF mission is ended or all ammunition is expended.

d. Zone of Fire. Artillery delivers or is prepared to deliver fires into an area called a zone of fire. To ensure fires are distributed and massed as required, zones of fire are designated for all artillery units. Normally, zones of fire correspond with zones of action, sectors of defense, or tactical areas of responsibility (TAOR) of the supported unit. Zones of fire are given in agreement with the tactical mission assignment. Contingent zones of fire are used to ensure complete artillery coverage and to provide maximum fire on points critical to the success of the operation. Contingent zones may also be assigned to cover dead spaces in the zones of fire of DS units.

e. Boundaries. Boundaries designate the geographical limits of the zone of action of a unit. A commander enjoys complete freedom of fire and maneuver within his own boundaries, unless otherwise restricted. Artillery units do not have boundaries; artillery operates within the boundaries of the supported unit. The delivery of fires and positioning of artillery units must be cleared by the appropriate commander who has control of the zone of action. Appropriate FSCCs coordinate fires across boundaries with the unit to whom the area is assigned, unless such fires are permitted by a fire support coordination measure.

f. Artillery With Units In Reserve. Artillery is not held in reserve. Artillery with a unit assigned a reserve mission is given another tactical mission within the division or employed in support of another division if the parent division is in reserve. Liaison sections may remain with the reserve unit for planning purposes. Organic artillery of a reserve division must be prepared to reassemble and support their parent division when it is committed. Fire support plans employing reinforcing artillery must be developed so that any disruption caused by its withdrawal is minimized.

g. Auxiliary Weapons. When directed by the appropriate commander, the fires of units with weapons capable of employment as artillery may be used to supplement artillery. These units should be connected to artillery by survey, liaison, and communications. Examples of such auxiliary weapons are captured and replacement weapons.

2005. Fundamentals of Organization for Combat

The following are guiding fundamentals for organizing artillery for combat:

a. Adequate Support for Committed Maneuver Elements. Adequate fire support must be provided to units committed in close combat. What constitutes *adequate support* is determined by the commander, considering METT-T. The minimum adequate fire support for a committed unit (e.g., infantry regiment or separate maneuver battalion) is normally considered to be one artillery battalion in DS. Some situations may require more artillery support; e.g., reinforcing or GS-R artillery. This may result in less support or no DS to one unit to increase the combat power of another.

b. Weight the Main Effort or Most Vulnerable Area. Weight must be added to support the main effort or to strengthen the most vulnerable area. Weight can be accomplished by assignment of a reinforcing or GS-R mission, by positioning and assignment of azimuths of fire, by the allocation of additional ammunition, and by assignment of priority of fires.

c. Immediately Available Artillery for the Commander to Influence the Action. The GCE commander retains immediately available artillery with which he can influence the action. GS and GS-R missions accomplish this fundamental.

d. Facilitate Future Operations. Artillery must be responsive to unforeseen events and capable of smooth transition from one mission to another. Several methods accomplish this: nonstandard tactical missions, O/O missions, positioning, and allocation of ammunition.

e. Maximum Feasible Centralized Control. Artillery is most effective when control is centralized at the highest level consistent with its fire support capabilities and the requirements for the overall mission. Centralized control permits flexibility in providing support to the force as a whole and its subordinate units. Centralized control is accomplished by the GS and GS-R missions and centralized fire control. See chapter 4. Decentralized control makes artillery responsive to the needs of the front-line troops. Decentralized control is accomplished by the DS mission and decentralized fire control. The optimum degree of control varies with the tactical situation. An offensive force will have the initiative and will want artillery responsive to subordinate units; i.e., decentralized control. A defensive force will want centralized control of artillery to respond to the enemy's initiatives.

f. Other Considerations. Terrain and communications may influence the organization for combat. Operations separated by terrain features (e.g., mountains, marshes, etc.) may necessitate decentralized control. The flow of intelligence is another consideration. Artillery should be responsive to the headquarters receiving the bulk of intelligence.

2006. Organization for Combat for MAGTF Operations

a. Marine Expeditionary Unit. MEU artillery support is normally that support provided to the battalion landing team (BLT). It consists of artillery appropriate to the mission and situation. The typical artillery organization is a firing battery employed with a mix of towed howitzers and attached support; e.g., communications, maintenance, and a survey and manual meteorology capability. The M101A1 howitzer is particularly suitable for ship-to-shore movement by helicopter, while the M198 has the range, lethality, and ammunition variety suitable to sustained operations ashore. The MEU command element has an artillery officer.

b. Marine Expeditionary Force. MEF artillery support is normally that support provided by the division. As dictated by the situation, additional artillery can be provided; e.g., activation of a USMCR

356-548 O - 93 - 2

battalion, artillery from other Marine divisions, or artillery from other sources. The MEF command element has an artillery officer.

2007. Supporting Commander's Role

When artillery is attached to a supported unit, the artillery commander is a subordinate commander and a special staff officer of the supported unit commander. In other command relationships, the artillery commander is an advisor to the supported commander and an independent commander who provides fire support. The artillery commander provides fire support expertise to the supported commander and the FSCC. The artillery commander must know, understand, and anticipate the supported commander's actions and requirements. He must read the battle with the supported commander, think ahead, and project fire support. He does this by direct personal contact, through liaison officers, and by encouraging staff liaison.

Chapter 3

Artillery Commander and Staff

3001. Coordination

Coordination between artillery officers at each level is essential for effective artillery employment. Coordination is practiced within the staff, between the staff and subordinate commanders, and between the artillery staff and other staffs.

3002. Artillery Officer (FMF, MAGTF)

An artillery officer is assigned to the FMF headquarters and MAGTF command elements. These officers advise their respective commanders on fire support and artillery matters. They have cognizance of artillery requirements, target analysis, dissemination of information and intelligence of interest to artillery, coordination of survey support, and damage assessment of friendly nuclear fires. The MAGTF artillery officer performs his duties as part of the MAGTF FSCC. He may also be assigned as the FSC for the MAGTF.

3003. Artillery Regimental Commander

The commanding officer of the artillery regiment controls the operations of his regiment. He also functions as the division artillery officer and division FSC.

a. As the division artillery officer, he advises the division commander and his staff on artillery matters. He determines the requirements for artillery support and the organization for combat. He is also concerned with matters about artillery ammunition, target acquisition, meteorology, survey, and training. He keeps abreast of the enemy artillery situation. He works with the division weapons employment officer (WEO) on target analysis and damage assessment of nuclear fires on surface targets.

b. As the division FSC, he advises the division commander and his staff on fire support coordination matters, including fire support coordination training. He is also responsible for the operations of the division FSCC. He is assisted by two assistant fire support coordinators (AFSCs). For more information on fire support coordination functions, see FMFM 6-18.

3004. Artillery Battalion Commander

The artillery battalion commander executes the fire support responsibilities inherent in his assigned tactical mission. He is responsible for the training, morale, and discipline of the personnel in the battalion. During operations, the commander reconnoiters routes, position areas, and observation sites. He guides his staff and subordinate commanders in artillery operations, including fire direction, fire planning, and CSS matters. He maintains liaison with the supported or reinforced unit commander. He also provides expertise and advice on fire support coordination matters to the supported commander.

3005. Artillery Staff

The artillery staff assists the commander in the control of artillery and the coordination of fire support. The duties of the regimental and battalion staffs are similar and generally conform to the principles and procedures described in FMFM 3-1, *Command and Staff Action*.

a. Executive Officer. The executive officer (XO) is the principal assistant and adviser to the commander. The XO complements the activities of the commander and coordinates the actions of the executive and special staffs. To the appropriate members of the staff, he conveys the commander's decision when required and makes additional decisions if necessary to fulfill the commander's basic decisions. He oversees the preparation of orders and memoranda prepared by the staff and submits these to the commander for approval. In operations, the XO assists the commander by conducting duties as directed; e.g., liaison, reconnaissance, etc. He ensures the commander's policies, directions, and guidance are carried out, particularly when the commander is absent from the headquarters. The XO assists the staff to ensure administrative and logistics support for the unit.

b. Executive Staff. The regimental and battalion executive staffs consist of the executive officer, the S-1 (personnel), the S-2 (intelligence), the S-3 (operations and training), the S-4 (logistics), and the S-6 (communications and information systems). Some areas of staff responsibility overlap; e.g., ammunition resupply involves the S-3 and S-4; targeting involves the S-2 and S-3. Artillery-specific duties include—

(1) S-1. No duties peculiar to artillery. The S-1 is an advisor to the commander on matters about personnel and general administration. He obtains and controls directives and documents for the unit. He gives particular attention to the staffing of technical billets and makes timely casualty reporting to enhance personnel replacements.

(2) S-2. Primarily concerned with artillery intelligence and the coordination of target acquisition and observation efforts. The S-2 supervises the operations and training of the intelligence section. Other duties include:

- Preparing information requirements, processing target information and intelligence, and preparing intelligence documents and reports.
- Supervising counterintelligence, counterfire activities, personnel security, and physical document security.
- Disseminating maps, photographs, and data about the enemy.
- Working closely with the S-3, organic target acquisition assets, and supported, higher, and adjacent units. He provides advice on the enemy order of battle, weapons, and tactics, and he predicts targets.
- Studying captured enemy documents and material or forwarding it to higher headquarters, as appropriate. Captured material is coordinated with the S-4; captured documents with the S-1. He ensures Marines are knowledgeable in handling EPWs.

(3) S-3. Responsible for organization, plans, training and operations. He supervises the operation of the main COC. He is concerned with task organization, fire planning, and target analysis. Other duties include:

- Preparing artillery operation orders, letters of instruction, and operational reports.

- Coordinating and delivering artillery support. He keeps abreast of the supported unit's tactical situation to ensure adequate and safe artillery support. He keeps others informed of the artillery situation; e.g., fire capability, ammunition status.
- Employing operational security and electronic warfare (EW) in artillery operations.
- Working closely with commanders, other staff officers, and the staffs of higher, lower, reinforcing, and reinforced or supported units on artillery matters. He keeps the S-2 informed of all targets attacked or planned for attack and advises on changes in observation and intelligence requirements; coordinates the activities of liaison officers; keeps the S-4 informed of ammunition requirements; coordinates survey activities; and keeps the S-6 advised on communication requirements.

(4) S-4. Primarily concerned with CSS matters. He determines requirements and makes recommendations to the commander on policies, priorities, and allocations of CSS, in coordination with the S-3. For detailed information on the duties of the S-4, see FMFRP 6-17. Other duties include—

- Recommending the location, movement, and employment of the command's CSS elements. The S-4 normally supervises the unit headquarters' rear echelon and coordinates lines of communication with forward units.
- Planning and supervising ammunition supply in coordination with the S-3. He advises the S-3 on the availability of ammunition by lot and type, keeps appropriate ammunition information and records, and recommends the locations for ammunition dumps.
- Maintaining current records of all traffic data, road nets, water points, supply points, and maintenance facilities. He also maintains records of critical items of supplies and equipment.

(5) S-6. Provides advice on automated information and communications systems support; plans and supervises the installation, operation, and maintenance of the communications system; disseminates communications-electronics operating instructions (CEOI); and manages cryptographic material systems. He coordinates with the S-3 to ensure communications planning and training are compatible with the S-3's plans and the FDC's procedures. The S-6 recommends, in coordination with the S-3 and the headquarters battery commander, the location of key installations within the

headquarters echelons. To improve communications, he coordinates with the S-6s of higher, lower, reinforcing, adjacent, and supported/reinforced units.

c. Special Staff. The special staff provides advice and assistance of a specialized or technical nature to the commander and the executive staff. Some of these individuals are as follows:

(1) Assistant S-3/FDO. The assistant S-3 also serves as the FDO. In addition to assisting the S-3, he supervises the operation of the FDC. He coordinates the delivery of artillery support by conducting tactical fire direction. He maintains status of artillery operations and keeps others informed of the artillery situation; e.g., fire capability, ammunition status.

(2) Artillery Liaison Officer (LNO). The artillery LNO is the artillery commander's personal representative to the unit with which liaison is established. The artillery LNO exchanges information, plans and policies, and he promotes coordination between the two units. On deployment, the artillery LNO stays with the supported unit throughout the operation. Artillery battalions and batteries provide LNOs to supported and reinforced units, and to lower, adjacent, and higher units by order of the commander. FMFM 6-18 has detailed information on the functions of the artillery LNO.

(3) Survey Officer. The regiment and battalions have a survey officer on their T/O. The survey officer coordinates and advises on survey activities; trains survey parties and other artillerymen; e.g., hasty survey techniques; maintains survey equipment; prepares survey plans for present and future operations; and gathers and reports information on intelligence, target acquisition, and observation.

The survey officer establishes and/or extends survey control to artillery units and other units, as required, distributes survey information, and exchanges survey data with the survey officers of higher, lower, and adjacent units. He reconnoiters and marks routes and position areas. He has the capability of establishing OPs to conduct critical target area survey and/or high burst/mean point of impact (HB/MPI) registrations. During nuclear, biological, and chemical (NBC) threat periods, the survey section is capable of conducting NBC monitoring activities.

(4) Meteorological Officer. The regiment has a meteorological officer on its T/O. He advises the commander and staff on all artillery meteorology matters. He supervises the production and

dissemination of meteorological information at the intervals required to support the division. This information is disseminated in the following met messages: computer met message, ballistic met message, target acquisition met message, fallout met message, and air-weather service met message. The meteorological officer establishes liaison with other meteorological sections and the weather sections of other armed services. He plans the positioning of meteorological assets to best support the scheme of maneuver.

(5) Counterbattery Radar Platoon Commander. The CBR platoon commander in the artillery regiment advises the commander and staff on radar matters and assists in coordinating the counterfire activities of the organization. He selects positions for the radars in coordination with the S-3 and S-2. He trains the radar sections and supervises the maintenance of radar equipment.

(6) Assistant Fire Support Coordinator. The regiment has two artillery officers who function as AFSCs. The AFSCs represent the artillery regimental commander in the division FSCC during his absence. See FMFM 6-18.

(7) Target Information Officer (TIO). The regiment has a TIO on its T/O. The TIO establishes the target information section (TIS) at the division FSCC. See FMFM 6-18.

(8) Other Special Staff Officers. The regiment and battalions have other staff officers who provide advice and supervision of a technical nature. These officers include ordnance, motor transport, maintenance management, and NBC officers.

(9) Field Artillery Chief. The regiment and each of the battalions have a field artillery chief who is the technical expert on the employment of howitzers. He advises commanders and staffs on the employment of howitzers and provides expertise on gun line operations.

3006. Artillery Firing Battery

a. Battery Commander. The battery commander has responsibilities comparable to those of the battalion commander when the battery is operating independent of the battalion. When under the control of a battalion, the battery commander performs his duties within the policies and procedures established by the battalion commander. He is

responsible for the normal functions of a unit commander; e.g., morale, discipline, and training. The battery commander's tactical duties include:

- Selecting firing positions by practicing reconnaissance, selection, and occupation of positions (RSOPs).
- Coordinating survey support or providing hasty survey, when required.
- Planning marches and movements.
- Supervising battery operations, maintenance, supply, and survivability.
- Keeping the battalion commander and battery personnel informed.

The battery commander controls the tactical employment of the battery and relies on his XO for the supervision of detailed battery operations. Much of the battery commander's time is spent conducting RSOP, liaison, and coordination.

b. Executive Officer. The XO assists the battery commander in the conduct of battery operations. The XO supervises the battery while in position and during displacements. The XO ensures the practice of safe firing battery procedures and ammunition handling and storage. He ensures continuous maintenance of equipment and position improvement (camouflage, hardening, etc). He keeps the FDC and BOC informed about the status of the gun line; e.g., minimum quadrant elevation (QE) by charge, firing status, the referred deflection, piece displacement, and lateral limits of azimuth or deflection. The XO also provides ammunition information such as the amount, type, lot numbers, weight of projectiles, and powder temperatures. He coordinates CSS for the battery. During displacements, the XO leads the battery to the next position. He supervises the occupation of the position, ensuring the weapons are laid and prepared for firing.

c. Fire Direction Officer. The FDO trains and supervises the FDC. With assistance of FDC personnel, the FDO computes firing data and ensures that only proper, accurate fire commands are sent to the battery. He ensures that a situation map is maintained and that FDC records are complete and accurate. He ensures that communications are maintained with the battalion FDC, the BOC, FOs, and LNOs. The FDO is assisted by the operations chief.

d. Assistant Executive Officer (AXO). The AXO supervises the fire direction operations of the BOC. He also assists the XO and the FDO in battery operations, as required, giving the battery a 24-hour capability.

e. First Sergeant. The first sergeant fulfills those duties and responsibilities associated with a unit first sergeant. In the field, the first sergeant monitors and/or supervises the provision of food and water services, laundry, showers, and the care and evacuation of personnel.

f. Battery Gunnery Sergeant. The battery gunnery sergeant assists in the supervision of the battery's firing. His duties require him to spend much of his time on or near the gun line. He may accompany the advance party during RSOP to prepare the next position for occupation.

g. Local Security Chief. The battery local security chief supervises the local security efforts of the battery. He trains battery personnel in security operations and patrolling. During operations, he prepares the battery defensive plan and supervises its execution. He receives guidance on local security matters from the battery commander and may accompany the advance party during RSOP to prepare the next position for occupation.

Chapter 4

Artillery as a Fire Support System

4001. Understanding Artillery

As discussed in chapter 1, artillery is a fire support system. Like other fire support systems, artillery has strong and weak points. Optimum effectiveness requires an understanding of what artillery is, what affects its firing accuracy, and what contribution artillery makes to combat power. This chapter discusses artillery first from the howitzer perspective and talks the reader through the delivery of artillery fire. Finally, the chapter identifies artillery limitations and offers considerations for offsetting these weaknesses.

4002. Artillery Weapons

Marine artillery includes weapons classified as cannons. A cannon is a piece of artillery, fixed or mobile, which includes guns, howitzers, and breech-loading mortars. Cannon artillery is classified by caliber of the tube diameter and by means of transport. Marine cannon artillery consists of *light* (120mm and less), and *medium* (121mm through 160mm).There are currently no *heavy* (161mm through 210mm) or *very heavy* (greater than 210mm) cannons in Marine artillery.

Artillery weapons have three basic characteristics: **mobility, stability, and flexibility.**

a. Mobility. Artillery must keep up with the supported unit. It must be capable of displacing quickly to be in position to deliver fires where and when needed. Ground means of transport include towed and self-propelled weapons. A *towed weapon* is one that must be moved by an external prime mover, such as a truck or tractor. The weapon is detached from the prime mover for firing. *Self-propelled weapons* have their cannons permanently installed on a full tracked vehicle which provides its own automotive power. Light artillery is normally towed; medium artillery is towed or self-propelled; and heavy artillery is usually self-propelled.

Trafficability affects the mobility of artillery; e.g., mountainous, sandy, marshy, or snowy terrain. Artillery can also be transported in ships and landing craft.

Artillery weapons are helicopter-transportable and air-transportable. Artillery weapons that are carried by helicopter and landed to permit immediate employment are *helicopter-transportable*; e.g., towed weapons. Prime movers can be lifted by helicopter, depending on atmospheric conditions, distance to be flown, and vehicle weight. Weapons that are used in air movement operations are *air-transportable*; e.g., towed and self-propelled weapons.

b. Stability. Stability is the ability of an emplaced weapon to remain in place and withstand the shock of firing. Stability allows the delivery of accurate fires in various soil conditions. Artillery weapons have built-in features which provide stability; e.g., suspension systems, trails/spades, firing platforms. The selection of good firing positions (i.e., level, firm ground) and the practice of field expedient methods can enhance stability; e.g., logs placed behind trails in sandy soils.

c. Flexibility. Flexibility is the ability of a weapon to deliver fire over a wide front at all angles of elevation without time-consuming shifts. Artillery has on-carriage elevation and traverse mechanisms to allow rapid shifts. This characteristic, coupled with the range capability of medium and heavy artillery systems, reduces the requirement for frequent artillery movement to provide continuous support.

4003. Artillery Ammunition

For the artilleryman to achieve maximum effectiveness of his fires, he must know ammunition. Characteristics of ammunition can be found in appendix A and technical manuals (TMs).

a. Shell/Fuze Combinations. A variety of ammunition allows the selection of the projectile/fuze combination best suited to the target and situation. Certain ammunition may affect friendly maneuver; e.g., family of scatterable mines (FASCAM), improved conventional munitions (ICMs), smoke.

b. Propellant Selection. Propellant selection influences range, accuracy, and survivability of the artillery unit. Higher charges increase

the range of weapons; lower the trajectory of weapons allowing the projectile to pass under enemy radar; decrease the time of flight thereby increasing responsiveness; and increase the fragmentation effects of the projectile. However, high charges create greater wear on the weapon and cause greater range dispersion.

c. Ammunition Lot Management. Ammunition is manufactured by lot. A lot is a quantity of material all of which was manufactured under identical conditions and assigned an identifying lot number. Effective ammunition lot management is directly related to accuracy in fires. The ballistic characteristics of the projectile are influenced by the muzzle velocity of respective lots during firing. Close coordination between the FSSG, division, and the artillery regiment is required to ensure proper ammunition lot management. Ammunition should be resupplied and fired by lot. Large quantity lots are normally used during registrations and fire missions requiring uniform effects for accuracy. Small quantity lots are used for fire missions where uniformity of effects is less critical. Each artillery section segregates ammunition by lot on the gun line.

4004. Fire Delivery

a. Fire Direction. Fire direction is the employment of firepower. It includes tactical decisions and technical computations. Fire direction is exercised in the FDC. The FDC is the agency through which an artillery commander directs the fires of his unit. The FDC receives requests for fire. For more on fire direction, see chapter 8.

(1) Tactical Fire Direction. Tactical fire direction is the control of one or more units in the selection of targets to attack, designation of the unit or units to fire, selection of the method of attack, and selection of the most suitable ammunition for the mission. The regiment exercises tactical fire direction when assigning missions to subordinate units or when responding to requests for reinforcing fires from subordinate or supported units. The battalions exercise tactical fire direction of firing batteries to the extent required and as the tactical situation permits. Firing batteries can exercise tactical fire direction, particularly when operating independently. FDCs can exercise tactical fire direction manually or by employing automated fire direction equipment.

(2) Technical Fire Direction. Technical fire direction is the conversion of requests for fire to appropriate firing data and fire commands. Technical fire direction is exercised by firing batteries using automated or manual procedures but can be exercised by battalions, if required.

b. Fire Control. Fire control is the control of all operations connected with the application of fire on a target. Control may be centralized or decentralized. Control should be centralized at the highest level consistent with the capability of the FDC to maneuver and mass the fires of two or more units. Unreliable communications may necessitate decentralized control in whole or in part.

c. Firing Accuracy. Artillery's effectiveness is measured by how well it can deliver fire on target. Artillery strives for the ability to deliver massed and accurate fires without adjustment. Accuracy also saves ammunition.

(1) Firing accuracy depends on the control of three types of errors; human, constant, and inherent. Examples of human errors are inaccuracy in determining the battery or target location and errors laying the battery. These errors can be minimized by training. Constant errors include factors such as drift, muzzle velocity (MV) variations, variations in projectile weights and propellant temperatures, altitude differences between the firing battery and the target, and variations in atmospheric conditions. The FDC can compute corrections to compensate for constant errors. Inherent errors are composed of ballistic factors which cannot be corrected. See paragraph 4006.

(2) The ability to deliver accurate predicted fires without adjustment requires five elements of information. These elements include target location and size, accurate weapon location, ammunition and weapon information, met information, and computation procedures.

(a) Target Location and Size. Accurate target location and size permits the computation of accurate firing data and the selection of the best method of attack. Accurately located targets require fewer rounds and firing units for effectiveness on target. The use of lasers and laser-guided munitions enhances accuracy. See FMFM 6-8 for detailed procedures for target location. Accuracy of artillery is also dependent on gun target range. Generally, the closer the weapon is to the target, the more accurate the fire.

(b) Accurate Weapon Location Artillery survey provides accurate location and directional control essential to firing accuracy. When required, artillery units can determine location and direction using hasty survey techniques. Hasty survey techniques are less accurate than survey data provided by survey parties using precision equipment. Detailed procedures of hasty survey are given in FM 6-2, *Field Artillery Survey* and FM 6-50, *Tactics, Techniques, and Procedures for the Field Artillery Cannon Battery.*

(c) Ammunition and Weapon Information. Accurate firing requires accurate weapon and ammunition data. Fire control tests ensure that a howitzer is laid accurately on target. TMs provide detailed descriptions of these tests. Regular checks on the fire control alignment can be made by boresighting. Some periodic tests must be done at the FSSG. Accuracy results from a determination of the actual performance of the weapon's MV. The firing battery can calibrate individual weapon MV using the M-90 velocimeter. The battery should conduct calibration as often as possible. Firing tables and technical gunnery procedures allow the battery to account for specific ammunition information (weight, fuze type, rocket motor temperature, or timer temperature).

(d) Met Information. The weather affects the projectile in flight; e.g., temperature, air density, wind. Current met information allows the battery to compensate for nonstandard weather effects in its firing data.

(e) Computation Procedures. The computation of firing data must be accurate. Fire direction training and automated equipment enhance the computation of accurate firing data.

(3) Corrections are determined by the FDC to compensate for the constant errors. Corrections for *nonstandard conditions* are applied to firing data to increase accuracy. These corrections can be determined using various techniques, as dictated by the tactical situation:

(a) Met + VE (Velocity Error). The preferred technique is known as met + VE. Met + VE is a technique by which met data and MV data are used in the mathematical computations of corrections to improve accuracy. This technique enhances survivability because it allows first round accuracy without registration.

(b) Registrations. When met and MV data are not available or the FDO does not have confidence in the data, then he should conduct a registration to obtain accurate data for subsequent engagement of targets. A precision registration provides the highest degree of accuracy, but increases the vulnerability of the unit and is time and ammunition expensive. HB/MPI registrations are the most efficient. Survivability may be enhanced by offset registration (i.e., registering from a supplementary position), abbreviated registration, one round corrections from radar, or registration to the rear to reduce the chance and accuracy of detection.

Registration fire may be disguised with other fires, and several units can register simultaneously. To hold the number of batteries registering to a minimum, registration corrections can be transferred from one unit to other units if accurate MV data and common survey control are available. Registrations should include those propellants which give sufficient coverage of the zone of action and should be closely coordinated with met flights.

(c) Adjust Fire Techniques. When required, adjust fire techniques and the best available met + VE solution are used. Accurate target location and refinement corrections are required for accurate corrections using the adjust fire technique. Missions conducted solely for registering should be held to an absolute minimum.

d. Techniques of Delivery. The technique of delivery describes how the weapon is aimed. The gun-target range and the tactical situation influence the technique used.

(1) Indirect Fire. Indirect fire is delivered at a target which cannot be seen by the aimer. Indirect fire allows artillery to fire from firing positions in defilade for enhanced survivability. The FDC computes data to aim the weapons. Indirect fire can be delivered as low angle or high angle fire.

(a) Low Angle Fire. Low angle fire is delivered at angles of elevation below the elevation that corresponds to the maximum range of the gun and ammunition concerned. Low angle fire allows the artillery to engage targets at extended ranges without displacing.

(b) High Angle. High angle fire is delivered at angles of elevation greater than the elevation that corresponds to the maximum range of the gun and ammunition concerned. In high angle fire, the range decreases as the angle of elevation is increased. High angle fire is used when firing from deep defilade, from within cities, or over high terrain features. High angle fire may also be required when targets are located directly behind hill crests, in jungles, or in deep gullies or ravines. High angle fire increases the vulnerability of friendly artillery to radar detection and generally reduces the accuracy of fires.

(2) Assault Fire. Assault fire is a special technique of indirect fire. It is extremely accurate destruction fire. The maximum charge that will clear intervening crests is used to effect maximum MV and penetration. Firing is conducted by a single weapon, normally of medium or higher caliber. The weapon is positioned at a sufficiently short range to attain pinpoint accuracy against a stationary target. The short range and flat trajectory make possible successive hits on the same portion of the target. Assault fire is used for the destruction of caves, pillboxes, or other fixed fortifications by firing on the vertical portion of the target.

(3) Direct Fire. Direct fire is delivered at a target which is visible to the aimer. In direct fire, the gunner of the weapon sights (and tracks) the target and aims the weapon. Direct fire is used primarily for the battery's self-defense but can be used to engage targets for destruction or neutralization effects in support of the force.

e. Ammunition Selection/Volume. The proper selection of ammunition and volume will achieve the desired results with maximum effectiveness and efficiency. If the wrong ammunition is used, a larger quantity of ammunition is required, thus wasting ammunition and increasing vulnerability to enemy counterfire. If the volume is insufficient, the results will be reduced or nonexistent. FDOs use joint munitions effectiveness manuals (JMEMs) to determine ammunition/volume selection. Other tools such as the graphical munitions effects table (GMET) and the attack guidance matrix can also assist the FDO in determining volume/selection of ammunition. Logistics constraints may influence the selection.

f. Method of Attack. The method of attack includes arranging or shaping the fires to conform to the target. The fires of several units can be delivered on a target in a single mission; the bursts of a unit's

rounds can be distributed to provide coverage of the target; and the time of delivery can be controlled to achieve surprise. These methods are interrelated and are often used in combination. The method of attack is influenced by the size of the target area, target composition, mobility of the target, and number and vulnerability of firing units. The artilleryman can achieve the most from his available ammunition by selecting the proper method of attack.

(1) Forms of Fire. In relation to form, artillery fire can be delivered as a concentration or barrage.

(a) Barrage Fire. Barrage fire is a technique where fires are configured to achieve the desired results in the target area. The fire is designed to fill a volume of space or area rather than aimed at a given target. The configuration, volume, and duration of fire is based on its intended effect and tactical situation.

(b) Concentrated Fire. Concentrated fire is fire from a number of weapons directed at a single point or small area. In Marine artillery, the term **massed fire** is synonymous with concentrated fire. Massed fires inflict damage and casualties on the enemy before the enemy has time to react and seek cover. Massed fires increase the survivability of friendly artillery by reducing the firing signature and enhance ammunition economy by requiring fewer rounds fired. Massed fires are most useful when engaging *soft* targets (e.g., personnel in open) which can quickly become *hard*; e.g., personnel with overhead cover. Massed fires do not give increased effectiveness on targets that are hard and stay hard. Here, an accurate volume of fire is more important.

(2) Distribution of Bursts. The distribution of bursts can be shaped for optimum target coverage. The term *sheaf* is used to denote the planned planes (lines) of fire that produce a desired pattern of bursts with rounds fired by two or more weapons. Figure 4-1 depicts the sheafs.

(a) Circular Sheaf. When using automated technical fire direction, the BCS assumes a circular sheaf unless data is input otherwise. The BCS computes individual weapon aiming points around a target with an assumed radius of 100 meters.

(b) Converged Sheaf. A converged sheaf places all rounds on a specific point. It is effective when engaging small, hard targets.

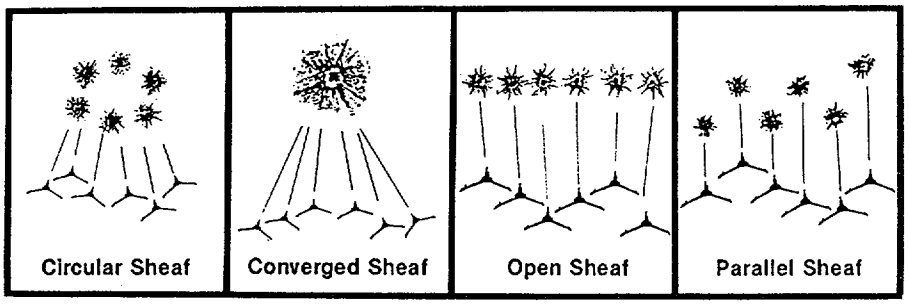


Figure 4-1. Sheafs.

(c) Open Sheaf. The open sheaf separates the bursts by the maximum effective width of the burst of the type shell being used. The open sheaf provides for optimum coverage of a linear target (a target which has more width than depth).

(d) Parallel Sheaf. A parallel sheaf results when the lines of fire of all pieces are parallel. The parallel sheaf is particularly effective when engaging area targets. This sheaf is normally used in manual technical fire direction.

(e) Special Sheaf. Sheafs can be other than parallel, converged, open, or circular. Special sheafs of any configuration can be provided to match the target area.

(3) Method of Fire and Control. The method of fire and control indicates the manner of attacking a target. The distribution and timing of delivery can be controlled.

(a) Area Fire. Area fire is a volume of fire delivered in a prescribed area, generally for neutralization effects.

(b) Precision Fire. Precision fire is used for registration and for attack and destruction of point targets.

(c) Special Corrections. Special corrections may be used to attack targets. These corrections are time-consuming and may increase the vulnerability of the firing unit. Special corrections include zone, sweeping, and zone and sweep fires.

Zone Fire

Zone fire is delivered in a constant direction at several quadrant elevations. Zone fire is used for targets whose depth is generally parallel to the battery.

Sweepinq Fire

Sweeping fire involves lateral distribution to cover wide targets generally perpendicular to the battery.

Zone and Sweep Fire

This method of fire combines zone and sweeping fire and is valuable in attacking large, regular-shaped targets.

(d) Controlling the Time of Delivery. The time of delivery of fires can be controlled by the observer, FDC, or FSCC. The *at my command* technique allows for the control of the exact delivery of fire. The *time on target* technique assures initial rounds strike the target at the time specified. Controlling the time of delivery of fires enhances surprise and shock and is particularly advantageous when engaging moving targets.

g. Rates of Fire. The greatest demoralizing effect results when surprise fire is delivered with maximum density. Density results from a high volume of fire achieved by massing and by high rates of fire. The rate of fire is the number of rounds fired per weapon per minute. Rates of fire vary with the weapon, as determined by the heating effect on the weapon. Lower charges have a lesser heating effect than higher charges, thus increasing the permissible rate of fire. Rates of fire are specified as the sustained rate and the maximum rate.

(1) Sustained Rate. Sustained rate is the rate of fire that a weapon can continue to deliver for an indefinite length of time without seriously overheating.

(2) Maximum Rate. Maximum rate is the rate of fire that a weapon can continue for a short period without seriously overheating.

4005. Observation and Target Acquisition

Observation is employed by artillery for four purposes: target acquisition, adjustment of fires, surveillance of fires, and battlefield surveillance.

The primary purpose, target acquisition, permits first round fire for effect by accurate target location. Targets are detected by ground or air observers, weapons-locating radars, and other means such as sensors.

a. Observed Fire. Observed fire is fire which the point of impact or burst can be seen by an observer. The fire can be controlled and adjusted on the basis of observation. Observation is sought whenever possible because it allows for adjustment of fire for best possible effect. It allows continuation of fires only as long as it yields beneficial results and provides for damage assessment. Fires on targets of opportunity and prearranged fires can be observed.

(1) Target of Opportunity. A target of opportunity is a target visible to an observer which is within range of available weapons and against which fire has not been scheduled or requested.

(2) Prearranged Fire. Prearranged fire is formally planned and executed against targets or target areas of known location. Such fire is usually planned well in advance and is executed at a predetermined time or during a predetermined period of time. *Scheduled fires* are prearranged as to location and time of delivery. *On-call* fires are prearranged as to location and fired on request or on signal.

b. Radar Fire. Radar fire is fire aimed at a target which is tracked by radar. Weapons locating radars provide a means to detect and locate hostile indirect fire weapons. They can also be used to adjust friendly fire and conduct registrations.

c. Unobserved Fire. Unobserved fire is fire for which the points of impact or bursts are not observed. Targets are obtained from intelligence sources, by the study of aerial photographs, by target prediction, and detected by target acquisition devices. With corrections for nonstandard conditions, unobserved fires can be delivered with some degree of accuracy. However, observation is always desired.

d. Targets Suitable to Artillery. A target is a geographical area, complex, or installation planned for capture or destruction by military forces. It is an area designated and numbered for future firing. Not all targets detected on the battlefield are suitable to artillery nor can artillery engage all targets encountered. Some targets would be a waste of ammunition, while others are best attacked by another supporting arm or by combined arms. The targets of prime importance to artillery in close support

of maneuver units are hostile infantry or armored combat formations and hostile mortar/artillery and rocket firing batteries. Targets encountered on the battlefield vary in composition, size and shape, vulnerability, mobility, and recuperability.

(1) Point Target. A point target is of such small dimension that it requires the accurate placement of ordnance to neutralize or destroy it. It is generally a target that is less than 200 meters in length and width. Examples of point targets are tanks, armored personnel carriers, and bunkers. These targets are made ineffective by inflicting casualties to the operating personnel and by damaging the equipment. Heavier caliber weapons produce greater effectiveness from one hit than lighter calibers. A direct hit by a lighter caliber weapon is usually required to render damage to a hardened point target. When the target radius is less than 50 meters, a converged sheaf should be considered.

(2) Area Target. An area target consists of an area rather than a single point. Area artillery targets include personnel (platoon-sized and larger) or materiel targets; e.g., armored formations, truck parks, ammunition dumps, petroleum, oil, and lubricants (POL) dumps, and communication centers. Large area targets may be subdivided into separate aiming points to distribute fires and ensure adequate coverage of the target. Effectiveness against area targets depends on the target location accuracy, target size, and degree of protection.

(3) Moving Target. For artillery to seriously damage a point target, the target must usually remain stationary or move very little while the fires are hitting the target. For an area target such as an armored or infantry battalion, individuals and pieces of equipment may move, but the unit effectively remains still if a portion of the unit remains in the dispersion pattern of the incoming rounds. Effectiveness of artillery requires an accurate prediction of the time of arrival of the target at an accurate, predetermined location. Consideration must be given to changes in speed of the target. Guided projectiles can be effective against moving point targets, depending on the speed and range of the target.

4006. Effects of Artillery Fires

The value of artillery is directly related to the effects it produces. Besides the factors discussed previously (i.e., weapon characteristics,

ammunition selection, characteristics of fire delivery, degree of observation, and accuracy of target location), the effects are influenced by inherent errors.

a. Inherent Errors. Inherent errors are composed of several ballistic factors: velocity, dispersion of ammunition propellants, ammunition lot variations, wear of tube, nonuniform ramming of projectile (separate-loading ammunition), seating of rotating bands, variations in propellant temperatures, moisture content of propellant, variations in weights of projectiles, residue buildup in bore (e.g., copper deposit from rotating band, residue from burning gases of propellant), and temperature of the tube. These errors cannot be corrected. However, some can be influenced by proper firing battery practices. These inherent errors contribute to dispersion.

b. Dispersion. If several rounds are fired under identical conditions from a single weapon with the same firing data, the rounds will not fall on the same point. The pattern on the ground will be roughly elliptical, with the long axis along the line of fire. This scattering is called dispersion.

(1) Probable Error. Half of the rounds fired will fall within a predictable distance over or short of the point of aim. This distance is referred to as one probable error in range (PE/R). See figure 4-2.

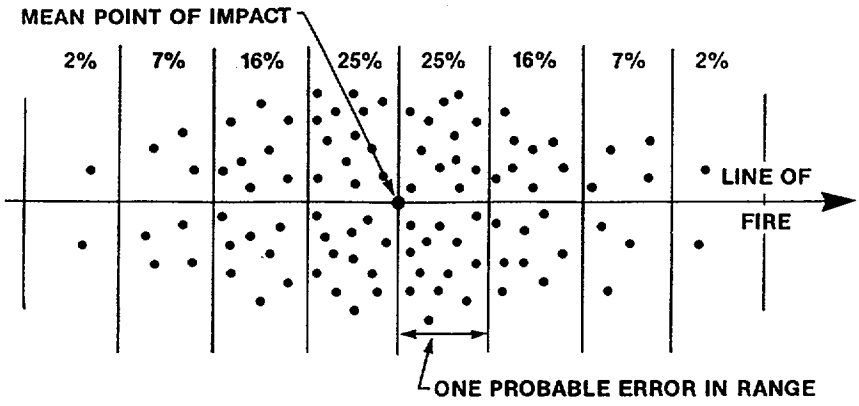


Figure 4-2. Dispersion Pattern and Probable Error.

Ninety-nine percent of all rounds fired will impact within four PE/Rs of the aiming point. The same procedure applies to probable errors in deflection (PE/D) (that is the distance that divides the number of rounds left or right of the point of aim into two equal groups is the PE/D), and probable errors in height of burst (PE/HOB). The values of the probable errors vary with the weapon, range, trajectory, propellant, and fuze (for PE/HOB) used. They can be found in the firing tables for the appropriate weapon. Probable errors are a function of time of flight of the projectile. Generally, the closer the weapon is to the target, the more accurate the fire.

(2) Application. Probable errors are used in determining when it is safe to fire or the amount of risk involved when the point of aim is near friendly front lines. The dispersion of artillery is a characteristic which can be regarded as either a capability or a limitation, depending on the type of target under attack. Against area targets, the bursting projectiles in the dispersion pattern achieve a wide area coverage. However, when attacking small area or point targets, the dispersion phenomenon necessitates the firing of many rounds in order to expect one of them to cause effect on the target.

c. Effects on Target. Artillery fires can be categorized based on the effects they produce on a target. Artillery can produce destruction, neutralization, harassing, interdiction, illuminating, screening, and suppression effects.

(1) Destruction Fire. Destruction fire is delivered for the sole purpose of destroying material objects. Destruction normally requires a heavy expenditure of ammunition, considerable time, and a means of observation. It is best suited to medium and heavy artillery and can be delivered by indirect, direct, or assault fire techniques. Defining the word destruction is easy. Determining when destruction has been achieved is difficult, particularly for an area target. To achieve destructive effects on a target, it is not necessary to completely destroy (e.g., demolish) the target. A target may be considered destroyed if it cannot perform its primary mission; i.e., a tank or artillery piece that cannot shoot, a radar site that cannot acquire. The determination of when a target has been destroyed is situational dependent. Some units and positions can sustain casualties and damage and still accomplish their mission. Therefore, destruction criteria should be based on METT-T and expected munitions effects.

(2) Neutralization Fire. Neutralization fire is delivered to render the target ineffective or unusable. The fires are used to temporarily hamper the movement and/or the employment of the target. For example, artillery fires may destroy an enemy battery's FDC. For the time it takes the enemy to rearrange their operations so the battery has a fire direction capability, the battery is neutralized. Casualties are inflicted on enemy personnel by fragmentation, concussion, fire, or chemical means. Like destruction, the effects required to render a target neutralized are situational dependent. The effectiveness of the fire depends on the degree of surprise, the amount of fire delivered, its concentration (mass), and the degree of protection the target has.

(3) Harassing Fire. Harassing fire disturbs the rest of the enemy troops, curtails movement and, by threat of losses, lowers their morale. These fires are delivered occasionally, usually at night or during periods of reduced visibility. Intermittent firing can serve to deceive the enemy as to what friendly maneuver is doing or preparing to do. The fire can be delivered by a single piece, battery, or battalion. Any target is suitable. Ammunition constraints and the counterfire threat may limit or make unfeasible the use of these fires.

(4) Interdiction Fire. Interdiction fire is delivered to prevent the enemy from using the area or point. Roads, railways, bridges, narrow corridors, and other lines of approach or communications may be interdicted to prevent, reduce, or disrupt the enemy forces, supplies, and communications.

(5) Illumination Fire. Illumination fire is delivered to illuminate an area. Illumination fire is used to observe enemy operations and movements, to adjust observed fire during hours of darkness, and to provide assistance to friendly night operations.

(6) Screening and Obscuration Fire. Screening fire using smoke projectiles is delivered to obscure the enemy's observation of friendly forces and their movement. Obscuration fires are used to restrict the enemy observation.

(7) Suppression Fire. Suppression fires are employed to momentarily interfere with an enemy gunner's capability to fire on friendly forces. Suppression fires stun the enemy and keep his head down

while friendly forces accomplish something. While the enemy is suppressed, friendly forces can attack, engage with direct fire, bypass, or call for and adjust neutralization fires. When the firing stops, the enemy will be able to return to action.

4007. Supporting Fires

Supporting fires are delivered by supporting units to assist or protect a unit in combat. Artillery provides two types of fires in support of the force—close and deep supporting fires. The distinguishing characteristic between the two is the proximity of the fires to the friendly forces. *Close supporting fires* are placed on enemy troops, weapons, or positions which, because of their proximity, present the most immediate and serious threat to the supported unit. *Deep supporting fires* are directed on objectives not in the immediate vicinity of our forces for neutralizing and destroying enemy reserves and weapons and for interfering with enemy command, supply, communications, and observations. Supporting fires can be used to achieve numerous purposes, as discussed below.

a. Counterfire. Counterfire is delivered to destroy or neutralize enemy weapons. Counterfire includes counterbattery, counterbombardment, and countermortar fire. Counterbattery fires are delivered to destroy or neutralize enemy indirect fire weapon systems such as cannons, rockets, and mortars. Countermortar fires are directed specifically against enemy mortars. Counterfire provides freedom of action to the supported force and allows the use of friendly artillery to be exploited.

b. Counterpreparation Fire. Counterpreparation fire is intensive, prearranged fire delivered when the imminence of the enemy attack is discovered. It is designed to break up enemy formations; disorganize the enemy's systems of command, communications, and observation; decrease the effectiveness of artillery preparation; and impair the enemy's offensive spirit.

c. Countermechanized Fire. Countermechanized fire is delivered against active enemy mechanized units. See NWP 22-2/FMFM 1-7, *Supporting Arms in Amphibious Operations*. Enemy motorized and mechanized units are engaged with long-range fires to create confusion, slow their movement, inflict damages, and fix them for attack by other supporting arms; e.g., air support.

d. Covering Fire. Covering fire is used to protect troops when they are within range of enemy small arms.

e. Final Protective Fire. An FPF is an immediately available prearranged barrier of fire designed to impede enemy movement across defensive lines or areas. FPFs consist of final protective lines (FPLs), principal direction of fire (PDF), and barrages. FPLs and PDFs apply to small arms; artillery normally fires barrages. An FPF is a priority target in the defense. One FPF can be assigned to a battery. The size of the FPF depends on the number of howitzers and the bursting radius of the weapon's munitions. See FMFM 6-18.

f. Marking Fire. Marking fire is placed on a target for identification. The fire can be used to mark the target for attack by other supporting arms (e.g., air support) and for orientation of observers/units.

g. Preparation Fire. Preparation fire is delivered on a target preparatory to an assault. Preparation fires are an intense volume of fire delivered in accordance with a time schedule. These fires disrupt communications, disorganize and soften the hostile defense, and assist the friendly forces in gaining fire superiority.

h. Reconnaissance by Fire. Reconnaissance by fire is a method of reconnaissance in which fire is placed on a suspected enemy position to cause the enemy to disclose his presence by movement or return of fire.

i. Suppression of Enemy Air Defense (SEAD). SEAD is fire delivered to neutralize, destroy or temporarily degrade enemy air defenses in a specific area by physical and/or electronic attack.

(reverse blank)

Part II

Employment

Artillery fires make a vital contribution to the accomplishment of the MAGTF's mission. Effective artillery support results when the artillery unit can shoot, move, and communicate. Artillery employment begins with thorough planning. Reliable communications and timely target and intelligence processing are critical to the responsive delivery of artillery fires. Finally, artillery units must be capable of timely, rapid displacements to ensure positioning for optimum support and for survivability.

This part provides techniques and procedures for the artillery commander and staff for effective artillery employment. It is intended as a basis for unit SOPs.

(reverse blank)

Chapter 5

Artillery Planning

5001. Overview

Artillery planning is conducted continuously and concurrently at all levels. The artillery officers on the FMF and MAGTF commanders' staffs plan artillery support to meet the needs of the force. They prepare an estimate of requirements and an estimate of supportability. Artillery commanders and their staffs develop estimates and subsequent plans which are based on their own units' capabilities and requirements.

5002. Artillery Staff Estimates

Staff estimates are within the framework of the commander's estimate and decision. See FMFM 3-1. Artillery staff estimates present a means of review and recommendation regarding organization for combat, CSS, intelligence, and tactical employment of the artillery. Estimates are conducted to ensure sufficient weapons and support are employed for effective fire support.

a. Role of the Artillery Officer, FMF and MAGTF. At the beginning of the planning phase of an operation, overall artillery requirements and the artillery's capability to provide effective, continuous support for each proposed course of action is determined. The estimate of artillery requirements addresses the number and types of artillery, the amount and type of ammunition, the amount and type of shipping, landing craft, and aircraft for movement, the amount and type of special equipment required for the operation, and the need for special training. The estimate of supportability analyzes the area of operations, enemy capabilities, and each course of action proposed to the commander and cites advantages and disadvantages of each from an artillery viewpoint. Requirements identified by artillery commanders are consolidated and analyzed, overall requirements refined, and final artillery requirements determined. In amphibious operations, the MAGTF commander, as the commander, landing force (CLF), submits consolidated requirements to the commander, amphibious task force (CATF) for review and

fulfillment, as appropriate. The MAGTF artillery officer prepares the plan of employment of the artillery. This becomes the artillery fire plan to the force operation plan or order. Appendix B provides the format for the estimate of supportability. FMFRP 6-17 provides the format and detailed information about the preparation of the estimate of requirements.

b. Role of Artillery Commander and Staff. The artillery commander and his staff examine the supported commander's concept of operation and determine how artillery support can best be rendered. The artillery commander prepares estimates, issues guidance, establishes priorities, and allocates his resources, as required. Each staff officer deduces requirements and concerns from his functional area of responsibility; e. g., operations, CSS, communications. This planning may be conducted verbally and in as much detail as permitted by the tactical situation and time available. Written estimates of supportability are prepared at lower echelons for separate operations and when requested by the supported commander. Requirements are consolidated at the senior artillery unit and forwarded through the chain of command. The artillery fire plan of the force operation plan/order, the operation plan of the higher artillery headquarters (as applicable), the fire support plan of the supported unit, and his own estimate of the situation guide the artillery commander in the preparation of his own plan/order.

5003. Artillery Fire Plan

The artillery fire plan is part of the operation plan of the supported unit or force. It contains the necessary information and instructions about the employment of artillery. The detail of artillery fire plans depends on the time available, extent and accuracy of target locations, plan of operations, artillery means available, and fire support requirements. The fire plan consists of three parts: the basic document, the target list, and schedules of fires. Information that is too voluminous to put into the body of the artillery fire plan may be placed in supporting papers to the plan. When possible, reference is made to an SOP. For fire planning procedures, see chapter 8. Appendix C provides the format for the artillery fire plan.

5004. Artillery Operation Order/Plan

The artillery commander may issue an operation order/plan amplifying the instructions on the execution of artillery support contained in the artillery fire plan. Reference to SOPs reduces the bulk of the order/plan. The order is as detailed as necessary to accomplish the mission without hindering the flexibility of the artillery.

Chapter 6

Communications

6001. Overview

Dependable communications are vital to artillery operations. The artillery cannot accomplish its mission if reliable communications don't exist between FOs, OPs, LNOs, and the FDC, or between the FDCs.

6002. Means of Communication

The artillery uses three means of communication: wire, radio, and messenger. Visual and sound signals may also be used. Single and multichannel radios, facsimile, and digital equipment are used. Each means has inherent advantages and disadvantages. The means used will be dictated by the availability of equipment, personnel, time, and the area of operations.

Other considerations affecting the means used for communications include the tactical mission assignment, the degree that control and fire direction is centralized, communications security, and the tactical situation; e.g., proximity of units, mission of supported unit. From a survivability standpoint, wire and multichannel radio are the preferred methods. However, in many situations, single-channel radio will become the primary means. For information on communications systems, equipment, and net descriptions, see FMFM 3-30, *Communications.*

a. Radio System. Radio is used when communicating over long distances and when other means are not possible or are severely limited. Radio is particularly important during displacements and the initial stages of occupation of positions, for widely dispersed operations, and in fast-moving situations. As the wire system is installed and expanded, some traffic load may be shifted from the radio to the wire system. If the wire system fails or if the traffic load becomes too great, the radio system can be used. The radio system must satisfy internal and external artillery communications. Internal communications are used for command and control, fire direction, dissemination of intelligence warnings and survey

356-548 O - 93 - 3

and met data, collection of information, and CSS. External communications with higher headquarters, reinforced, supported, and adjacent units are used for requests for fire missions, warnings, met and survey data, tactical orders, exchange of information and intelligence, fire support coordination, and for command and support supervision.

The extent of the radio system varies. The identity and purpose of the nets are established by doctrine. However, the net composition is established to satisfy mission requirements.

b. Wire System. Wire circuits parallel radio nets. Wire is used extensively in internal communications. Wire communications are particularly effective in the defense or in a slow-moving operation. The nature and extent of the wire system depends on the length of time the position is occupied, the terrain, and the distance between units/installations. Wire should be protected from damage by shelling, bombing, and vehicular traffic. When time permits, wire lines should be buried or installed overhead and alternate lines provided to all positions. Priorities are established for installation of wire circuits by SOPs or as directed by the commander or S-3. Priority is normally given to the installation of circuits necessary for the conduct of fire, fire direction, fire support coordination, and communications with supported elements. Local and administrative lines are installed as time permits. Wire lines are recovered on displacement, as the situation permits.

c. Visual and Sound Signals. Signals are useful in movement and convoy control. They are also used to alert individuals of possible attack, to signal the start or stop of a preplanned act, and in situations where the message is simple. Visual panels may also be employed for signaling.

6003. Other Systems and Equipment

Equipment technological advances are enhancing artillery operations. This equipment is facilitating the transmission of messages, navigation, unit identification, etc. As this equipment is fielded, the designation of nets to accommodate this equipment may be required.

a. Digital Communications. Digital communications afford tremendous opportunity to automate systems and to display real time information responsive to the commander's requirements. Digital communications means can exchange tactical fire direction information

among artillery units via very high frequency (VHF) and high frequency (HF) radio. Those means include digital communications terminal/battery computer system (DCT/BCS) and modified-fire support team/digital message device (MOD-FIST/DMD). Fire support messages can be exchanged via the AN/PSC-2 (DCT) operating with radio or wire equipment. Message types include call for fire, FPF, fire unit capability, check firing, and time check.

b. Position Location Reporting System (PLRS) (AN/USQ-90). PLRS provides the basic functions of position location, navigation and unit identification. The service is provided in all surface environments, during day and night operations as well as all conditions of visibility. A secondary mission is to provide a digital data communications capability which allows users to send and receive formatted as well as free text messages. The system is an automatically cryptographic-secured and jam-resistant ultra high frequency (UHF) radio network. User units employ transceivers and devices which permit units to provide data and requests to a master station and to receive and display information from a master station. In addition to providing a means for units to accurately locate their positions for faster coordination of fires, the system can enhance the delivery of fire. Observers can fix their own location, which enhances their ability to locate targets accurately and rapidly.

c. Global Positioning System (GPS). GPS is a space-based radio navigation system which provides position, velocity, altitude, and time both globally and continuously. The system has several uses to artillery, including navigation, position location, time, surveying, etc. Position location information can be provided in the military grid reference system to a spherical error probability of ten meters, or in latitude and longitude. The user may input target or reference point coordinates and receive range and bearing from his position to the target or reference point.

6004. Communications of the Artillery Regiment

a. Installation Responsibilities. The communications company, headquarters battalion, Marine division, and the communications platoon, headquarters battery, artillery regiment, establish the required communications at the division primary and alternate CPs.

(1) Communications Company, Headquarters Battalion. Installs, operates, and maintains a multichannel radio circuit between the

division and the artillery regiment headquarters. The company also installs and operates all wire facilities, multichannel terminals, and teletype systems in the division FSCC. When the division alternate CP is located at one of the artillery regiment headquarters echelons, communications company provides additional equipment, circuits, and personnel.

(2) Headquarters Battery, Artillery Regiment. Installs and operates all wire facilities within the artillery regiment headquarters echelons, provides wire and multichannel links to subordinate units, and provides personnel and equipment to operate all internal and external artillery radio nets for the division FSCC.

b. Internal Radio Communications of the Artillery Regiment

(1) Artillery Regimental Command Net (Arty Regt Comd)—HF

Purpose

Command and coordinate administrative and logistical activities; alternate for fire direction and tactical orders.

Stations

Artillery regimental headquarters; battalions; attached units; division FSCC, as required.

(2) Artillery Regimental Tactical Net (Arty Regt Tactical)—VHF

Purpose

Command and control of subordinate units; e.g., tactical mission assignments, displacement reports; counterfire; alternate for fire direction and fire support coordination.

Stations

Artillery regimental headquarters, battalions, attached units, division FSCC.

(3) Artillery Regimental Fire Direction Net (Arty Regt FD)—VHF

Purpose

Tactical fire direction; used by subordinate units to request reinforcing fires; alternate fire planning and coordination; division FSCC may monitor to stay abreast of artillery fire planning.

Stations

Artillery regimental headquarters; battalions; division FSCC; regimental FSCCs, as required.

(4) Radar Telling Net—VHF

Purpose

Exchange of radar intelligence information and requests for surveillance of enemy counterfire weapons; may be used for radar registration and adjustment of fires.

Stations

Artillery regimental headquarters; weapons-locating radar sites; battalions and batteries, as required. When a radar section is attached or under operational control of an artillery battalion, this net is activated.

(5) Division/GCE Artillery Air Spot Net—VHF/UHF

Purpose

Means for air observers to adjust artillery fire. The artillery LNO and/or the FO may monitor the net for information and coordination of targets in their unit's zones.

Stations

Artillery regimental headquarters, air observers, battalions and batteries, FSCCs, FOs, and GCE headquarters, as required. For specific missions, control may be passed to the FDC conducting the mission.

(6) Regimental Survey/Met Net—VHF

Purpose

Exchange of survey information and data between survey teams and, when required, the artillery survey information center; exchange of meteorological information between artillery units.

Stations

Artillery regimental headquarters; battalions/batteries; regimental and battalion survey officers; division headquarters, as required.

(7) Regimental Communication Coordination (Comm Coord) Net—HF/VHF

Purpose

Coordination, installation, and restoration of communication circuits.

Stations

Artillery regimental headquarters, battalions.

c. External Radio Communications of the Artillery Regiment. The artillery regiment is normally a station on the nets listed below.

- Division/GCE Command Net 1 (HF).
- Division/GCE Tactical Net 1 (HF/VHF).
- Division/GCE Alert/Broadcast Net (HF).
- Division/GCE Intelligence Net (HF/VHF).
- Division/GCE Fire Support Coordination Net (HF/VHF).
- Division/GCE Communication Coordination Net (HF/VHF).
- Division/GCE Air Observation Net (UHF/VHF), as required.
- Division/GCE Damage Control Net (HF), as required.
- Division/GCE Reconnaissance Net (HF), as required.
- Division/GCE Convoy Control Net (VHF), as required.
- MAGTF/LF Fire Support Coordination Net (VHF), as required.
- MAGTF Artillery Air Spot Net (UHF/VHF), as required.
- MAGTF/LF Artillery Command/Fire Direction Net (HF) (during landing phase of amphibious operations).

d. Multichannel Radio Communications of the Artillery Regiment. The artillery regiment has multichannel radio communications capability. The artillery regiment system interfaces with the infantry multichannel system. The artillery regiment can install multichannel radio between the artillery regiment and the artillery battalions. The artillery regiment provides the equipment and installs, operates, and maintains both terminals.

e. Wire Communications of the Artillery Regiment. Wire is used for local telephones within artillery headquarters echelons, wire/multichannel, radio-wire integrated circuits, teletype circuits, and radio remote connections. Trunk lines are installed between the artillery regiment's switching center and the division alternate CP switching center. Trunk lines may also be established to subordinate and attached units when distance, time, and the tactical situation permit. The artillery battalion lays wire lines to its batteries. In the firing batteries, trunk lines are laid between the battery switching center, the supported unit, the parent unit, and the liaison switching center when there is one. Wire is used to connect the BCS to gun display units on the gun lines. Wire is also used for local security communications. Long locals are often necessary between FOs, the liaison switching center, and the battery.

f. Teletype Communications of the Artillery Regiment. Teletype channels are designated in the multichannel radio equipment. A teletypewriter switching center is located in the regimental FDC.

6005. Communications of the Artillery Battalion

a. Internal Communications of the Artillery Battalion. Communications personnel and equipment are provided from headquarters battery to operate the following nets:

(1) Artillery Battalion Command Net (Arty Bn Comd)—VHF

Purpose

Command and control of batteries; principally used for administrative, logistic, and tactical traffic not related to fire direction; e.g., ammunition status, displacement reports.

Stations

Artillery battalion headquarters; firing batteries; regimental FSCC, as required.

(2) Artillery Battalion Fire Direction Net (Arty Bn FD)—VHF

Purpose

Tactical fire direction; used by batteries to request reinforcing fires; supported unit's FSCC may monitor to stay abreast of artillery fire planning and significant artillery missions.

Stations

Artillery battalion headquarters; firing batteries; reinforcing artillery battalions; regimental FSCC; battalion FSCC(s), as required.

(3) Artillery Conduct of Fire Net (Arty COF)—VHF

Purpose

Used by FOs to request and adjust artillery fire; LNOs in battalion FSCCs monitor/receive traffic for fire support coordination purposes; may be used to exchange targets and fire planning information. If tactical fire direction is centralized, the battalion establishes as many as three COF nets and acts as net control on each. The artillery battalion may identify a COF net for each maneuver battalion to facilitate continuity of fire support during battery displacements.

The maneuver battalion (LNOs, FOs) remains on the assigned COF net, and the firing battery assigned to provide fire support to the maneuver battalion enters this net. If tactical fire direction is decentralized, each battery in the battalion will have a separate COF net and will act as net control, each net monitored by the battalion FDC.

Stations

DS artillery battalion headquarters and firing batteries; FOs; artillery LNO at battalion FSCC; artillery LNO at regimental FSCC, as required; reinforcing artillery FDC, as required.

b. Higher Headquarters Artillery Nets. The artillery battalion activates appropriate artillery regimental nets. *As required* nets are activated as permitted by the equipment and personnel available.

c. External Communications of the Artillery Battalion. The external communication requirements are normally as follows:

- Infantry Regimental Fire Support Coordination Net (VHF).
- Infantry Regimental Command Net (HF), as required.
- Infantry Regiment or Battalion Tactical Net (VHF/HF), as required.
- Separate Battalion's Command Net (VHF), as required.
- Infantry Regimental Intelligence Net (VHF/HF), as required.
- Infantry Regimental Communications Coordination Net (VHF/HF), as required.
- Other nets listed in paragraph 6004c, as required.

6006. Communications of the Firing Battery

The battery communications system is established by the communications liaison, and FO elements of the battery. This system is established under the supervision of the artillery battalion unless operating under decentralized fire direction or as an independent or attached unit. The internal and external nets listed below may be established as required by the mission.

a. Internal Communications of the Firing Battery

(1) Artillery Battery Command Net (Arty Btry Comd)—VHF

Purpose

Command and coordinate administrative and logistical matters.

Stations

Artillery battery headquarters; subordinate elements, as required.

(2) Artillery Conduct of Fire Net (Arty COF)—VHF. See paragraph 6005a.

b. Higher Headquarters Artillery Nets. The firing battery activates appropriate artillery battalion nets. Other nets (e.g., radar telling, division/GCE artillery air spot) are activated, as required.

c. External Communications of the Firing Battery. The external communications requirements may consist of the following:

- MAGTF Air Observation Net (UHF/VHF), as required.
- Infantry Battalion Tactical Net (VHF/HF), as required.
- Separate Battalion's Command Net (VHF), as required.
- Other nets listed in paragraph 6004c, as required.

(reverse blank)

Chapter 7

Artillery Intelligence and Targeting

Section I. Organization and Processing

7101. Artillery Intelligence

The primary objective of artillery intelligence is to gain information of importance to artillery operations. This information is evaluated and interpreted to become intelligence. Artillery intelligence is the knowledge acquired through the collection, processing, and dissemination of all information about targets. Artillery intelligence is essential to artillery targeting. Artillery targeting is part of the GCE's total targeting effort. It is used to determine the enemy's capabilities and probable courses of action, to assist the artillery commander in the attack of targets, and to support contingency planning and counter enemy intelligence efforts. Artillery intelligence is enhanced by the conduct of intelligence preparation of the battlefield (IPB). For a definition and more information on IPB, see Appendix H, and FMFM 6-18.

7102. Intelligence Agencies

Marine artillery has a versatile intelligence organization designed to locate, analyze, and evaluate targets. The regimental headquarters battery and each of the artillery battalions have an intelligence section, which includes the S-2 (MOS 0202) and two intelligence men (MOS 0231). The regimental section is the principal link for the artillery intelligence system. In this section, all the information of interest to the artillery converges, is transformed into intelligence, and disseminated to higher, lower, adjacent, and supported units. Battalion S-2s report information to the regimental S-2 and disseminate information they receive to their commanders and subordinate units. In combat, intelligence sections are collocated with the FDC in the artillery main COC. The senior artillery S-2 works closely with the supported unit G-2/S-2 and TIS (when formed).

7103. Sources of Information

Artillery S-2s use all sources available to collect target information and intelligence.

a. Forward Observers. FOs with the forward units are the most active source of information. The FO locates targets and plans fires. He maintains continuous observation of the zone of action and reports all target and intelligence information; e.g., terrain and hostile dispositions.

b. Observation Posts. OPs provide greater depth of observation and more complete coverage of the battlefield than FOs. OPs have more freedom of movement than FOs because the OP does not have to accompany a maneuver unit and can occupy the most favorable terrain. OPs are established by the S-2 of battalion or higher echelons as directed by the artillery commander. The ability to continuously man an OP depends on the availability of personnel. Survey parties (when survey requirements are complete) or other trained personnel can be used. See paragraph 7203.

c. Counterbattery Radar Platoon. Each regiment has a CBR platoon equipped with weapons-locating radars. These radars detect and locate enemy mortars and artillery quickly and accurately enough for immediate engagement by friendly counterfire. These radars can also be used in a friendly mode to assist firing units. See paragraph 7204.

d. Air Observers. Air observers provide a means of observation for the MAGTF. The use of air observers may be limited by enemy air defense. The artillery S-2 and S-3 maintain close liaison with squadrons providing or supporting air observers for artillery intelligence requirements. They keep the squadrons informed of areas and targets of concern, frequencies and call signs, photograph requirements, SOPs, fire support coordination measures, and fire support available.

During flight, air observers report priority information on the division/GCE air observation net, on other air-to-ground nets, or via message drop.

Air observers can locate and call for fire on targets not visible to FOs, cover large areas rapidly, and fill gaps in coverage between FOs. Air observers support fast-moving operations, conduct registrations, provide battlefield surveillance, and provide information on camouflage discipline of friendly units. Air observers also provide locations

of possible artillery positions and routes, assist in locating and guiding resupply convoys, provide radio relay, and provide aerial photographs. Oblique air photographs can be taken to study terrain, target location, and suspected activity.

e. Other Sources. Other sources that can provide artillery intelligence are—

- Ground observers; e.g., mortar FOs, reconnaissance elements, infantry OPs, patrols, frontline troops.
- All artillery personnel may observe targets during the performance of regular duties; e.g., survey teams.
- Intelligence reports. See FMFM 3-21, *MAGTF Intelligence Operations*.
- Interrogation of prisoners of war; study of captured maps and documents.
- Shelling reports (SHELREP).
- Survey and meteorological data.
- Unattended ground sensors and UAVs.
- Interpretation of aerial photographs.
- Surveillance, reconnaissance, intelligence group (SRIG) units.
- Staff visits with the TIO and supported G-2/S-2.
- Other units.

7104. Processing of Information

a. The artillery S-2 coordinates the collection, processing, and dissemination of all information about targets. He coordinates the collection effort with the S-3. He exchanges information with higher, lower, and adjacent units. He works closely with other intelligence agencies in the targeting process. See FMFM 6-18.

b. The intelligence section exchanges target information and intelligence with the FDC. The FDC, in turn, provides target information/intelligence that it receives through fire direction channels. Fire missions are an important source of information.

c. Artillery information/intelligence received by intelligence sections is recorded in a manner that is readily accessible. Intelligence personnel must act quickly in evaluating and interpreting this data. Time-critical data must be disseminated rapidly. Targets capable of displacing rapidly and/or imposing an immediate, serious threat must be engaged as soon as possible.

(1) Counterfire information is processed separately from general information. Incoming counterfire information is recorded, evaluated, and organized to portray the enemy artillery situation. Counterbattery action is taken by the S-3, as required.

(2) General information is evaluated and interpreted to derive intelligence on targets other than enemy artillery and to evaluate damage to targets that have been fired on.

(3) The S-2 and S-3 analyze potential surface targets to determine their military importance, attack priority, desired effects, and weapons required to obtain the desired effects. This *target analysis* is time-dependent. It may vary from a mental evaluation to a detailed written analysis.

(4) Artillery information/intelligence is recorded in graphic or written form and systematically sorted into groups of like items for convenience of study and comparison. Various tools are used to record data; e.g., journals, worksheets, situation maps, overlays, and card files. See FMFM 3-21. Counterfire records are maintained separately and as noted in paragraph 7302.

d. As computer systems are fielded, the exchange of data between units will be enhanced. Many of the functions of target processing described in this manual will be automated. Manual procedures will be used as a backup.

7105. Dissemination

Information and intelligence are forwarded to units needing the data as the nature of the data indicates. Since forwarding all data as it is processed may overload the communications system, the S-2 makes the decision on what intelligence requires immediate distribution.

a. Artillery LNOs keep supported units informed of information and intelligence from the FOs and from the artillery battalion intelligence section.

b. Items of interest are forwarded by the artillery regimental S-2 to the division intelligence section as expeditiously as possible.

c. After evaluation and interpretation, the bulk of the information received is forwarded periodically as directed by SOPs.

Section II. Observation and Targeting

7201. Observation

In artillery, intelligence and observation depend on each other. The principal objective of observation is target acquisition. The artillery regiment has organic target acquisition assets to perform observation.

7202. Employment of Artillery Target Acquisition Assets

The effectiveness of artillery depends largely on the accuracy, completeness, and timeliness of target acquisition. Target acquisition is conducted directly (i.e., data from one source), indirectly (i.e., data from two or more means), or by both.

a. Coordination of Observation. Artillery target acquisition assets are a major component of the force's combat intelligence system. Full use of these assets is made by the G-2/S-2 of the force when forming his collection plan. Artillery S-2s coordinate the employment of these assets to ensure the needs of the force are met as well as specific needs of the artillery. To do this, a plan of observation is prepared simultaneously at each echelon and coordinated by each artillery headquarters with final coordination at the MAGTF level.

b. Plan of Observation

(1) Requirements and priorities are determined and continually updated. The artillery S-2 studies the zone of action using maps and terrain profiles prepared manually, computer-assisted, or obtained from the Topographic Platoon, Intelligence Company, SRIG. He works closely with the supported unit's S-2 to ascertain the coverage planned in the supported unit's collection plan. He learns the locations and sectors of surveillance of ground sensors, airborne sensor coverage, employment of reconnaissance teams, patrols, etc. He coordinates the assignment of zones of observation for each ground observer supporting the unit. Primary zones of observation are given for such areas as probable avenues of approach, killing zones, boundaries

between units, and areas in adjacent zones screened from their assigned observers. Secondary zones of observation may be assigned for other areas within the field of view of the observer. Lines of sight are predicted in the area of operations based on terrain, vegetation, weather, etc.

(2) The artillery S-2 prepares basic intelligence requirements and other intelligence requirements (OIR). See FMFM 3-21. He arranges for the exchange of SHELREPs and other information gained by the supported unit.

(3) At the higher levels, artillery intelligence efforts are integrated with other force assets such as air reconnaissance and surveillance, signals intelligence/EW, UAV coverage, infrared imagery, photographic missions, reconnaissance, and the sensor control and management platoon. The regimental S-2 determines the most likely positions for hostile batteries and mortars and identifies general areas for concentration of coverage. Particular attention is directed to adequate coverage at the critical junction of frontlines, division boundaries, rear areas, and to the search for targets in depth.

(4) The plan of observation is prepared to supplement and complete the collection plan of the supported unit and higher headquarters. The plan outlines mission statements for the collection of specific information, reporting requirements (e.g., as acquired, on a time schedule), positioning, and sectors of coverage of the various target acquisition assets employed by the artillery. Unnecessary duplication is resolved and dead space minimized. The plan seeks to provide a large angle of intersection for bilateral observation of targets for accuracy. The plan is published as part of the artillery fire plan or given orally.

(5) The artillery S-2 and S-3 work closely in developing the plan of observation. Artillery target acquisition assets are employed based on the plan of observation. The plan is refined as these assets occupy their positions. Visibility diagrams are obtained from each position to expose dead space. Redistribution or additional observation assets may be required; e.g., additional FOs in difficult terrain, air observers, artillery OPs, or sensors. Visibility diagrams should be checked with terrain profiles. For details on the visibility diagram, see FMFM 6-8.

(6) The artillery commander and S-3 consider the plan of observation in employing artillery. Positioning and communications are established to respond to targets generated by the plan of observation. For example, artillery batteries can be positioned to engage killing zones activated by sensors employed by the supported unit. Procedures to call for fire are identified; e.g., how reconnaissance teams will call for fire.

c. Considerations for Developing the Plan of Observation

- *Mission.* Focus the plan on mission accomplishment.
- *Enemy.* Employ friendly assets to take advantage of enemy vulnerabilities, while minimizing friendly vulnerability.
- *Terrain and Weather.* Terrain and weather can enhance or degrade target acquisition. For example, fog and dust can degrade visual observation; terrain can afford protection and offer suitable lines of sight.
- *Troops Available.* Priorities must be set to focus the observation effort on critical and vulnerable areas. Personnel and equipment must be employed in accordance with their capabilities, limitations, and vulnerability to enemy attack. Logistics, communications, survey, and security requirements of each asset must be considered.
- *Time Available.* Time must be available to move and position target acquisition assets.
- *Coordination.* Ensure target acquisition assets do not interfere with friendly operations and that coverage is complete without unnecessary duplication.
- *Continuity.* Ensure continuity in coverage by proper positioning and shifting of assets.

d. Observers Orientation. The S-2 and S-3 brief personnel tasked with performing target acquisition, as permitted by the tactical situation. The S-2 identifies particular areas of interest and enemy activities that are expected in the assigned areas or sectors of observation. The S-2 provides information about the enemy to assist the observer to detect and identify targets; e.g., the enemy composition, disposition, and tactics. The S-3 provides the current tactical situation in the assigned observation areas. The S-3 also briefs the plan of attack or defense of the unit/elements in whose zone of action the observers will be operating. When possible, debriefings are also conducted.

7203. Observation Posts

OPs are used to supplement the coverage by FOs. OPs are normally established by artillery battalions.

a. Location. The position of the OP depends on the area of operations and friendly positions in the area. Observation is usually best from higher ground. However, the weather may dictate otherwise; e.g., low clouds or fog. Landmarks should be avoided as they tend to draw hostile fire. Other considerations include ease of concealment of locations and routes thereto and ease of installation and maintenance of communications. Consider remoting antennae to the reverse slope of the OP. OPs may be established along the axis of movement and/or on the flanks.

b. Communications. Communications are established with the parent unit, with the supported unit commander, and where appropriate, with the cognizant FSCC.

c. Operations. OPs are surveyed as soon as possible to provide a common grid with firing units and adjacent OPs. If an OP is to be manned for more than 24 hours and if laser equipment is to be used, then survey of the OP is a priority. Personnel manning OPs should be familiar with flash ranging techniques and have a direction-measuring instrument; e.g., battery commander's scope, aiming circle, or modular universal laser equipment (MULE). See FMFM 6-8.

7204. Counterbattery Radar Platoon

The artillery has organic weapons-locating radar to enhance its intelligence and targeting efforts. The weapons-locating radars are organized into a CBR platoon. The CBR platoon consists of a warrant officer (MOS 0803) as platoon commander, a master sergeant (0848) as radar employment chief, a processing section which mans a target processing center (TPC), and four AN/TPQ-36 weapons-locating radar sections. Notionally, the CBR platoon will employ five radars in combat.

The TPC consists of a processing section chief and fire control men. The TPC collocates with the intelligence section of the supported artillery unit to produce counterfire targets. The TPC also controls the radar sections.

The CBR platoon is augmented by headquarters battery with communicators, radar technicians, and survey support, as required. The CBR platoon is authorized 1st echelon maintenance capability. Electronic maintenance platoon performs 2d echelon and higher maintenance on the radar set, and the supported artillery unit provides 2d echelon maintenance and repair on additional equipment such as motor transport. The supporting CSSE performs higher echelon repairs on CBR equipment.

a. Mission. The primary mission of the CBR platoon is to locate enemy rocket, mortar, and artillery weapons and to process all acquired enemy locations in a timely manner for counterfire and intelligence purposes. Secondary missions that can be assigned by the supported artillery unit are adjusting or registering artillery and providing hasty survey (grid coordinates). When a radar is used for a secondary mission, it is unable to do its primary mission.

b. Capabilities of AN/TPQ-36. The AN/TPQ-36 weapons-locating radar is capable of determining accurate first round locations of enemy rocket, mortar, and artillery weapons firing either high or low angle from 750 meters to 24,000 meters. Mortars are not normally detected at ranges over 12,000 meters. The radar is normally employed to electronically scan a sector of 1600 mils in the hostile mode of operation. However, the radar has the ability to search an area of up to 6400 mils by using the extended azimuth function. In this function, the designated search area is divided into 1600-mil sections and the radar automatically searches each sector for the amount of time assigned by the operator. The radar detects, verifies, and tracks projectiles in flight. The radar has two modes of operation: hostile and friendly.

(1) Hostile Mode of Operation. In-flight track data are used to determine the hostile weapon location and the predicted impact point. The radar can simultaneously track up to 10 projectiles and store 99 targets in memory while searching for new targets. Special procedures allow for averaging of closely grouped weapons, elimination of repeated weapon locations, and weapon-location height adjustment. Weapon location can be determined to an accuracy of 100 meters or 1 percent of the range from weapon to impact, whichever is larger. With the availability of survey, weapon location accuracy increases. Impact predictions are accurate to approximately 500 meters. The radar sections transmit data digitally or by voice to the TPC, and to a firing unit, if assigned.

(2) Friendly Mode of Operation. The radar can register and adjust friendly indirect fire. For this use, firing batteries are linked either digitally by BCS or by voice to a radar section, preferably by wire.

c. Command and Control. The CBR platoon is employed for responsiveness. The CBR platoon employs as a unit or as task-organized detachments. Depending on the situation, radars can be centrally controlled by the artillery regiment and the CBR platoon assigned a GS mission.

Some radar sections can be attached to or placed under the operational control of a battalion when required by the situation. Attachment is favorable for logistics or survey reasons, for widely-separated operations, and for the initial phases of an amphibious assault or expeditionary landing. A detachment normally contains one to three radar sections, a TPC, and support personnel and equipment, as required; e.g., maintenance, service, and survey support. The detachment commander, normally the radar employment chief or a designated individual, serves as a special staff officer to the supported artillery unit's commander. The supported artillery commander controls the detachment through the detachment commander. See FM 6-121, *Field Artillery Target Acquisition*, for detailed information on radars.

d. Employment

(1) In MEF operations, the CBR platoon is normally employed as a unit and controlled by the artillery regimental commander. The TPC is established in the artillery regimental main echelon COC. The CBR platoon commander works under the cognizance of the regimental S-2. He works closely with the regimental S-2 and S-3 to ensure that all CBR assets are being fully utilized and that all counterfire and intelligence data generated by those assets are being processed correctly. If the MEF is operating over a wide area or in rough terrain, it may be necessary to divide the platoon into detachments to provide optimum support. In this situation, each detachment will be task organized with control either being retained by the artillery regimental commander or passed to designated artillery battalion commanders (either GS or DS). Such decentralization can enhance timely target engagement.

(a) The CBR platoon commander coordinates the employment of radars operating under regimental control. The S-2 and S-3

provide guidance as deduced from the plan of observation. The S-3 designates the areas that will receive radar coverage. Based on this guidance, the CBR platoon commander selects a sector of search and general position area for each radar section. The radar section chief selects the actual site for the radar. The general position area should provide sufficient space for the radar section chief to find a site to meet technical considerations.

(b) The battalion S-2 coordinates the employment of radars placed under battalion control. The CBR detachment commander recommends to the battalion S-3 the general position area. The radar section chief selects the actual site for the radar. The radar provides targets to the battalion FDC, where the information is acted on, and sent to the regimental FDC. If the battalion cannot handle a fire mission, reinforcing fires are requested. This will usually occur when the battalion is too involved with close support to handle a counterfire mission. The regiment provides guidance on positioning, coverage zones, cueing, and frequencies. The regiment can reallocate radar assets across the division front as dictated by the situation.

(2) A CBR detachment is normally attached to the artillery battalion in MEB operations. The MEU does not normally have such a detachment.

e. Positioning. Tactically, the radar is positioned to provide coverage of the zone of action of the supported unit and to provide overlap coverage with other radars. Generally, the radar is positioned 3 to 6 kilometers behind the forward line of own troops (FLOT) in the offense and in the defense. Radars should be positioned at least 1000 meters apart and not face each other. Alternate positions are always selected. Technical considerations must also be considered.

(1) The radar site should be flat. The slope of the ground must be less than 120 mils for the radar antenna to be leveled for proper functioning. The optimum radar site will have terrain which gently slopes downward in the direction of search for a distance of at least 200 meters and then rises sharply to form a screening crest (a hill mass). A screening crest between the radar and the enemy will protect the radar from the enemy's EW, direct observation, and direct fire. The screening crest should be located within 300 to 1000 meters of the radar site and in friendly territory. The screening crest must afford

protection to the radar site without degrading radar operation. The optimum screening crest angle for the AN/TPQ-36 radar is 30 mils or less. The radar can function with a screening crest of up to 100 mils, but accuracy and detection decrease as screening crest height increases.

(2) The radar site should provide cover and concealment but the cover should not interfere with visual or electrical line of sight. Electrical line of sight is a straight path from the transmitting antenna to a reflecting object (projectile) or a receiving antenna unobstructed by terrain or other objects. Care must be also taken to ensure that the area in front of the antenna does not absorb or attenuate radar emissions. Reflections will cause multipath errors which produce false targets in the radar's computer. Optimally, the site will be surrounded on three sides with tall vegetation (such as trees) to provide a tunneling effect of radar emissions and to reduce the amount of side lobe radiation escaping from the radar site.

(3) Probability of detecting projectiles is a prime consideration in the positioning of radars. Preferably, the radar is positioned for a side view of the projectile path to obtain a larger reflective surface. In the hostile fire mode, the radar should be positioned to sight the projectile while it ascends and approaches the radar. The probability of detection varies with the horizontal angle (aspect angle) formed at the hostile weapon position between the direction of the hostile projectile and the direction of the radar position. Aspect angles of between 0 to 400 mils and between approximately 1300 to 1500 mils yield over 85 percent probability of detection. Aspect angles of 800 mils have the lowest probability of detection. In the friendly fire mode, the radar must be able to sight the projectile as it descends and goes away from the radar. Optimum aspect angles will increase the probability of tracking a projectile.

(4) The radar must be positioned for good communications to the TPC. If possible, the radar position should be near a firing battery to facilitate survey and logistics, and to take advantage of any existing defensive perimeters. The position must be accessible and provide adequate space for dispersal of two to six wheeled vehicles, tents for personnel, generators, remoted antennae, and other equipment.

(5) On occupation, the radar section prepares a visibility diagram (in duplicate). One copy is retained by the radar section, and

three copies submitted to the S-2 of the unit exercising control. The S-2 forwards a copy of the diagram to the next higher headquarters, as appropriate.

f. Cueing. The radar emits a very high powered beam of energy especially vulnerable to detection. To minimize its vulnerability, a system of *cueing* must be established to tell the radar when to radiate in both the hostile and friendly modes. The CBR platoon commander and S-2 coordinate cueing schedules and instructions based on all intelligence information and the commander's guidance. The cueing instructions will vary with the threat, terrain, and mode of operation. Alternate cueing methods should be planned.

(1) In the hostile mode, the radar is oriented and activated on a suspected weapons location as determined by information and intelligence sources. The radar is cued only when enemy indirect fire weapons are active. FOs, OPs, and air observers are examples of sources that can be used to cue radars. The radar can radiate for 15 minutes or more without being located by enemy ground-based EW if optimum conditions are met. These conditions are a minimum search sector, screening crest, and a tunneling effect created by vegetation. If the site has a screening crest but no vegetation for a tunneling effect, limit radiation to 8 minutes. If the screening crest is not available, or is inadequate, limit the radiation time to 2 minutes. If the radar radiates for more than 2 minutes, then it must move immediately to prevent its detection. When the enemy poses a significant EW threat, a maximum cueing time of 1 minute should be established.

(2) In the friendly mode, the radar will commence radiating when the firing unit announces **SHOT** and will cease radiating when the radar console signals **DISPLAY NEXT LOCATION**, or 15 seconds after the firing unit announces **SPLASH**, whichever comes first.

(3) Regardless of the merits of the radar site or enemy EW capability, the enemy EW threat as well as friendly EW missions conducted must be constantly evaluated and updated for maximum radar efficiency and survivability. Radiating times of over 2 minutes should be carefully considered before implementation.

Section III. Counterfire

7301. Purpose and Description

Counterfire, collectively, includes the attack of the enemy's cannons, rockets, and mortars, and the assets which support these weapons; e.g., target acquisition, command and control, and logistics elements. Successful counterfire requires continuous effort; emphasis at all stages of the operation; and incorporation of all assets—maneuver, mortars, naval surface fire support, offensive air support, EW, and artillery.

Counterfire is vital to infantrymen and artillerymen. Counterfire provides freedom of maneuver and use of friendly indirect fire support. Counterfire information is of great value in estimating enemy tactical capabilities which may permit early development of effective countermeasures.

a. Collecting Counterfire Information. All MAGTF means are used to collect counterfire information. Understanding the capabilities and vulnerabilities of the enemy indirect fire weapon systems facilitates collection. Counterfire information is collected by crater and shell fragment analysis, detection by target acquisition devices (e.g., radars), air and ground observation, electronic signatures, and target prediction. All artillerymen, particularly FOs, should be trained in crater analysis and shell fragment identification. A crater analysis team is designated at each battery, battalion, and regimental headquarters echelon. For crater and shell fragment analysis procedures, see FMFM 6-8.

(1) Crater Analysis. Crater analysis is the examination of a shell crater with the purpose of determining the line of flight of the projectile to establish its probable launch point. The detonation of an artillery or mortar shell produces a crater with distinguishing marks. The crater analysis provides directional information (shell ray) which identifies the direction to the hostile weapon and its type; e.g., artillery, mortar. This shell ray can be correlated with other rays to facilitate target location. Terrain and soil conditions determine the degree of identification from a crater. The most distinctive shell crater patterns are usually found on flat, firm ground.

(2) Shell Fragment Analysis. Projectiles and fragments have distinguishing characteristics which, when analyzed, can be used to determine the *caliber of the shell and the type of weapon* from which it is fired. Generally, shell fragment analysis occurs concurrently with crater analysis.

(3) Other Types of Information Required. Besides information produced by crater/shell fragment analysis, other information helps the counterfire effort. This information is derived from intelligence gained prior to and during the battle. Examples are as follows:

- Number of enemy indirect fire weapons by type.
- CSS status and resupply capability of enemy.
- Enemy tactics for employing indirect fire weapons; e.g., positioning and frequency of displacement/camouflage, volume/length of fires, deception.
- Method enemy uses to control his indirect fires; e.g., positioning of OPs, method of calling for fire.
- Enemy counterfire tactics and target acquisition capability.
- Effect friendly counterfire is having on the enemy; e.g., causing him to move or cease firing.

b. Reporting Counterfire Information. Essential to the counterfire effort is *prompt* reporting. The quicker the information gets into the counterfire targeting process, the faster appropriate response can be delivered. The artillery TPC is the hub for collecting counterfire information. Artillery batteries, battalions, and the regiment can receive counterfire information. Counterfire information is usually reported by use of a SHELREP.

(1) Shelling Reports. Enemy shellings are reported by SHELREPs. A SHELREP contains information on caliber, direction, time, density, and area shelled. On shelling, these reports are originated immediately at any level and forwarded to the supporting artillery. Both infantry and artillery communications may be used. Other combat support and CSS units use their command channels. The radar telling net can be used by artillery units to exchange radar intelligence information.

(a) SHELREPs, mortar reports (MORTREPs), and bomb reports (BOMBREPs) are sent as complete as time permits. No report is

delayed or neglected for lack of complete information. Counterfire information is urgent in nature and is given precedence immediately after fire missions, except for flash messages. This allows for the orientation (cueing) of weapons-locating radars to locate the source of the hostile fire. Fragmentary reports are of value in supplementing or confirming information already on hand. FOs should be designated as shell report teams.

(b) Artillery Counterfire Information Form (ACIF). The ACIF (appendix F) can be used to report hostile indirect fire in friendly areas. The form is transmitted by the most rapid means available. For ease and speed of reporting, each item is identified by the alphabetical designation; e.g., *Hotel, harassing*. All items of the report are transmitted in the clear except items A, B, and K. If the level of damage is so extensive that it affects current operations, item K may be reported separately as a flash message.

(2) Immediate Counterfire. Immediate counterfire is the attack of the enemy's indirect fire systems that are inflicting heavy damage on friendly forces. Any unit can request immediate counterfire. The most responsive unit will attack the enemy indirect fire unit inflicting the damage. If the request exceeds the unit's capability, that firing unit requests assistance from the next higher unit. The immediate counterfire request includes the following information:

Identification:	AIB this is C24
Warning Order:	Immediate counterfire
Type of Fire:	Light howitzer
Direction of Source of Fire:	Northeast
Extent of Fire:	30 to 40 rounds received, still firing
Area Shelled:	Grid 536211

c. Counterfire Responsibilities. Counterfire activities are centralized at the lowest echelon capable of effective counterfire efforts. Counterfire activities include the targeting and attack of enemy indirect fire weapons, associated equipment, and observers. In the division, counterfire activities will normally be conducted at the artillery regimental level. Artillery battalions assist the regiment by processing target data and responding to counterfire requests. In smaller landing operations, the artillery battalion or battery, as appropriate, must assume responsibility for counterfire activities.

(1) Artillery Commander. Artillery commanders advise their supported commanders on the enemy fire support capabilities and make recommendations on counterfire means, priorities, surveillance measures, and defensive measures. The senior artillery commander ensures artillery is organized for combat and positioned to support the counterfire effort. He makes recommendations concerning attack guidance. He assists the supported commander to prepare a counterfire plan to incorporate all available assets.

(2) Artillery S-2. The artillery S-2, using the intelligence section and TPC, is primarily responsible for the coordination of counterfire activities of the command. At the regimental level, he is assisted by the CBR platoon commander. The senior artillery S-2 coordinates with the GCE and MAGTF G-2. The artillery S-2 and the MAGTF G-2 have joint responsibility for obtaining information. Repositioning of artillery within the MAGTF may be dictated by the capability of the enemy long-range artillery. Information on enemy nuclear delivery capability must be sought.

(3) Artillery S-3. The artillery S-3, through the FDC, is primarily responsible for the timely and effective attack of targets. He works closely with the S-2 in the positioning of target acquisition assets. He is guided by the artillery commander and the attack guidance of the supported unit.

7302. Counterfire Activities

Counterfire activities are conducted by a basic targeting methodology characterized as DECIDE-DETECT-DELIVER. The DECIDE function includes tasking of target acquisition assets, information processing, selection of an attack means, and determining the requirement for post-attack assessment. It results in the commander's targeting guidance and priority intelligence requirements, a high pay-off target (HPT) list, target selection standards, and attack guidance. The DETECT phase is the execution of target acquisition. Target acquisition assets are tasked to find specific targets. The main objective of the DELIVER phase is the attack of targets and post-attack assessment, if required. It involves such tactical fire direction tasks as deciding when to attack (immediately or in a program), the selection of the attack system, and determining the desired effects.

a. Terminology. The following terms are used throughout the discussion on counterfire activities:

(1) Target. A geographical area, complex, or installation planned for capture or destruction by military forces. It is an area designated and numbered for future firing.

(2) Suspected Target. A possible target that requires further correlation or additional information before it is considered a target.

(3) High Value Target (HVT). Those assets the enemy commander requires for the successful completion of his mission.

(4) High-Payoff Target. HPTs that must be acquired and successfully attacked for the success of the friendly commander's mission; normally identified for a specific point in the battle in the order of priority on the commander's HPT list.

(5) Target Category. Those categories used to facilitate the processing of target data, particularly the maintenance of counterfire target files. These include—

1—Cannon
2—Mortar
3—Rocket
4—Artillery Command and Control Element
5—Target Acquisition System
6—Nuclear Delivery System
7—Air Defense System
8—General (any target not categorized elsewhere)

(6) Target Selection Standards (TSS). Criteria established by the G-2/S-2 of the supported unit to determine if data is a target or a suspected target. The artillery S-2 makes recommendations on the establishment. The standards are based on the enemy's demonstrated use of deception and the susceptibility of our collective systems to such deception. The standards will be changed as the situation changes (including reliability of sources and knowledge of enemy's deception efforts). A guide for TSS is provided below:

Data is usually considered a target if the source is radar ranging, the intersection of three SHELREPs, or located by one SHELREP and a grid-producing source; e.g., air observer.

Data from an air observer is usually considered a suspected target.

Data from flash ranging (FR) may be a suspected target depending on enemy deception.

Data from G-2 and FSCC sources will specify targets or suspected targets.

(7) Target Prediction. Predicting a target's existence and location by analyzing available combat information and intelligence.

(8) Counterfire Reference Grid (CRG). A series of 5-kilometer squares (figure 7-1) covering the division's entire zone of action. The CRG is established by the counterbattery officer. The CRG is used to rapidly orient target acquisition assets and firing units to a target area. In the artillery, the CRG is placed on the target production map, FDC maps, the order of battle (OOB) map, and maps maintained by radar sections. The CRG is also placed on the maps of FSCCs. Gridlines are lettered and the coordinates are read as one reads a map (right and up). To avoid confusion, the letters I and O are not used in the CRG. Artillery units respond to fire missions in designated CRGs.

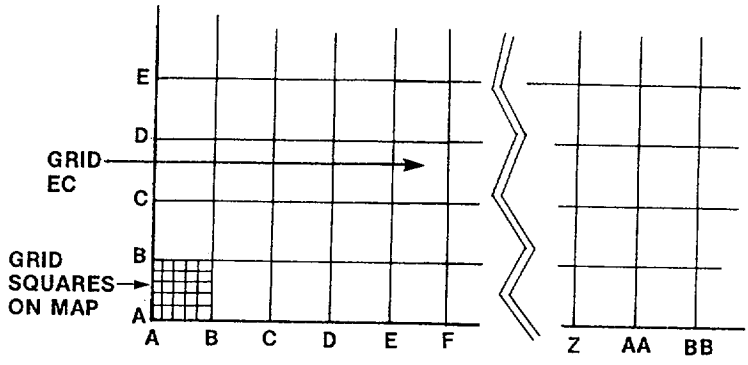


Figure 7-1. Counterfire Reference Grid System.

b. Functions. Counterfire activities are conducted as a coordinated effort by the TPC, intelligence section, and the FDC. The TPC's primary function is to produce valid targets. The counterbattery officer heads the TPC. The intelligence section develops and maintains the enemy OOB, predicts targets, and prepares and disseminates intelligence reports. The FDC is responsible for the attack or the planning for attack of targets.

c. Target Production Process. All incoming information/intelligence is processed to produce targets. See figure 7-2. When data is received in the TPC, a target card is completed in duplicate and a target number and target category assigned. The data is evaluated against TSS. Directional information is plotted to correlate target data. The TPC makes a decision as to whether the data yields a target or a suspected target.

(1) For targets, the TPC passes the target card (copy 1) to the FDC. The FDC takes action based on the attack guidance (e.g., engage immediately or plan), records its activity on the target card, and passes the target card to the TPC for filing. Target damage assessment is obtained when required and recorded on the target card. A copy of the target card (copy 2) is passed to the intelligence section for appropriate action (e.g., evaluation for OOB information), then returned to the TPC for filing.

(2) For suspected targets, the TPC passes a target card to the intelligence section for action; the card is returned and filed for later use. Data recorded for a suspected target may provide the confirmation needed to produce a target from later reports.

(3) The TPC monitors and recommends changes to the coverage of target acquisition assets as required to produce more targets. For example, a suspected target or target area may be placed under surveillance to detect evidence of the enemy.

d. Tools and Symbols. Various tools and symbols are used in the target production process. See figure 7-3.

(1) Target Production Map. The target production map is used to produce targets by visually correlating suspected target data. It is also used for orienting and positioning target acquisition devices to produce targets. The map is 1:50,000 and depicts current friendly boundaries, the location of friendly target acquisition devices and their sectors of coverage (see target acquisition capabilities overlay), all suspected targets, category 1-3 targets (see SHELREP overlay), and the CRG.

(2) SHELREP Overlay. Directional information is plotted on an overlay and placed on the target production map. The information is depicted by constructing a ray, drawn to length corresponding to

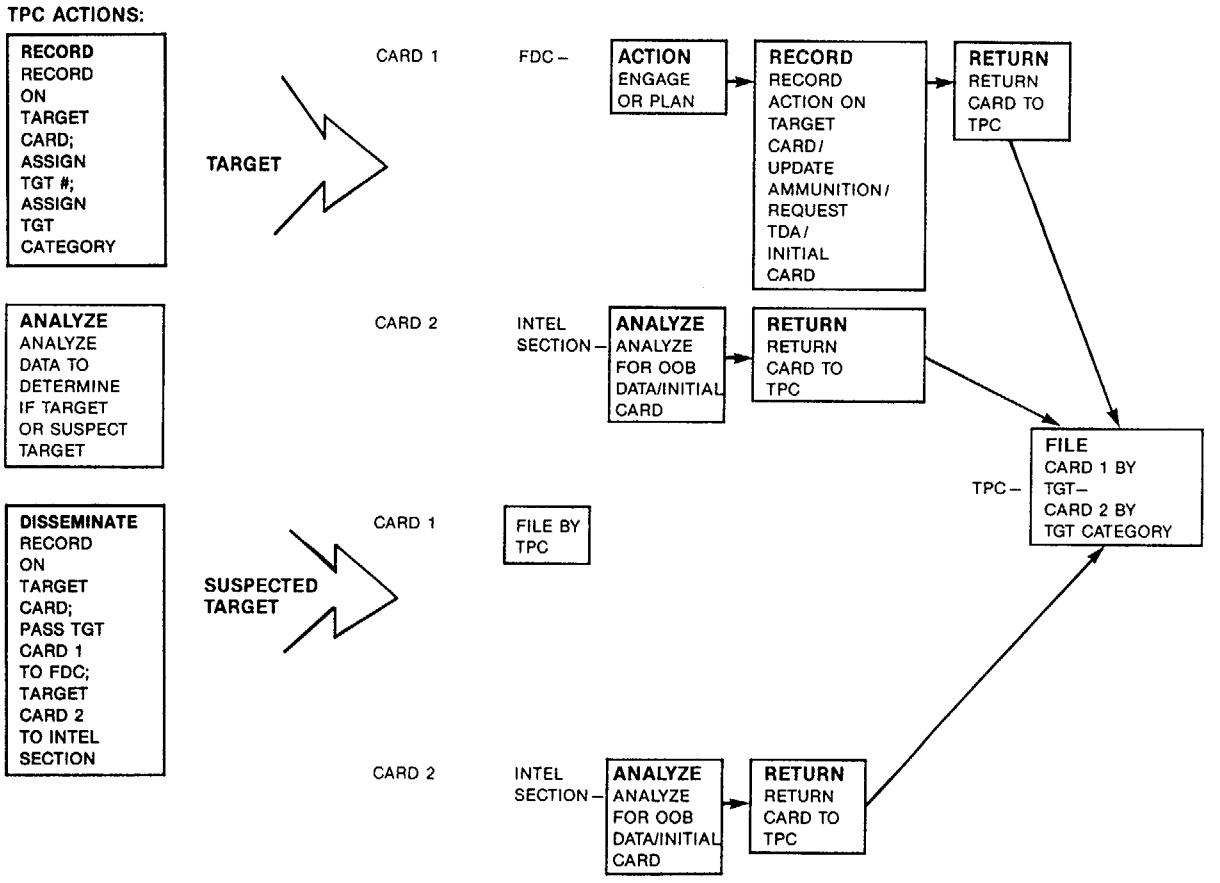


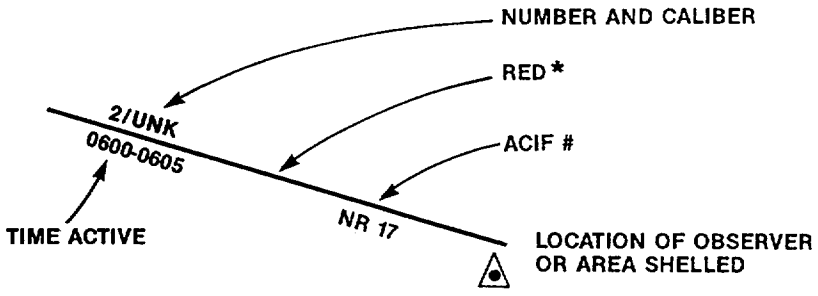
Figure 7-2. Target Production Process.

SUSPECTED TARGET SYMBOL

		EXAMPLE	
Quadrant IV Date/Time Group (of last activity)	Quadrant I Target Number	261652Z	AY8611
Quadrant III Description (number/caliber/ type)	Quadrant II Source/Accuracy	6/122/MRL	RR/0-200

- A target is distinguished from a suspected target by a dot placed in the middle of the symbol.

SHELREP OVERLAY



* Color of ray indicates caliber (or size) of weapon.

Figure 7-3. Tools and Symbols in the Target Production Process.

356-548 O - 93 - 4

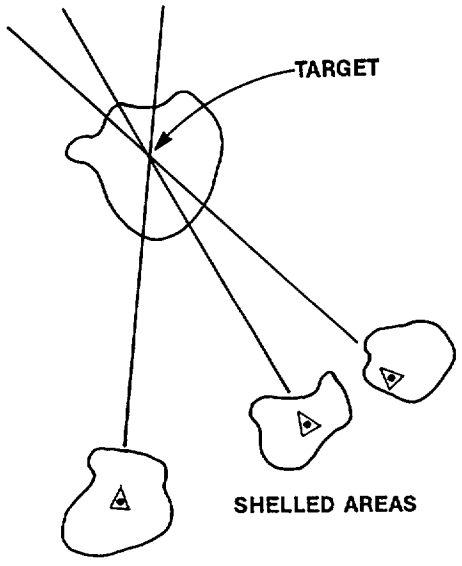


Figure 7-3. Tools and Symbols in the Target Production Process – Continued.

the maximum range of the weapon reported on. When the caliber of the weapon is unknown, the ray will be drawn to represent the enemy's longest shooting weapon in the theater. When three rays of the same caliber intersect, a target is produced. A target card is then filled out and the rays are purged from the overlay. The rays of the different caliber weapons are color coded as instructed by unit SOP.

(3) Target Acquisition Capabilities Overlay. This overlay is placed on the target production map and used to identify areas covered or not covered by target acquisition assets. This overlay is constructed from information gained by the plan of observation.

TARGET CARD

For use of this form, see FM 6-121, the proponent agency is US Army Training and Doctrine Command

Target No. AV 8621	Target ☑ (✓ Yes)	Category (Circle) (1) 2 3 4 5 6 7 8	Fired ☐ (✓ Yes)

SOURCE	LOCATION	ACCURACY	DTG	DESCRIPTION/REMARKS
CR	6345 3465	C-150	361723Z	6/152/HOW
FDC ✓				
INTEL ✓				
TPC ✓				

The above is DA Form 4695 dated 1 May 1976.

Figure 7-3. Tools and Symbols in the Target Production Process—Continued.

(4) Target Production Forms

(a) Artillery Counterfire Information Form. The ACIF form is used for the initial recording of data transmitted to artillery intelligence agencies and sources. It is a temporary record and is not kept in the permanent files. As information is posted to a target card, this form is destroyed.

(b) Target Cards. Target cards are used to record all targets and suspected targets. At any given time, the target card provides the most accurate grid associated with a target as well as a record of target engagement and damage assessment. All subsequent data about the target or suspected target goes on the same target card. The target card is used to pass target data to other personnel and sections. Completed copies of the target card are filed in the target card file by target number (copy 1) and target category (copy 2).

(c) Journal. The journal is used to record significant events (e.g., changes to attack guidance or TSS) and the action taken. The journal is collected and filed by the operations chief at the end of each shift.

e. Order of Battle. The enemy's OOB concerning indirect fire weapon systems is established/maintained from data received in artillery channels and by monitoring the division intelligence net. The artillery regiment's OOB effort is an extension of the division's. However, the artillery OOB effort stresses collection that will produce artillery targets. If, for example, an OOB report received at the regiment from the G-2 describes the general location of a motorized rifle regiment, the regimental S-2 should analyze the report to predict the locations of targets of interest to the artillery regiment. To collect and interpret data on the enemy, the analyst needs a well-rounded knowledge of the enemy OOB and tactics. The OOB analyst in the regimental intelligence section develops OOB information that can result in the employment of firepower. Data is correlated to develop targets through target prediction.

(1) Target Prediction. Enemy OOB evolves by making predictions of target locations. The analyst predicts targets by an analysis of space, time, and type. He evaluates the size and terrain in an area of enemy operations. He also deduces how many forces the area would accommodate based on the enemy's tactics and techniques of employment. See figure 7-4. He compares this with how much time the enemy had to effect a build-up and the type of forces he is employing. He correlates incoming target data to confirm his speculations. Target acquisition assets sensitive to the signature of the target can then be used to accurately locate or confirm a predicted target. Depending on the tactical situation, reconnaissance by fire may be conducted to obtain target locations and other information.

(2) Order-of-Battle Tools. Various tools are used in determining and recording the OOB.

(a) Order-of-Battle Map. The OOB map is the basic tool used by the intelligence personnel in making target predictions and subsequent cueing of radars. Depicted on this map are friendly boundaries, the CRG, and enemy indirect fire OOB. This map should be located next to and used with the target production map. Firm targeting data may be produced by the correlation of information from the OOB map and the target production map.

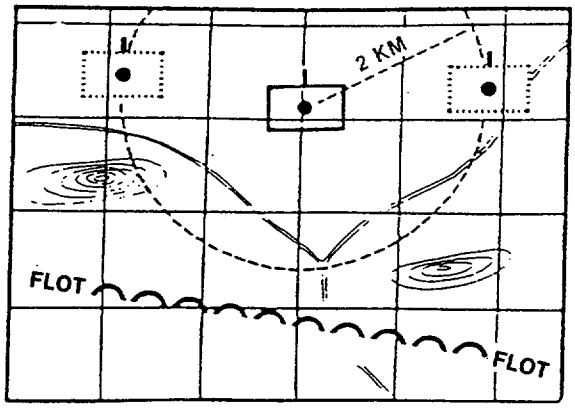


Figure 7-4. Target Prediction.

(b) Targeting Workbook. The targeting workbook is used to record, sort, interpret, and evaluate OOB data. The workbook has no set format but is usually organized by type target; e.g., cannon, mortar, rocket, combat outpost. The S-2 organizes and formats the workbook to best suit the current tactical needs in determining the enemy indirect fire OOB data.

(c) Publications. There are specific publications available to assist in developing OOB. A regimental OOB library should be established and include but not be limited to the following:

Register of Intelligence Publications (DIA)*

Scientific, Technological Intelligence Reports (DIA and/or CIA)*

Area Studies Handbook (DIA)

Order-of-Battle Handbook (specific country)

Projectile Fragmentation Guide (DIA)

* Defense Intelligence Agency and Central Intelligence Agency.

f. Target Damage Assessment (TDA). TDA provides a means for the S-2 to judge the effectiveness of the fire support system and the accuracy of the target location system. Damage assessment can greatly assist in purging invalid data from maps and files. It can also lead to better methods of target engagement and can provide data that may produce additional targets. OOB information can also

be obtained from TDA. Often the best source of TDA for a given target is the agency that produced the target. Air observers are particularly useful in this function.

g. Purging System. The S-2 must devise a system for evaluating and purging targets. The local situation, volume of targeting information, rapidity of movement across the battlefield, personnel, and time available all impact on the system used. If a purging system is not used, the volume of targets and suspected targets will soon become unmanageable. The system may be as simple as an hourly check to purge all target/suspected targets based on a time period or as complex as establishing individual criteria for each category of target.

h. Function of the FDC. The FDC attacks targets based on the attack guidance. Once a target is determined, the FDO either issues a fire order to engage the target or plans it for later engagement. When the decision is to attack, the FDC exercises tactical fire direction. When required, the FDC may initiate a request for naval surface fire support (NSFS), close air support (CAS), or EW support. Designated targets are engaged in counterfire programs. See FMFM 6-18. The FDC maintains a map to control the engagement of targets. This map depicts all targets, friendly boundaries, friendly firing units, fire support coordination measures, and the CRG. Targets are plotted using the target symbol with quadrants II and IV left blank. See figure 7-3.

(1) Attack Guidance. Attack guidance is specified by the supported or higher commander and is magnified by his operations staff and the FSC to explain how and when targets should be attacked. The guidance is provided so targets are engaged in the battle in concert with the commander's desires. Attack guidance may be recorded on an attack guidance matrix. See figure 7-5. The artillery commander makes recommendations in the preparation of the matrix. Included in the matrix is a category (2) for fire support. Category (2) is where the commander establishes his guidance for the engagement of counterfire targets. He bases his guidance on the factors of METT-T. The attack guidance addresses three elements: when to attack targets; how to attack targets; and restrictions in the attack of targets. The artillery commander may amplify this guidance to meet specific artillery needs.

CAT		HP	WHEN	HOW	RESTRICTIONS
(C^3)	1	46, 48	I	N/EW	Coord attack w/EW
(FIRE SPT)	2	1, 2, 7	A	N	DNE MRL older than 10 min
(MANEUVER)	3	25, 28	A	25%	Last volleys RAAMS/ADAM
(ADA)	4	58	P	S-2/G-2	SEAD program 120800A
(ENGR)	5		P	N	Countermobility program
(RSTA)	6	85	P	EW	
(REC)	7	103, 105	P	N	
(NUC-CHEM)	8	111, 112	I	D	Accy 0-200 M/TDA req
(POL)	9		A	D	
(AMMO)	10		A	D	
(MAINT)	11		P	N	Not high value/payoff
(LIFT)	12		P	N	Not high value/payoff
(LOC)	13		P	N-3/G-3	Not high value/payoff; no FASCAM

CAT – Target Category (from target value analysis [TVA]).

HP – Designated high payoff target. These targets have priority for engagement. Target numbers from TVA target sheets.

When – When the target should be attacked:

- I – Immediately. Interrupt other nonimmediate attacks if necessary.
- A – As acquired. Attack as assets are available.
- P – Plan. Include target in a program of fires or file for later attack when the situation changes.

How – How target is attacked:

- S – Suppress.
- N – Neutralize.
- D – Destroy.
- EW – Jamming or other EW means.
- ×% – Specific percentage of casualties or damage.
- DNE – Do not engage.
- G-2 – Coordinate attack with G-2 (any other person or element could be indicated).

Other abbreviations may be used as required by unit SOP.

Restrictions: Any constraint on the attack of target, such as accuracy, time expired since acquisition, required coordination, TDA requirements, or munition restrictions by amount or type.

Figure 7-5. Example of Attack Guidance Matrix.

(a) When to Attack. Targets may be attacked immediately (i.e., interrupt other lower priority attacks if necessary), as acquired (i.e., attack as assets are available), or planned in a program of fires or filed for later attack when the situation changes.

(b) How to Attack. This may be expressed as a percentage of casualties or as the effect desired; e.g., neutralize.

(c) Restrictions. Any restriction in the attack of targets including ammunition restrictions, units to fire, and counterfire targets that may be engaged, and other restrictions that may apply. The restrictions may be expanded to include special restrictions such as accuracy requirements and priorities in which to attack targets. It may include coordination or engagement instructions. Instructions may be included to preserve artillery in order to concentrate firepower at critical times.

(2) Counterfire Programs. Counterfire programs are planned and fired based on the commander's guidance, the tactical situation, and the availability of artillery (ammunition) and other fire support. Targets which have most recently been active in the zone of the supported unit are usually selected for counterfire programs. When such programs are fired, priority of fire may be to counterfire, and a considerable portion of fire support would engage counterfire targets. The delivery of a counterfire program uses a sizable amount of fire support assets and will be an important command decision.

7303. Counterintelligence Activities

Counterintelligence activities are concerned with identifying and countering the threat to security posed by hostile intelligence services or organizations, or by individuals engaged in espionage, sabotage, subversion, or terrorism. Artillery units practice countermeasures, security and concealment of friendly information and installations, and tactical deception.

a. Concealment and Camouflage. The artillery should make maximum use of natural and artificial concealment to prevent detection. The S-2 should inspect positions to determine the effect of camouflage and the degree of camouflage discipline.

b. Tactical Deception. Ruses, feints, and deceptive measures may be employed by artillery commanders. Tactical deception measures must be coordinated at the highest level to ensure control. Some ruses which are commonly used are as follows:

(1) Dummy Positions. When practicable, generally during defensive situations, dummy positions and installations should be constructed. To be effective, the position must **look** real. The position should be tactically sound, but at least 1,000 meters from friendly units. Effectiveness can be obtained by obvious vehicle tracks, use of logs to simulate gun tubes, **crude** camouflage, use of spoil around the position to indicate recent fighting, use of discarded equipment and trash in the position, flash and sound simulators, and false communications (only when authorized). Roving guns can use the position.

(2) False Preparations. When ammunition and time are available, preparations may be fired to deceive the enemy on the time or location of the attack. Reconnaissance by fire can be conducted.

(3) Covering Fires. Fires may be employed to cover patrol activity and relief of units. Smoke munitions are good covering fires. Too frequent use will arouse enemy suspicion.

(4) Roving Gun or Battery. Use of a roving firing element is a counter-counterbattery measure to mislead the enemy about the amount, strength, and composition of friendly artillery. One or more guns or an entire battery can be employed as a roving element. The roving element moves frequently since its detection will likely be compromised once it has conducted a fire mission. The technique minimizes the amount of fire from the battery position to avoid disclosing the position to enemy target acquisition means. An FDC and a command and control capability must accompany the roving element. A roving gun FDC sends fire for effect data to nonadjusting elements. The roving element must be positioned so counterfire does not endanger other friendly units. A reduction in firepower may be caused by using this technique. Roving guns can be used to conduct registrations. As a general rule, a roving battery is from a reinforcing battalion.

(5) Avoidance of Stereotype Procedures. The S-2 should watch for procedures that may be assisting the enemy. An example is routine methods and timing of movements and resupply.

c. Propaganda. The artillery is employed in psychological warfare. Artillery can deliver *propaganda* shells which disseminate propaganda leaflets.

d. Security Measures. The artillery S-2 and the communications officer are responsible for reporting violations and recommending additional security measures for the command. Security measures are primarily concerned with security of movements, communications security, and security of documents.

7304. Intelligence Documents

The artillery S-2 is responsible for the preparation or assistance in the preparation of many documents; e.g., staff studies and estimates. Intelligence documents are used by the S-2 in target prediction, analysis, and to maintain up-to-date information files. See FMFM 3-21.

a. Lists of Targets. Lists of targets may be formed depicting current counterbattery or countermortar targets.

b. Artillery Intelligence Bulletins/Reports. Artillery intelligence bulletins may be published by the higher artillery headquarters. These bulletins follow the standard five-paragraph order format and provide information of interest to artillery units. Examples of information in these bulletins are enemy dispositions and strengths, weather conditions, and map and photographic information. Periodic intelligence reports may also be published.

c. Artillery Intelligence Annex or Appendix. The artillery S-2 is responsible for preparing an intelligence annex to the artillery operation order. He may prepare an artillery intelligence annex to the MAGTF/LF operation order when the necessity is determined by the artillery officer and G-2 on the MAGTF or LF staff.

Chapter 8

Delivery of Fire

8001. Overview

This chapter addresses those functions directly associated with the delivery of fires: fire planning and fire direction. Fire planning and fire direction are intertwined to some extent. Survey and meteorology are also addressed because of their close relationship to the delivery of fires.

8002. Fire Planning

Fire planning is the planning conducted by each supporting arm agency in response to the supported commander's fire support plan. The fire support plan is a plan which outlines how the commander wants to use his fire support assets to support an operation. The purpose of artillery fire planning is to obtain the maximum effect from available artillery and to ensure adequate and coordinated fire support to all elements of the force. Planning is conducted continuously and concurrently at each echelon. Artillerymen work closely with supported commanders to ensure the artillery fire plan complements and extends the fire support plan.

Artillery fire planning includes—

- Targeting.
- Scheduling of fires.
- Provisions for attacking targets of opportunity.
- Fire direction.
- Positioning and movement of units.
- Communications.
- CSS.

a. Fire Planning Considerations. The following considerations must be analyzed in artillery fire planning:

- Mission and scheme of maneuver (or plan of defense) of the supported unit.
- Location of desired fires.
- Information of the enemy situation to include size and composition of targets. Products of intelligence preparation of the battlefield (IPB) are evaluated.
- Amount and type of artillery and ammunition available.
- Other fire support means available and their capability.
- Requirements of higher headquarters.
- Restrictions.
- Available CSS.
- Adequacy and dissemination of SOPs.
- Time available.

b. Artillery Fire Planning Procedures. Different circumstances require different approaches to artillery fire planning. Sometimes, it is possible or necessary to spend days or weeks planning an operation and its artillery support. At other times, the planning must be done in a day or two or even in a few hours. Fire planning involves the following actions:

(1) Targeting. The collection of target data is an essential fire planning action. Target data is collected continuously by all available sources: FOs with supported company/teams, artillery LNOs in FSCCs, and artillery FDCs. FSCCs identify targets for attack by artillery. FDCs can derive targets through its own targeting efforts.

(2) Scheduling of Fires. In fire support planning, the FSCC uses a target list worksheet to list targets to be engaged by a specific supporting arm, along with any amplifying remarks about specific engagement requirements; e.g., firing times, ammunition, etc. The worksheet is provided to the appropriate supporting arms agency for fire planning.

(a) The artillery fire planner (artillery commander, LNO, or S-3) reviews the target list worksheet provided to artillery, analyzes the targets, determines the method of attack, and conducts tactical fire direction. He prepares a scheduling worksheet(s) which depicts the assignment of firing batteries to specific targets for engagement. See FMFM 6-18. Fires of any reinforcing artillery

are incorporated into the schedule. The completed scheduling worksheet is provided to the supported unit for approval or changes/additions. The approved schedule(s) of fire is sent to the higher artillery headquarters along with requests for reinforcing fire.

(b) For quick fire support planning, the artillery battalion allocates a firing battery(s) to the supported unit for fire support planning. The supported unit selects the targets to be engaged by artillery, schedules its fires, and forwards the completed schedule to the artillery FDC for execution.

(c) When scheduled fires are executed, the FDC will notify the FSCC of any assigned targets that were not engaged or that were only partially engaged.

(d) When scheduling fires, consider arranging for surveillance of critical targets during firing; e.g., use of a radar.

(3) Attack of Targets of Opportunity. In some situations, accurate target location may be scarce with targets developed as the battle progresses. Artillery must be in position to respond to targets of opportunity. In jungle warfare and other similar situations, this is a vital element of fire planning.

(4) Fire Direction. Fire direction is essential to ensure that targets assigned in the fire plan **can** be engaged to achieve the desired effects. Tactical and technical fire direction are conducted by appropriate FDCs.

(a) Firing units must have the correct time of delivery of fires. Fires can be delivered using a time on target (TOT) or at my command (AMC) technique. TOTs can be accomplished using several methods: synchronized clock (e.g., "TOT 1505"), elapsed time (e.g., "TOT 5+00, standby . . . hack"), or event-oriented (e.g., "TOT H-5"). Units report "rounds complete."

(b) FDOs examine fire missions to detect danger to friendly forces or other restrictions; e.g., friendly forces on intermediate crests, restrictive fire support coordination measures or other firing restrictions, proximity to friendlies, rules of engagement, or other restrictions. Problems foreseen in firing are identified to the higher headquarters FDC and/or supported unit FSCC, as appropriate.

(c) Firing units are assigned fire missions/targets, as appropriate. Considerations include the gun target line, target range, survivability of firing units, ammunition status, method of attack (e.g., need for multiple aim points, volume, and duration of fires) and effects desired.

(d) Ammunition selection takes into account effectiveness on target, ammunition economy, firing restrictions, and safety to friendly forces.

(e) Other aspects of fire direction include disseminating attack guidance, priority of fires, firing SOPs (e.g., type/volume of fire for immediate suppression), registration restrictions, etc.

(5) Positioning and Movement of Units. Artillery must be positioned to provide the required support. Factors considered in positioning include concept of operation, probable errors, trajectory restrictions, communications, and survivability of artillery. The concept of operation may require the repositioning of firing units and/or the development of a displacement plan. Coordination is effected with the unit in whose zone of action the positioning and movement will occur. For a detailed discussion of positioning and movement, see chapter 9.

(6) Communications. Artillery fire planning must ensure communications exist for reporting targeting information, triggering of fire support, fire direction, fire support coordination, and reporting of TDA. Provisions must be made for continuous support during artillery displacements. In some situations, direct communications between a target acquisition asset (e.g., air observer, radar, reconnaissance team) and a firing unit may be established.

(7) Combat Service Support. Concurrent with tactical fire planning, consideration is given to the logistical means necessary to accomplish the delivery and sustainment of fires. Example: a fire support plan may require a heavy expenditure of ammunition. The artillery commander makes provisions for the required resources and determines what effect such an expenditure will have on future fire support requirements. Time must be available to pre-position resources or resupply, when required.

(8) Other Considerations. The artillery commander analyzes his personnel (e.g., strength, training, rest) and equipment status to

determine his unit's capability to fulfill its fire support requirements. He must also consider his ability to provide adequate security for his unit. He identifies the need for deception, identifies survivability techniques based on the enemy's target acquisition capability, and coordinates engineer support.

c. Preparation of Artillery Fire Plans. The organization for combat establishes the channels and responsibilities for artillery fire planning. Artillery fire planning channels may be as depicted in figure 8-1.

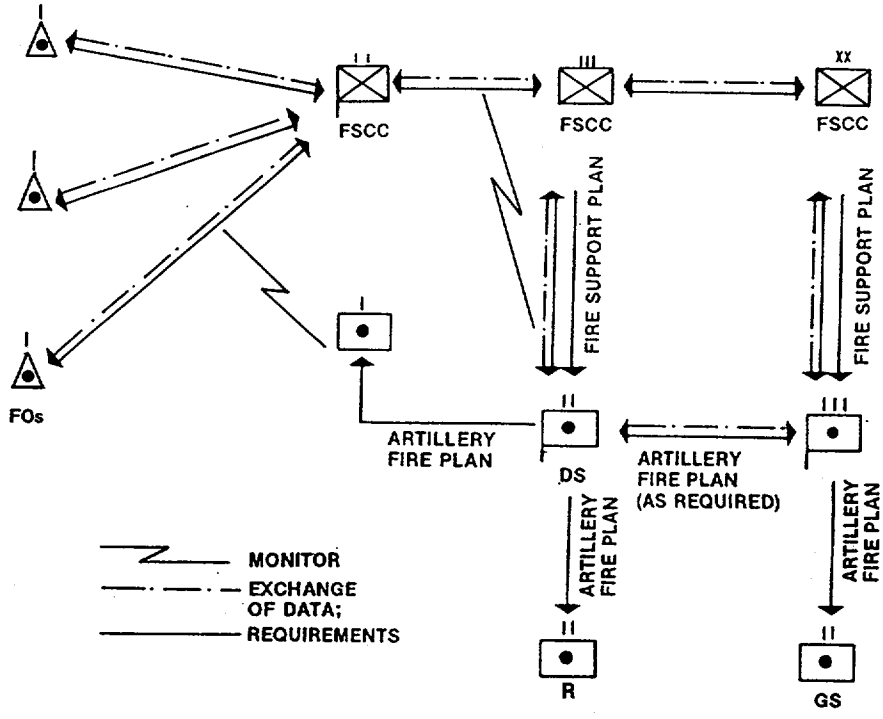


Figure 8-1. Artillery Fire Planning Channels.

(1) Artillery Regiment Fire Planning. The artillery regimental S-3, in coordination with the AFSC and the G-3, prepares the artillery regimental fire plan. This fire plan provides specific guidance to artillery units on how the artillery portion of the division's fire support plan is to be executed. The plan meets the fire support requirements

of the division. Fire planning requirements prepared by battalions in DS are reviewed and integrated into the regimental artillery fire plan. The fires of the battalion(s) in GS are employed on targets requested by, or beyond the range of, the battalion(s) in DS and on targets designated by the division commander. The artillery regiment plans counterfires and fires involved with special ammunition (toxic chemicals). Targets that are beyond the range of artillery or targets that are obviously unsuited to artillery attack are identified to the division FSCC for possible attack by other fire support means or by combined arms.

(2) Fire Planning by an Artillery Battalion in Direct Support. The S-3 of the artillery battalion in DS is the focal point for artillery fire planning for an infantry regiment or separate battalion. The S-3 plans the fires of the battalion and any reinforcing artillery available. He receives target information, fire support requirements, and guidance/input from the regimental and battalion artillery LNOs and the artillery regimental S-3. The battalion S-3 prepares the battalion's fire plan and provides the plan to the infantry regiment/separate battalion for approval as early as possible. The artillery regiment is provided an overlay showing the locations of targets and proposed fires, a fire capabilities overlay, requests for additional fires, and, as appropriate, schedules of fire desired by the supported unit. The completed fire plan is distributed to firing batteries, reinforcing artillery, and the artillery regiment. LNOs at regimental and battalion FSCCs receive the plan and ensure that FOs are notified of the fires planned in their sectors.

(3) Fire Planning by a Reinforcing Artillery Battalion. When a reinforcing artillery battalion is assigned, the reinforced artillery battalion provides the reinforcing battalion a fire plan, lists of targets, schedules of fire, and position areas. The reinforcing artillery battalion conducts tactical and technical fire direction and provides an LNO to the reinforced battalion to enhance fire planning and responsiveness.

(4) Fire Planning by an Artillery Battalion in GS. The artillery regiment plans the fires of an artillery battalion(s) in GS. The regiment provides the battalion with position areas, lists of targets, and targets designated for firing. The battalion S-3 prepares the battalion's fire plan and forwards a copy to the artillery regiment for integration with the plans of other battalions, for corrections, and for additions. The approved plan is returned to the battalion for execution.

(5) Artillery Battery Fire Planning. The artillery battalion plans the fires for firing batteries unless a firing battery is detached from the artillery battalion. The artillery LNO in the supported battalion's FSCC works closely with FOs, the artillery LNO at the infantry regiment, the artillery battalion S-3, and the battery FDO. He is the representative of the artillery battalion and receives guidance/assistance from the battalion and battery commanders. The firing battery performs technical fire direction. When attached to the supported unit, the firing battery commander and artillery LNO prepare a battery artillery fire plan.

8003. Fire Direction Center

a. Objective of Fire Direction. Fire direction involves tactical decisions and the computation of technical firing data. The objectives of fire direction are as follows:

- Continuous, accurate, and timely fire support under all conditions of weather, visibility, and terrain.
- Flexibility to engage targets over a wide area.
- Prompt massing of fires of all available units in any area within range.
- Rapid delivery of fires within the zone of the supported unit.
- Control of artillery through orders, policies, and priorities, and by means of adequate liaison and communications.
- Implementation of safety measures.
- Gaining/exchanging target information.
- Coordination of subordinate unit's fires and integration of the artillery fire plan with other supporting arms.

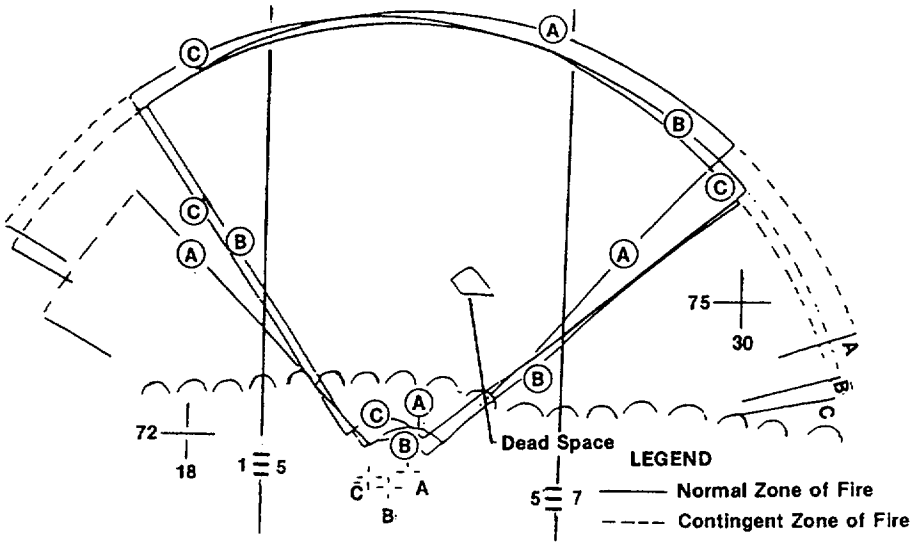
b. Organization of the Fire Direction Center. The FDC is organized to meet the requirements and conditions existing at the artillery headquarters. Its configuration may vary with the mode of operation and tactical situation; i.e., degree of permanence. FDCs may be established in tents, buildings, or in vehicles. In the typical regimental and battalion FDC, the operations and intelligence sections are collocated. The arrangement must allow for rapid fire direction and exchange of information between personnel. Maps and charts should be positioned to facilitate sharing of information. Radios must be positioned to allow monitoring and rapid access by *actuals*, when required. Space must be

allowed for LNOs or representatives of attached elements; e.g., TPC. Only essential personnel should be in the FDC. In the regimental and battalion FDCs, a watch officer/FDO supervises the operations of the FDC, under the cognizance of the S-3. The S-3 positions himself where he can best perform his duties. In the battery FDC, the battery FDO supervises the operations of the FDC.

c. FDC Forms, Records, and Charts. The FDC maintains necessary forms, records, and charts to conduct fire direction. The FM 6-40 series discuss the requirements for technical fire direction. For tactical fire direction, some of the requirements are as follows:

(1) Situation Map. The situation is actively sought and maintained by FDCs to ensure adequate fire support and safety to friendly forces. The following situation maps are kept:

- *Artillery Situation Map*—battery positions, artillery headquarters echelon positions, supported unit headquarters echelons, fire capabilities overlay depicting the range and traverse limits of the firing units (figure 8-2), target overlay, CRG overlay, radar capabilities overlay, as required.



NOTE: Color scheme may be used to help distinguish between batteries. Maximum range determined from firing tables.

Figure 8-2. Fire Capabilities Overlay.

- *Supported Unit Situation Map*—scheme of maneuver overlay, fire support coordination measures overlay, checkpoints and route overlay, FO positions (firing battery), maneuver unit positions.
- *Enemy Situation Map*—maintained by intelligence section. Emphasis is on plotting of enemy indirect fire weapons systems.

(2) S-3 Journal. The S-3 journal is used to record all incidents and messages with an entry describing the action taken, if any. Copies of messages and orders sent and received and records of fire missions are kept. At specific intervals, the journal is closed and becomes part of the unit journal.

(3) Miscellaneous Forms, Records, and Charts. Examples are fire order standards, ammunition, and communications status.

d. FDC Reporting. FDCs exchange reports with each other and their supported units. These reports assist in tactical fire direction and fire support coordination. Appendix F provides the formats for these reports.

(1) Ammunition Report (AMREP). The AMREP is used to maintain an accurate ammunition status of firing units. The AMREP facilitates ammunition resupply and the forecasting of consumption rates. The AMREP is submitted frequently enough to allow operational and resupply decisions. The frequency for submission is often specified in unit SOPs or in operation orders. The report is submitted to the higher artillery headquarters. The artillery LNO with the supported unit's FSCC is kept abreast of the artillery's ammunition status.

(2) Displacement Report (DISREP). The DISREP is used to report the displacement of a firing battery or element. The DISREP is submitted when the unit can no longer fire from its present position due to displacement. The report is submitted to the higher artillery headquarters and to the supported unit.

(3) Fire Capabilities Report (FIRECAP). The FIRECAP is used to report the firing status of an artillery battery or element. The report is made when a unit occupies a new firing position and is ready to fire, or when a change occurs in the number of weapons available; e.g., a gun out of action due to enemy action or a mechanical malfunction. The FIRECAP is sent to the higher artillery headquarters and to the supported unit.

(4) Command Post Report (CPREP). The CPREP is used to report the time of opening and closing of a headquarters echelon and the location of the new echelon. The report is submitted to the higher artillery headquarters and the supported unit.

(5) Flash Report/Spot Report/Target Report (FLASHREP/SPOTREP/TAREP). These reports are submitted after significant incidents such as contact with the enemy, incoming fires, receipt of friendly casualties, damage to friendly equipment, findings of significant intelligence value, initiation/completion of tactical operations. The TAREP is used to pass target data. The TAREP is submitted when a significant target is detected, or after the attack of a significant target or target on the target list. These reports are submitted to the higher headquarters and to the supported unit.

(6) Radar Report. The radar report is used by the artillery to control and coordinate the use of the radars of the CBR platoon. The report is used by the CBR platoon and the controlling artillery unit.

(7) Firing Report (FIREP). The FIREP is used to report the firing on a major target. Major targets are normally specified in the operation order or SOP. The report is submitted to the higher artillery headquarters and/or supported unit.

(8) Other Reports. Other reports may be submitted by the artillery as prescribed in the operation order or SOPs. Unnecessary reports, or reports which duplicate data submitted in other reports, should be avoided.

e. Clearance to Fire

(1) Calls for Fire. Artillery fires on targets beyond an established coordinated fire line (CFL) can be delivered without clearance from the unit in whose zone of action the fires will impact. Fires on targets short of the CFL, however, require some method of clearance. Based on the commander's rules of engagement, the procedure for clearing these calls for fire will be specified in operation orders or unit SOPs as either positive clearance or passive clearance. Artillery COF nets are monitored by artillery LNOs in battalion FSCCs. After coordinating the monitored call for fire as discussed in Chapter 6 of FMFM 6-18, the LNO (on behalf of the FSC) approves or disapproves the request for both (1) clearance to engage the target and (2) the use of artillery on

the target (type and volume of fire requested). Under positive clearance procedures, each call for fire on targets short of the CFL must be specifically cleared by a voice or digital transmission from the FSCC of the unit in whose zone of action the fires will impact. This may require FSCCs monitoring calls for fire from its observers to seek clearance from other FSCCs. Under passive clearance procedures, the FSCC monitors the call for fire transmission, and either remains silent if the fire mission is cleared (*silence is consent*), or interjects by voice or digital transmission if the fire mission is not cleared or if more time is required to clear the fire mission (e.g., with another FSCC). In order to avoid inadvertent clearance resulting from a loss of communications, commanders may modify passive clearance procedures by stipulating that fire missions are not cleared unless the FSCC acknowledges that the call for fire was monitored. Regardless of the procedure used to clear the engagement of the target, approval for the use of artillery on the target (vice another fire support means) is normally conveyed by the FSCC remaining silent (*silence is consent*). For further discussion, see FMFM 6-18.

(2) Adjustments. Cumulative corrections in the adjustment phase of a fire mission must be watched for possible interference or danger to friendly units.

(3) Fires Beyond the Fire Support Coordination Line (FSCL). Units firing on targets beyond the FSCL must inform all other affected units in sufficient time to allow necessary reaction to avoid friendly casualties and to avoid unnecessary duplication. The MAGTF FSCC will establish procedures for exchanging this information.

(4) Other Clearance. Clearance must be obtained on those munitions that can cause danger or affect operations of the supported or other units. Examples are smoke, illumination, ICM, FASCAM. See FMFM 6-18 and the unit SOP.

8004. The Regimental FDC and Its Functions

The regimental FDC is composed of personnel from the operations platoon. The typical regimental FDC will have watch sections consisting of the FDO/watch officer, operations chief, and fire control men. The regimental communications platoon provides a communications watch supervisor and sufficient personnel to man the radio terminals in the FDC. Functions of the regimental FDC during operations include targeting and counterfire activities, tactical fire direction, movement and positioning

of units, and other functions. The FDC, TPC, intelligence section, and other headquarters sections make up the main echelon COC.

a. Targeting and Counterfire Activities. The regimental FDC works closely with the division FSCC and division G-2 section in targeting matters. The artillery regimental commander, as division FSC, ensures that the agencies' functions are coordinated. The regimental S-3 and S-2 interface with their counterparts in the artillery battalions and with the CBR platoon commander for targeting matters. Specific emphasis is on counterfire targets.

b. Tactical Fire Direction. The regimental FDC exercises tactical fire direction of organic artillery battalions and attached artillery units; e.g., attached multiple launch rocket system (MLRS). It exercises tactical fire direction to the degree consistent with the communications capability, positioning of units, and range capability. The regimental FDC receives fire missions from several sources, including the division FSCC and its own observers; e.g., survey, weapon-locating radars, etc. It also receives requests for reinforcing fires from artillery battalions. The regiment assigns fire missions to a battalion(s) or attached unit. To avoid diverting DS artillery from its primary mission, artillery units in GS are normally tasked first. The regimental FDC directs the massing of artillery battalions on targets worthy of such attack.

c. Movement and Positioning. The regimental FDC maintains the location of artillery battalions, attached artillery units, and weapons locating radars.

(1) DS and Reinforcing Artillery Battalions. The artillery commander of an artillery battalion in DS positions his batteries to best support the supported unit. He keeps the regimental FDC informed on the positions of his units. The reinforcing artillery commander keeps the regimental FDC informed of all displacements directed by the DS battalion. When required, the artillery regimental commander or S-3 may assign a position area to a DS or reinforcing battalion. This is normally done to facilitate a future mission assignment. Such assignment must not preclude the battalion from accomplishing its current mission.

(2) GS and GS-R Artillery Battalions. The regimental commander or S-3 directs the positioning of GS and GS-R units and radars operating under regimental control. These units are positioned to ensure adequate coverage of the division, to provide mutual support, to weight the battlefield, and to facilitate future mission assignments.

The positions of artillery with DS and reinforcing missions are considered in the positioning of GS and GS-R units. The reimental S-3 coordinates the positioning and movement of GS and GS-R units with the division FSCC. He also keeps the division FSCC informed of the locations of DS and reinforcing artillery.

(3) Route Priorities. The regimental S-3 establishes priorities for the use of the main supply route. He coordinates the movement of artillery units with the regimental S-2 and S-4 and issues movement orders.

(4) Headquarters Battery. The regimental commander directs the movement and positioning of the headquarters battery in coordination with his staff and the headquarters battery commander.

d. Other Functions of the Regimental FDC. These functions include the following:

- Ammunition management.
- Muzzle velocity management.
- Coordination of CBR platoon employment.
- Arrangement of survey and MET support.
- Coordination of EW support.
- Coordination of engineer support.
- Interface with supported unit's FSCC on artillery matters.
- Dissemination of fire support coordination measures, attack guidance, and other information received from supported unit.
- Preparation of the artillery fire plan.
- Dissemination of firing restrictions and safety guidance.
- Coordination of NBC defense and NBC operations.

e. Continuity of Operations. Battalion FDCs will be prepared to act as the alternate regimental artillery FDC in emergency situations. Normally, the responsibility for assumption of control, in priority, is a battalion with a GS mission, a GS-R mission, or a reinforcing mission. The battalion assuming control will make appropriate announcements to units under regimental control and to the division FSCC. Necessary communications nets will be activated, the tactical situation updated, and the necessary facilities established to assume regimental FDC functions. Surviving personnel from the regiment will bring salvageable equipment to reconstitute the regimental FDC.

f. Alternate Division Command Post. The artillery regimental headquarters main echelon must be prepared to function as the alternate

division CP. The alternate division CP will consist of a COC, an FSCC, and a direct air support center. The tasks involved in establishing the alternate division CP are conducted by the artillery regiment, the division headquarters battalion, and the regimental headquarters battery.

(1) Tasks of the Artillery Regiment. The artillery regiment provides work space and communications support for the alternate division CP, when established. The alternate division CP may be established in the regimental headquarters main COC or an area adjacent (e.g., tent, building, etc.) to the regimental headquarters main COC using remote communications terminals. The regimental FDC continues to operate by activation of the forward echelon; itself operating from another area in the main echelon position; or assuming control from the alternate regimental COC. The regiment provides communications equipment for those division nets normally guarded by the artillery regiment (e.g., division tactical and intelligence nets) and those nets operated by the division FSCC, within equipment capability.

(2) Tasks of Headquarters Battalion, Division. The division brings personnel, work materials and supplies (e.g., map boards, charts, desks, etc.), communications equipment and personnel for other net requirements, and its own transportation.

(3) Tasks of Regimental Headquarters Battery. The headquarters battery commander functions as the headquarters commandant for the alternate division CP. He identifies billeting areas, assists in establishing work spaces, as required, and provides messing.

8005. The Battalion FDC and Its Functions

The battalion FDC is composed of personnel from the operations platoon. Watch sections are operated similar to the regimental FDC. The battalion communications platoon provides equipment and personnel support to the FDC. Functions of the battalion FDC during operations include fire direction, movement and positioning of batteries, and other functions.

a. Fire Direction. The battalion FDC has primary responsibility for tactical fire direction in the battalion. The extent that tactical fire direction is exercised is situation dependent. In some situations, the battalion FDO may make all tactical fire direction decisions. In other situations, tactical fire direction may be decentralized; e.g., when a battery is operating independently; when the battalion is unable to maintain communications with a battery; or when batteries are widely

dispersed. Every effort is made to exercise control over the batteries before decentralizing tactical fire direction. Regardless of the degree of centralization, the battalion FDC works closely with battery FDCs. The battalion FDC can provide valuable guidance on techniques for engaging targets. The battalion FDC provides technical fire direction support, as required. See paragraph 1004b.

(1) Centralized Tactical Fire Direction. Centralized fire direction equates to authority to make decisions regarding fire missions, how fire control is executed, and how calls for fire are answered. The degree of control may be to the degree that the battalion controls all fire missions directly, or the battalion intercedes as necessary. The degree of centralization is dictated by the tactical situation, communications, and the FDC's personnel strength, training, and expertise.

(a) Fire missions can be transmitted on Arty COF Nets established by the battalion. For responsiveness, calls for fire are sent to a firing battery assigned to a specific Arty COF Net, each controlled by the battalion. The battery and battalion FDOs concurrently analyze the fire mission. The battery FDO determines how to attack the target. The battalion FDO provides guidance and intercedes, as necessary. Considerations include nature of the target, recommendation of the requester, attack guidance, commander's guidance, firing restrictions, ammunition status, accuracy, gun-target line, and survivability.

Procedures

The battery FDO transmits a request for additional support to the battalion FDC, if required. If the battery FDO determines his battery can adequately meet the mission requirements, he issues a fire order and a message-to-observer (MTO).

The battalion FDO intercedes as necessary after monitoring the call for fire or the battery FDO's MTO. The battalion FDO may decide to mass the battalion, request reinforcing fires, give the mission to reinforcing artillery, give the mission to another firing battery, use a different shell fuze combination or volume of fire, assign aimpoints for engagement of large targets, and/or pass the request to the FSCC to assign the target to another supporting arm. The battalion FDO announces his decision using a fire order. If the battalion FDO decides to mass the battalion, the battalion FDC may assume control of the fire mission.

(b) In extreme cases of centralization, the battalion FDC may answer all calls for fire, make all tactical fire direction decisions, and assume control of fire missions on the net(s). Fire orders are then transmitted to firing batteries, as appropriate.

(c) When required by the situation, the battery FDO may make his own tactical fire direction decisions. Each battery will establish a separate Arty COF Net and will act as net control. The net is monitored by the battalion FDC as communications allow. The battalion FDC responds to requests from the batteries and assists where applicable.

(2) Provision for Continuous Support. An artillery battalion in DS must provide continuous support, even during displacement. To accomplish this, the battalion may identify an Arty COF Net for use by a maneuver battalion and assign a firing battery to guard the net. When a battery cannot fire, the battalion FDC may assign another battery to guard the Arty COF Net or the battalion FDC may guard the Arty COF Net, assume control of fire missions on the net, and issue appropriate fire orders.

(3) Fire Missions From Other Sources. An artillery battalion with a DS mission may receive fire missions from sources other than its FOs (e.g., from the artillery regiment) or the battalion FDC may initiate fire missions itself. An artillery battalion with a reinforcing or GS mission may receive fire missions originated by the reinforced battalion (as appropriate) and/or the artillery regiment. For these fire missions, the battalion FDO/watch officer makes the appropriate tactical fire direction decisions and issues fire orders to the batteries. After the mission is terminated, the battalion FDO sends a FIREP to the unit which originated the mission.

(4) Reinforcing Artillery

(a) Fire Mission. The FDO will assign a unit(s) to reinforce another for a particular fire mission. The reinforced unit will give replot data of the target to its reinforcing unit(s). Communications between the units will be on the Arty Bn FD Net. If positive communications cannot be established between the units, the battalion FDC will act as relay. After the fire mission, the reinforcing unit(s) will resume its normal operational status.

(b) Reinforcing Tactical Mission. Reinforcing artillery will establish communications with reinforced artillery over the higher Arty Regt FD Net or the reinforced unit's FD net. Fire missions will be directed by battalion fire order or as described in the preceding paragraph.

b. Movement and Positioning. The artillery battalion S-3 directs the positioning and movement of firing batteries and other artillery units operating under the battalion's control. The DS battalion S-3 makes the necessary coordination for the movement/positioning of the DS battalion and any reinforcing artillery. The regimental S-3 makes the necessary coordination for GS and GS-R battalions. The battalion S-3 coordinates the movement with the battalion S-2 and S-4 and issues movement orders to the batteries. The batteries submit DISREPs and FIRECAPs to the battalion. The battalion commander directs the movement and positioning of the headquarters battery. For more on movement and positioning, see chapter 9.

c. Other Functions of the Battalion FDC. Other functions of the battalion FDC are similar to those performed by the artillery regimental FDC. See paragraph 8004d. For ammunition, the S-3 identifies the type, quantity, location/unit, and required time/date for ammunition resupply. The battalion FDC maintains an accurate ammunition status of the battalion. The battalion S-3 assigns firing batteries to priority targets and assigns priority of fires. He also establishes battalion fire order standards and coordinates the assignment of FOs and LNOs. Targeting is conducted in concert with the regiment.

d. Continuity of Operations. A firing battery will be designated as the alternate battalion FDC. The procedure is similar to that for the regiment. See paragraph 8004e.

8006. The Battery FDC and Its Functions

The battery has the necessary personnel, equipment, and communications for the determination of firing data. Functions of the battery FDC in operations include fire direction, movement and positioning, and other functions.

a. Fire Direction. The firing battery has the necessary personnel, equipment, and communications for technical fire direction. The battery FDC can exercise tactical fire direction, when required.

(1) Battery FDC. In the FDC, fire missions are analyzed, firing data determined, and fire commands issued to the artillery sections. The FDC uses the BCS as the primary means to determine firing data. The BCS is digitally linked to a gun display unit at each artillery section. This link allows fire commands to be rapidly transmitted to the artillery sections for firing. The FDO ensures that the fires will not endanger friendly forces. The FDC maintains the tactical situation and receives all fire plans for the battery. The FDC answers all radio transmissions including calls for fire, issues fire orders, executes fire plans, establishes firing standards, and makes required reports for the battery. The FDC passes necessary information to the BOC to enhance its capability as an alternate FDC.

(2) Battery Operations Center. The BOC gives the battery an alternate FDC capability. The BOC monitors the communications nets on which the battery is a station, maintains the tactical situation, and assists the FDC as required; e.g., preparing firing data for scheduled fires, updating firing data for planned targets based on met data, etc. The BOC is also prepared to conduct fire direction duties, when required; e.g., during displacement of the FDC, loss of communications or fire direction capability of the FDC, etc.

(3) Priority Targets. The FDC ensures the battery is laid on its assigned priority targets. A FPF is a priority target in the defense. See paragraph 2004 for information on priority targets and FPFs.

(4) A 24-Hour Operation. The battery must be capable of 24-hour operation. At the same time, personnel need rest to prevent mistakes. This can be accomplished by maintaining one or more artillery sections, and keeping either the FDC or BOC completely operational for rapid response to a fire mission. Remaining artillery sections maintain a minimum crew alert, prepared to join in a fire mission. The battery will lay on the highest priority target, with firing data and ammunition for other priority targets ready.

b. Movement and Positioning. The battery commander moves and positions his battery based on direction of the artillery battalion. The artillery battalion commander provides guidance for the conduct of movements and positioning. Based on this guidance, the battalion S-3 identifies position areas and a direction of fire, controls the timing of movements, and may direct the routing and method of displacement. The battery commander is responsible for the selection of actual firing

positions within designated position areas, and if not otherwise directed, the method of displacement. When the battery is operating independently of the battalion, the battery commander will coordinate and direct his own movement and positioning. For details of movement and positioning, see chapter 9.

8007. Fire Orders

Once the FDO has determined the type of munition and volume of fire required, he must select the firing units and send the fire order. The fire order is the FDO's decision on how to attack a specific target given in a prescribed manner. The format for fire orders is given in FM 6-40, *Field Artillery Manual Cannon Gunnery*. Considerations in determining the fire order include the following:

- Nature of the target.
- Ammunition availability.
- Commander's guidance (may include firing restrictions).
- Artillery available and their status.
- Target location accuracy and proximity to friendlies.
- Positioning and range capability.
- SOP.
- Call for fire (what was requested).
- Effects desired and effects of ammunition.

8008. Massing Fires

The massing of the fires of more than one artillery unit depends on common survey or registration for all units. Centralized control facilitates massing of fires. The FDO allows adequate time for all batteries and battalions to prepare to deliver the fire. The elements of the fire order provide for the desired effect, control, and timing of firing.

a. Units to Fire. The units capable of firing on a target are determined from the fire capabilities overlay. When a unit requests additional fire, the artillery commander or the S-3/FDO must decide whether to grant the request. The number of units to fire and the amount of ammunition must be considered when approving requests for additional fires.

The unit requesting the fire is informed of the decision and instructed on details of coordination if the fire is not controlled by the senior FDC.

b. Target Location

(1) Known. The location of the target may be determined by survey, from aerial photographs, or from a study of the ground by commanders, ground observers, or air observers. The FDO includes in his fire order the grid coordinates and altitude of the target, target number, nature of the target, amount and type of ammunition, method of fire, and the time of opening and/or lifting fire. Fire on these targets is delivered without adjustment, whenever practicable.

(2) Unknown Initially. A battery or battalion may request additional fire on an important target on which it is adjusting. The requesting unit provides the approximate grid coordinates, target number, and description of the target. The correct grid coordinates and altitude are provided as soon as this data is determined. Communications are kept open and the reinforcing units stand by to provide the requested support immediately.

c. Method of Attack. The size and nature of the target will govern the distribution of the fires of the participating artillery units. When the target area is large, each battery and battalion may be assigned a part of the target; e.g., aimpoints.

d. Massed Fires in Close Support. The FDO must be especially cautious when massing fires in close support of troops. Corrections for nonstandard conditions are used, and check rounds may be fired.

8009. Survey and Meteorology

Survey and met allow the delivery of accurate fires. For detailed information on survey operations, refer to FM 6-2, *Field Artillery Survey*. For detailed information on meteorological operations, see FM 6-15, *Field Artillery Meteorology*.

a. Survey

(1) Mission of Survey Section. The mission of the survey section is to provide a common grid to the required accuracy. Accuracy

requirements (fourth-order/regimental level, fifth-order/battalion level, or hasty/battery level survey) are established by the effects required on the target and the inherent system inaccuracies. Survey control, consisting of position location, position height, and a line of known direction is furnished to firing elements and target acquisition assets. Common survey control allows firing elements to be tactically employed while retaining the ability to deliver accurate, massed, and timely fire support. Additionally, survey control may be extended to other MAGTF units, when required; i.e., declination stations, PLRS, etc.

(2) Common Grid. Common grid is the determination of weapons and target acquisition systems relative to one another. Establishing a common grid is a command responsibility. A common grid allows the artillery to achieve the following:

(a) Massing Fires. Accurate survey permits rapid and economical massing of fires. For artillery to mass fires accurately without survey requires an observed adjustment of all units on the target or prior registration of all units on a common point.

(b) Delivery of Surprise Observed Fires. If survey is not available and all batteries are required to adjust on a target, the element of surprise is lost. Complete surprise is impossible without survey.

(c) Delivery of Effective Unobserved Fires. Without survey, consistently effective unobserved fires are possible only if the target has been fired on previously and replot data has been computed.

(d) Transfer of Firing Data Between Units. Transfer of firing data between units is possible only when units are located relative to each other and to the target (on a common grid).

(3) Survey Operations. The survey mission is accomplished through planning, coordination, fieldwork, and the timely collection, evaluation, and dissemination of survey information.

(a) Planning. The artillery commander provides guidance to the survey officer in planning. Survey planning is based primarily on the planned positioning and movement of firing units and target acquisition assets. Considerations include priority, accuracy, and time requirements, position requirements, and future plans.

The tactical situation, availability of survey control, number of installations, terrain, weather, and the availability of survey resources available are influencing factors. The planning begins early to ensure the computation and dissemination of timely and accurate survey. The planning must provide for survey depth to support artillery in all areas of the battlefield. Survey sections must have the appropriate equipment and personnel to accomplish their mission. Planning is conducted at all echelons simultaneously.

(b) Coordination. The regimental survey officer has staff responsibility for all survey within the regiment. His aims are starting control for survey operations; unity of effort in survey operations; balanced workload; survey control to all units requiring support; assistance to battalion survey sections, when required; and survey closure for accuracy in computations. He coordinates with the S-3 for survey requirements and to secure information about the movement and positioning of artillery units. The regimental survey officer makes provisions to initiate surveys and tie together all surveys conducted in the area. He strives to conserve time, to eliminate duplication in survey work, and to accomplish survey work on the basis of priority. He establishes a regimental survey plan which outlines how survey operations will be conducted. The survey plan supports the artillery's concept of operations. Survey information and data are exchanged using Regimental Survey/Met Net.

(c) Fieldwork. Artillery survey is conducted using various methods and equipment. Survey sections use GPS receivers, the position and azimuth determining system (PADS), and conventional survey equipment to extend common survey control throughout the area of operations. Fieldwork includes establishing survey control points (SCPs), measuring distances and horizontal and vertical angles, making astronomic observations, accurately recording field data, and making sketches of survey control points. The fieldwork must be started immediately on receipt of the commander's orders and be continuously and aggressively pursued. Fieldwork produces raw data that must be converted to usable horizontal and vertical position locations and azimuth. The fieldwork is converted to usable data through survey computations.

(d) Survey Information Center. The regimental survey officer establishes a survey information center. The survey information center collects, evaluates, and disseminates survey information

to units of the division. It is usually located within or near the artillery regimental headquarters main echelon. The survey information center maintains a file of survey information, which includes trig lists of actual and proposed areas of operation, an index file (record of SCPs) containing fourth-order (1:3000) and higher control points, and designated fifth-order (1:1000) SCPs. Survey information maps and overlays are maintained to aid in the rapid dissemination of survey information to using units and for planning the artillery survey to support the MAGTF. These maps and overlays show the known SCPs, proposed surveys, completed surveys, friendly and enemy information that may affect the survey operations, and proposed artillery position areas/positions.

The survey information center—

- Obtains and disseminates accurate time for astronomical observations.
- Checks field records and computations of survey parties within and/or attached to the artillery regiment.
- Adjusts all fourth-order traverses to distribute minor errors in distance and direction throughout all stations occupied in the survey.
- Converts survey data to common grid, when required.
- When required, performs transformation computations of coordinates from one datum to another.
- When required, must perform computations for conversion of coordinates from geographic to grid and from grid to geographic.

(4) Engineer Support for Survey Operations. Consideration must be given to engineer support for establishing survey control. When trig lists and geodetic data are not available, the survey capability of the artillery must be augmented with engineer survey support. Requests for augmentation from the engineer topographic unit(s) are appropriate. The MAGTF engineer officer designates the SCPs when adequate control can be provided from trig lists and lists of geodetic data. When a topographic unit is part of the MAGTF engineer task organization, the MAGTF trig list is maintained by the engineer unit. The artillery survey information center forwards required data from the artillery trig list(s). If a topographic unit is not a part of

356-548 O - 93 - 5

the engineer task organization, the artillery survey information center will maintain the trig list. When the artillery is assigned responsibility for all MAGTF tactical survey operations, the artillery regimental survey officer will designate SCPs, maintain trig lists, and provide survey control to all designated agencies of the MAGTF.

(a) In MEF-sized operations, the MAGTF engineers possess the capability to extend control to the rear of major elements (divisions) of the force. This control is to third-order accuracy. Control, to the order required, is extended to units within the MAGTF, as required.

(b) In MEU-sized operations, the engineers may or may not possess adequate survey capability. When this capability is not available, the artillery element of the MAGTF will often be assigned this responsibility.

(5) National-Level Support for Survey Operations. During mobilization, the Department of Commerce provides to the Department of Defense officers of the National Oceanic and Atmospheric Administration (NOAA) for duty with the various armed services. NOAA officers are assigned to the headquarters battery, artillery regiment. A period of adjustment and familiarization with military service and related requirements may be necessary on initial assignment of these specialists.

The NOAA officers are qualified in the following:

- Surveys of coastal waters and adjoining land areas.
- Observation, study, and prediction of ocean tides and currents and the earth's magnetic elements.
- Geodetic control surveys and related gravity and astronomical observations.
- Production of nautical and aeronautical charts.
- Seismological observations and investigations.

(6) Survey Control. Survey operations must be started as soon as the requirement for survey has been identified and the tactical situation allows. The goal is to establish survey control **before** occupation by the firing or target acquisition elements. Direction is the most important element of survey control. When survey control is not immediately available, all efforts should be directed toward establishing

common directional control in the position area. Providing **timely** direction, location, and height may take precedence over the accuracy of data. The commander makes the decision to accept survey data below established accuracy requirements. When artillery survey (regimental/battalion level) is not readily available and time is critical, the firing units and/or target acquisition assets can perform hasty survey techniques to establish direction and location data. Hasty survey should be upgraded as soon as the situation permits.

(a) Direction. Recommended methods of establishing direction as listed below according to priority:

- Astronomic observation.
- PADS.
- Traverse using a theodolite.
- Azimuth from north-finding module.
- Hasty survey techniques.

Hasty survey techniques can establish direction by simultaneous observation with an aiming circle; polaris 2 reticle observation with aiming circle; polaris-kochab observation with aiming circle; or directional traverse using an aiming circle.

(b) Location. Recommended methods of establishing location are listed below according to priority:

- GPS survey (regiment-level).
- PADS.
- Traverse using a theodolite.
- GPS navigational.
- Hasty survey techniques.

Hasty survey techniques establish location by graphical three-point resection or graphical traverse.

(7) Regimental Survey Operations. The regimental survey section supports the survey operations of lower echelons. The primary function of regimental survey is to provide subordinate artillery echelons a basis for establishing survey operations. A battalion SCP may be provided, or, when available, trig lists containing data for stations in the vicinity of the unit may be used. In either situation,

a common grid is established. Accurate azimuth can then be determined through various techniques; e.g., PADS, astronomic observation, etc. The location and number of SCPs depend on the method of survey (e.g., PADS) and the dispersion of artillery. Survey control is also provided to those artillery units that require a survey capability; e.g., met sites, target acquisition assets. The regimental survey section may be required to recover and verify established battalion SCPs or extend survey control into adjacent division areas. Declinations stations are established, as required.

(8) Battalion Survey Operations. Battalion survey provides survey control primarily to firing batteries of the battalion. Met sites, weapons-locating radars, and other installations requiring survey support operating in the battalion's position area may also be supported. Survey control may be extended forward when FOs require such control. After artillery survey requirements have been met, battalions in DS may provide survey control for the supported unit, as required. Battalion survey officers submit survey requirements prior to position surveys and submit control data to the regimental survey section as accomplished.

(a) Position Area Survey Requirements. Survey control is required for each firing battery of the battalion. Survey control is identical for all firing batteries regardless of caliber. See figure 8-3.

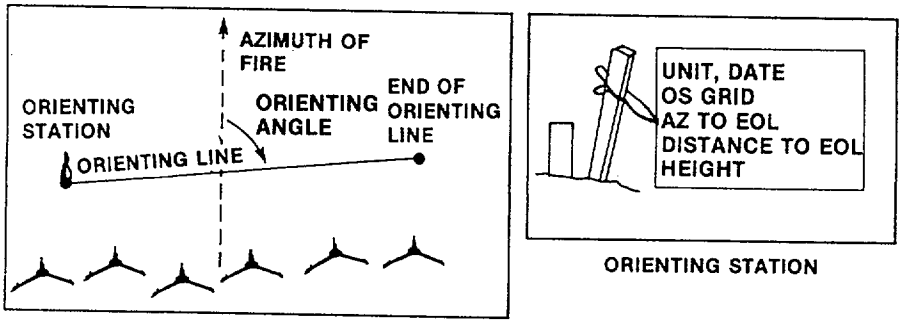


Figure 8-3. Position Area Survey.

(b) Firing Battery Positions. Each firing battery is provided an orienting station (OS), the orienting line (OL), and the end of orienting line (EOL). This data is used in laying the battery. The

OS and EOL are physical positions on the ground. The EOL must be visible and at least 100 meters from the OS. The sites for these points are selected by the battery commander/executive officer, when available, or by the survey officer. Factors considered in selecting the sites include line of sight between the OS and the weapons, direction of fire, traffic pattern in the battery area, and tactical aspects of the sites. The sites may be located in front of or behind the gun line. Unit SOP should establish a technique for marking the points for rapid identification. For example, a color-coded stake may be placed next to the OS, inclined at a 45-degree angle in the direction of the EOL. A stake is oriented at the EOL in a likewise manner. This technique facilitates locating these points at night. Each point is tagged and marked with the name of the station and the date surveyed. The azimuth of the OL is recorded at the OS. To preserve operational security or to allow for completion of survey control, some data (e.g., unit, orienting station grid, and height) may be omitted from the tag and relayed to the battery by other secure means.

(9) Survey for Weapons-Locating Radars. Survey for weapons-locating radars is provided by regimental and/or battalion survey sections. The artillery regiment may task the nearest battalion to provide survey control. Artillery battalions provide survey for attached radars. Survey requirements for radar positions include the coordinates and the height of the radar position and a line of known direction to an azimuth mark. The distance and vertical angle to an azimuth mark are also required.

(10) Survey for Other Sites. Survey control may be provided to other sites by regimental and battalion survey sections. Such sites include EW, met stations, UAV control positions, alternate and supplementary positions, and offset registration positions.

(11) Target Area Survey. Target area survey consists of surveying designated critical points in the target area. Target area survey is performed in situations that favor a fixed OP from which the observer does not have a suitable means of locating targets. As equipment is fielded that allows observers to locate themselves and targets accurately, the need for target area survey will decrease. When target area survey is required, the survey party will establish an SCP with an azimuth mark as close as possible to the OPs. Then, using conventional survey techniques, the critical points are surveyed. Once critical points have been surveyed, observers will watch the target

area for enemy movement or suspicious activity. When a target of opportunity is sighted, it is located using a polar plot method of target location (see FMFM 6-8) or the intersection method of target location. The survey party must use extreme caution when conducting target area survey to avoid making silhouettes on the skyline.

b. Meteorology

(1) Mission of Artillery Meteorology. The accurate delivery of artillery fires requires all echelons of artillery to be continuously informed of the met situation. Accurate meteorological data must be obtained and appropriate corrections must be applied to all fires to save ammunition, decrease time in adjustment, and obtain a greater surprise effect. The mission of artillery met is to fill the meteorological needs of the artillery by providing the following messages within the limits of their unit capabilities:

- Computer met messages.
- Ballistic met messages.
- Fallout met messages.
- Sound ranging met messages.
- Met data to ACE, as required or requested.

(2) Operations of the Artillery Meteorological Section

(a) Capability. The artillery meteorological section has the capability of sounding the atmosphere to heights of 30,000 meters, day or night, and in all types of weather except severe surface winds. The section can sound the atmosphere at approximately 2-hour intervals, or for high altitude soundings, at 4-hour intervals. The meteorological section has the capability to measure upper air winds; to compute upper air densities and temperatures; and to report the temperature-humidity index, wind chill factor, and surface winds.

(b) Equipment. The artillery meteorological section employs electronic (primary) and visual equipment. Electronic equipment consists of the meteorological data system (MDS). The MDS is a mobile, automated system which collects, processes, and transmits met data digitally to FDCs.

(c) Scheduling. The scheduling of met messages should be geared to the needs of the using units. Requirements for fallout

messages are determined by the MAGTF or the GCE. The artillery regimental S-3 publishes a schedule of met requirements for the regiment.

(d) Employment. The met assets of the regiment are employed as a unit or as detachments with independently deploying battalions. The primary consideration in employing the regimental met section is the proximity of the firing units.

When possible, a met station will be established as close as feasible to the majority of the trajectories of the artillery weapons being supported. The station should be well forward and within a headquarters echelon area, where communications facilities are available. Prevailing winds, terrain, and logistical requirements are also considered in the met site selection. When possible, the following minimum requirements should be satisfied: A level area of cleared land, no obstructions within 200 meters, and no objects on the horizon above an angle of 3 degrees. In most instances, a compromise is required between this ideal location and the tactical requirements (area, cover, and camouflage). The area to be occupied by the section must be identified and a line of direction established therein.

The selection of the met station(s) is made by the regimental meteorological officer. He coordinates the positioning with adjacent meteorological sections. Met stations are moved as necessary to maintain support. This movement must be planned and organized to ensure an uninterrupted flow of met data to using units. The artillery commander directs this movement.

(e) Accuracy of Met Data. To be useful, met data must be accurate. Several factors affect this accuracy.

1 **Positioning of Met Station.** Studies addressing met message validity have established guideline distances for average weather situations. In rolling to level terrain, data from met stations up to 20 kilometers from the trajectory midpoint are acceptable. In mountainous regions, in coastal areas, and along shorelines of large bodies of water, met measurements vary significantly over relatively short distances. Met message validity will be reduced proportionately to the inconsistency of the terrain; e.g., met data measured from a valley would not be representative of that occurring in another valley a few kilometers away. To maximize their capabilities, a met station should be positioned as far forward as possible to best support

the operation. The location should be one that is tactically sound, supports good communications, and optimally, where the balloon will pass as close to trajectory midpoint along the gun-target line as possible. The prevailing wind pattern may affect the positioning. Multiple stations should be separated as the terrain dictates.

2 **Timing.** The passage of time may decrease the accuracy of a message because of the changing nature of weather. There are no specific rules for determining the usable time, since that determination will depend on the characteristics of the atmosphere, periods of transition, meteorological section movement, personnel, supplies and equipment, and number of lines of the met message required. The time of day may also be a factor. Generally, a reading is made at approximately 2-hour intervals, or when the temperature changes 5 degrees or more. During periods of stable temperatures, soundings can be less frequent. During periods of transition (sunrise/sunset) the atmosphere changes rapidly (heating up/cooling down) and met schedules may have to be adjusted to less than 2 hours. When the atmosphere stabilizes (minimal change in temperature), met schedules could be taken at intervals that exceed 2 hours.

3 **Validity Decision.** The decision on the validity of the met message is made by the user. The user may have data available from more than one station. The user selects the best data available. Generally, the **first choice** of data is from a station within 20 kilometers of the projectile midpoint trajectory. The **second choice** is from the nearest met station up to 80 kilometers from the trajectory midpoint (upwind is best) and less than 2 hours old. The **third choice** is data from a station within 20 kilometers and over 2 hours old. A met message 4 hours old may be used except during day/night transitions or frontal passages.

(f) Dissemination of Met Messages. In order for met data to be useful, the data must be disseminated in a timely manner. Units requesting met data must specifically state what information is needed. The number of lines requested should be no greater than what is needed for the maximum ordinate of the weapon being fired. Met messages will be sent digitally using MDS. If MDS is not available, met messages will be sent by (in order of priority)—wire, messenger, or radio. Fallout met messages will be transmitted by the most expeditious means available.

Chapter 9

Movement and Positioning

Section I. Reconnaissance, Selection, and Occupation of Position

9101. Introduction

The artillery commander maneuvers his unit to render effective support and to enhance survivability. Artillery units conduct movement and positioning by a procedure called reconnaissance, selection, and occupation of position (RSOP). The purpose of RSOP is to assist the rapid and orderly movement of the artillery from a position area, assembly area, or a march column into a position from which it can deliver the fire support required to accomplish its mission.

9102. Reconnaissance

Reconnaissance is the examination of terrain to determine its suitability for use in accomplishing the mission. Routes and positions for cannons, support installations, and OPs are reconnoitered. Reconnaissance is continuous. There are three methods of reconnaissance—map, air, and ground. The best reconnaissance is one which uses a combination of all three methods. Normally, the commander is able to conduct only a map and ground reconnaissance.

a. Map Reconnaissance. Map reconnaissance involves studying and analyzing a map to become familiar with the terrain and to determine the location of potential position areas and routes. This method is fast and should be the first step in any reconnaissance. Unsuitable position areas and routes can be eliminated immediately. However, map reconnaissance will not reveal terrain or other features that may have changed (e.g., the existence or utility of a bridge, surface conditions, or the presence of friendly or enemy forces in positions or along routes). When available, aerial photographs can provide a current, detailed picture of the terrain.

b. Air Reconnaissance. Air reconnaissance is a quick way to reconnoiter large areas. It is especially useful for checking routes and for getting a general indication of the terrain and position area availability. However, detail of the area may be difficult to determine. From the air, true surface conditions may not be distinguishable or may be distorted. Also the ground appears to be flatter than in reality. The preferable aircraft for air reconnaissance is the helicopter. Space aboard the aircraft may not allow key staff members to accompany the commander. When planning air reconnaissance, exercise caution to preclude the flight plan from compromising the route or positions.

c. Ground Reconnaissance. This is the best method of reconnaissance. However, it takes time and there is risk involved. It takes time to physically examine the terrain for suitability. Because caution must be exercised to avoid the risk of revealing the position to the enemy, ground reconnaissance is best performed during daylight.

9103. Reconnaissance for Movement of the Regiment

Reconnaissance is conducted to prepare for the movement and positioning of the regiment. The regiment is moved and positioned to ensure coverage to the supported force, to weight the main effort, to facilitate future operations, and to enhance artillery operations; e.g., mass fires, counterfire, survivability, communications, and CSS. The regimental commander may conduct reconnaissance, but this is limited due to his role as division artillery officer and FSC. The regimental commander and/or his S-3 direct the movement and positioning of artillery battalions and other units with GS and GS-R missions, and, when required, battalions with DS and reinforcing missions. The regiment normally assigns position areas based on the recommendations of the unit commanders. To facilitate planning and execution of the movement plan, an artillery execution/position matrix may be prepared. Appendix G provides an example of such a matrix.

a. Battalion Position Areas. Positioning of the regiment is accomplished by the assignment of battalion position areas. Position areas do not constitute a rigid restrictive area for the battalion or its batteries. They should be considered only as guides to be followed as closely as the mission, terrain, and tactical situation permit. Battalions with missions requiring the delivery of chemical weapons normally have priority of positions, followed by units with a DS mission. Battalion commanders conduct reconnaissance to find position areas to meet their assigned mission requirements and to meet the guidance of the regimental commander.

b. Regimental Headquarters Echelons. The commander positions his headquarters echelons to enhance control and support of his battalions and coordination with the division. The commander locates himself where he can best obtain the information critical to his situational awareness and command the regiment. The COC of the echelon where the commander is located is designated the regimental CP.

(1) Main Echelon. The regimental commander selects the general position area for the main echelon, with the S-3's recommendation. The selection is made by map reconnaissance or, when possible, by ground and/or air reconnaissance. In consultation with the S-6, the regimental headquarters battery commander conducts a reconnaissance to determine the specific position of the main echelon and the location for the COC within that position. During displacement, the main echelon personnel, vehicles, and equipment moving to and occupying the new position are temporarily designated the forward echelon until control of operations has been assumed from the main echelon.

(2) Rear Echelon. The S-3 selects the general position for the rear echelon, with the S-4's recommendation. The S-4 or his representative conducts a reconnaissance to determine the specific location of the rear echelon.

c. Counterbattery Radar Platoon. The CBR platoon commander moves and positions radars operating under the regimental control for coverage of the areas designated by the S-3. The CBR platoon commander conducts reconnaissance for position areas, and the radar chief selects the actual site for the radar.

d. Meteorology Station. The regimental meteorological officer normally conducts reconnaissance and selects the position area for the met station. The meteorological chief selects the actual site. The S-3 makes recommendations for the positioning and movement of the station.

e. Route Reconnaissance. Route reconnaissance is conducted continuously by all units. Route reconnaissance facilitates the movement and CSS of artillery units. This is essential in certain types of environments; e.g., mountains, jungles, and arctic areas. Routes are selected to maximize trafficability and to minimize detection and attack by the enemy. The strength and condition of bridges and the location of obstacles must be determined and routes/lanes marked. Roads may require improvement by engineers. Information about routes is disseminated to all units.

9104. Reconnaissance for Movement of the Battalion

The artillery commander initiates reconnaissance based on his knowledge of the tactical situation or as a result of a change in mission. Movement and positioning are driven by fire support requirements, the tactical situation, communications, and survivability. The artillery battalion commander selects positions that allow the battalion to accomplish its mission. The discussion in paragraphs 9104a and b applies to the artillery battalion commander and, as feasible, battery commanders.

a. Planning the Reconnaissance. To be effective, reconnaissance must be planned. The planning will vary with the mission, time available, and method of reconnaissance.

(1) Artillery Commander. The commander plans and coordinates the reconnaissance. He analyzes the tactical situation to identify positioning requirements. By map reconnaissance, he identifies a potential position area(s). He coordinates the potential area with the supported/reinforced unit and higher artillery headquarters, as appropriate. The commander determines the presence of other units or their planned occupation of positions in the vicinity of the area and routes to be reconnoitered. Provisions may be required to bypass friendly units along the route. The commander considers the distance and route to the new area and personnel and equipment availability. He then determines how the reconnaissance will be conducted, the composition of the reconnaissance party, the route(s) of the reconnaissance, and the time available. He develops his plan, plans fires, and issues orders for its execution.

(2) S-2. The S-2 provides information to help the commander plan and execute his reconnaissance. This information includes the enemy threat, camouflage, visibility and trafficability, weather, and obstacles. Sources of this information are reports from other units, from air observers, FOs, and LNOs, and other sources.

(3) S-3. The S-3 recommends to the commander the movement and positioning of the unit. He considers the coverage to the supported/reinforced unit, the ability to mass fires, terrain and weather, the enemy situation, and if necessary, the nuclear/chemical dosage rates and levels of contamination. He ensures that the positions can be supported by communications and CSS and that the new position areas meet survivability requirements. Based on the commander's decision and guidance, the S-3 makes position area assignments, designates azimuths of fire or aimpoints (e.g., grid intersection),

arranges for route precedence, and issues warning and/or movement orders. The S-3 directs survey operations to support the positioning plan. Close coordination is required between the S-3, the survey officer, and battery commanders. The survey party may precede the battery commander to a firing position designated by the S-3; link up with the battery commander during RSOP; or extend survey to the position after the selection by the battery, but before occupation.

(4) S-4. The S-4 plans CSS to support the movement and positioning of the unit. He coordinates engineer support and arranges for CSS to displacing units; i.e., repair and replenishment point (RRP). See FMFRP 6-17.

b. Movement Briefing. The artillery commander assembles key personnel and briefs them on the details of his reconnaissance plan. The format for the briefing is generally as follows:

(1) Situation

- *Enemy situation.* Include known or likely ground or air activity, obstacles, etc.
- *Friendly situation.* Include the locations of friendly units along the route(s) and in the position areas, obstacles, etc.

(2) Mission. The mission to be accomplished from the new position.

(3) Execution

- *Destination.* The commander points out, on the ground or on a map, the position(s) and locations (or tentative locations) of installations within the position. For the battery, the commander also identifies the azimuth of fire.
- *Route(s).* The commander traces the route(s) to be used during the movement. He identifies potential trouble points along the route; e.g., likely ambush points, obstacles, etc.
- Order of march.
- Potential emergency firing positions (during displacement).
- Convoy control measures. See paragraph 9209.
- Time of movement.
- Security measures, to include immediate actions and planned fires.
- Mission-oriented protective posture (MOPP) status and areas of known chemical or nuclear contamination.
- Any other special instructions.

(4) Administration and Logistics. Administrative logistical information; e.g., vehicle recovery, rations, water, fuel, etc.

(5) Command and Signal

- Prearranged codes and signals for the movement.
- Convoy communications; e.g., frequencies, net control restrictions, etc.
- Location of key personnel in the convoy; e.g., commander, corpsman.

c. Battalion Commander's Reconnaissance Party. The battalion commander assembles personnel and equipment for the reconnaissance. The composition of the reconnaissance party will vary with the mission and any restrictions that may apply. Normally, the commander will include in his party the S-3, S-6, and survey officer. The S-2 may accompany the commander to analyze security requirements and/or to identify position areas for radars, OPs, etc. In some situations, battery commanders, survey personnel, wiremen, the ammunition NCO, and a medical representative may accompany the battalion commander.

(1) Actions Prior to Departure. Before leaving on the reconnaissance, the commander gives his XO as much information as he can to allow the battalion to continue operations and to prepare for movement during his absence. He may provide instructions for the issuance of the battalion order following the reconnaissance.

(2) Reconnaissance Party in March Column. During a march with the supported unit, artillery reconnaissance parties usually precede the artillery units and march with the advance elements of the supported unit in column. The artillery commander can reconnoiter positions along the route, as necessary. If time is limited, the commander may have to proceed to the position area, conduct reconnaissance and select the position, and coordinate security while the unit is on the march.

(3) Conduct of the Reconnaissance. The battalion commander seldom performs all the operations of the reconnaissance personally. He normally assigns reconnaissance tasks to members of his party. On arrival at the potential position area, the members accomplish their assigned tasks and reassemble at a specified time and place.

The tasks performed include the selection of positions for the battalion headquarters echelons, routes, and communications sites. The battalion commander may identify battery position areas and (battalion) position areas for any reinforcing artillery. Alternately he may give guidance and authorize the commanders to select their own position areas. He orients the units by assigning azimuths of fire or aimpoints. The battalion commander may also identify position areas for other artillery units under battalion control; e.g., CBR detachment. Following the selection of position areas, the battalion commander determines the method and order of movement.

d. Battery Position Areas. Like battalion position areas, battery position areas are general in nature. Battery commanders reconnoiter their assigned position areas as a part of the battalion commander's party, or they may plan and execute their own reconnaissance. When required, the battalion may assign a battery a *position* to occupy. In contrast to the battery position area, the position is the specific location occupied or to be occupied by the battery; i.e., grid coordinates. This may occur when the battalion desires to positively control the positioning of artillery.

(1) Position Area Selection Factors. Several factors affect the selection of battery position areas. An important factor is control and coordination of the battalion. The disposition of the battalion on the ground will affect its overall capability to meet its fire support requirements and its survivability. Other considerations for the selection of position areas include:

(a) Supported Unit's Mission and Plans. For example, in a movement to contact, position areas near roads allow artillery to keep up with the fluidity and speed of the battle. Position areas should not interfere with other troops or installations.

(b) Firing Capability. Battery positions should be mutually supporting with at least 3,000 meters overlap in their firing capability fans. Other considerations include gun-target line, firing range, and capability to mass. Avoid positioning which requires a battery to fire directly overhead another battery.

(c) Enemy's Capability. Positioning will be influenced by the enemy's capability and means to detect and attack artillery.

- For a radio direction-finding threat, position batteries laterally to degrade this capability.

- For a counterfire threat, position batteries at least 1,000 meters apart.
- For an NBC threat, position batteries to minimize the effects and exposure to these weapons.
- For an air threat, position batteries randomly and dispersed.
- For a ground threat, position batteries to take advantage of existing security of other units. When possible, position batteries for mutual support and outside the range of the enemy's long-range direct fire weapons.

(d) Terrain. Terrain can dictate the selection of position areas.

- Terrain can minimize detection and vulnerability to enemy attack. A position can be selected against an embankment to afford protection from air attack; a battery can be placed in a position area which has restricted armored vehicle access.
- Terrain can limit the availability of suitable firing positions.

(e) CSS. Consider CSS during positioning. Generally, artillery position areas should be road-accessible.

(f) Communications. Consider communications within the battalion, as well as with the supported unit when selecting battery position areas. When possible, the capability for wire communications should be sought.

(2) Battalion Positioning Techniques. Based on the tactical situation and the position area selection factors, the commander/S-3 may use the following positioning techniques.

(a) Battalion Perimeter. Firing batteries are positioned near each other with the headquarters battery main echelon positioned central to firing batteries to form a battalion perimeter. This technique favors command, control, coordination, survey, CSS, communications, and local security. This technique is desirable when the enemy has minimum detection and counterfire capability, in close terrain, and on a relatively static battlefield. The battalion is vulnerable to counterfire, radio and radar direction finding, artillery barrages, air strikes, and nuclear/chemical attack. Displacement of the entire battalion may be necessary if the position is discovered.

(b) Battery Perimeters. Firing batteries are positioned in separate perimeters with the headquarters battery main echelon positioned where it can best control the battalion. Command, control, coordination, communication survey, CSS, and local security become proportionately more difficult with the dispersion. This technique is desirable when the enemy has acquisition and counterfire capability, in open terrain, and on a relatively dynamic battlefield. The battalion as a whole is less susceptible to enemy detection and less vulnerable to enemy attack. For short periods, a control cell (e.g., the S-3, S-2, and essential equipment) may be required to extend the battalion's capability to maintain control.

(c) Firing Positions Outside the Perimeter. Firing batteries establish positions within a battalion perimeter or in battery perimeters. Additionally, a battery(s) may prepare a firing position outside the perimeter. The battery occupies the outside firing position with only the necessary personnel, equipment, and supplies for a specific mission. Following the mission, the battery returns to its primary position. The battery fires from within its perimeter only when it is infeasible to fire from the outside position. This technique extends the range of the battery and reduces the enemy's counterfire effectiveness. Command, control, CSS, and security are simplified, since the elements of the battalion are together most of the time. However, the battalion's ability to deliver massed or sustained fire is degraded. Additional positions and routes, time, survey, and communications are required. Consider the vulnerability of the battery while displacing.

e. CBR Platoon Detachment. When possible, a radar is positioned near one of the firing batteries to ease security and support. Generally, radars are dispersed at least 1,000 meters from another unit to avoid increasing the vulnerability of the unit by the radar signal and vice versa.

f. Battalion Headquarters Echelons. The battalion headquarters echelons are located to allow effective command and control of the firing batteries and, at the same time, communications with the supported/reinforced unit. The battalion commander locates himself where he can best command the battalion. The COC of the echelon where the commander is located is designated the battalion CP.

(1) Main Echelon. The battalion commander selects the general position area for the battalion's main echelon, with the S-3's recommendation. The selection is made by map reconnaissance or, when possible, by ground and/or air reconnaissance. This positioning is

influenced by the positions of the firing batteries and of the supported unit headquarters. The headquarters battery commander conducts a reconnaissance to determine the specific position of the main echelon and the location for the COC within that position. During displacement, the main echelon personnel, vehicles, and equipment moving to and occupying the new position are temporarily designated the forward echelon until control of operations has been assumed from the main echelon.

(2) Rear Echelon. The S-3 selects the general position areas for the rear echelon, RRPs, etc., based on the S-4's recommendation. The S-4 or his representative conducts a reconnaissance to determine the specific position for the rear echelon.

9105. Reconnaissance by the Firing Battery

After receiving a warning order or movement order by the battalion or on his own initiative, the battery commander reconnoiters new firing positions. He plans the reconnaissance. See paragraphs 9104a and b. He conducts a preliminary ground or air reconnaissance of the position area, whenever possible. He returns to the battery, preferably on an alternate route, and briefs key battery personnel; e.g., the battery XO, first sergeant, battery gunnery sergeant, local security chief, etc. The first sergeant assembles the reconnaissance party. In some situations, the battery commander may decide to bring an advance party on his reconnaissance. See paragraph 9105b. If the battery commander is conducting the reconnaissance as part of the battalion commander's reconnaissance party, the battery commander (and his reconnaissance party) meet the battalion commander at the appointed place and time.

a. Reconnaissance Tasks. The battery commander leads the reconnaissance party (and advance party) to the new position. He selects locations for battery installations, formulates the occupation plan, issues orders, and supervises the execution of the plan. During the reconnaissance, the commander may sketch the route and general layout of the position. The sketch is useful for briefing key personnel on the movement and to help orient personnel on arrival at the position, especially at night. Navigation can be aided by annotating the route with mileage and times marks. See figure 9-1.

Tasks performed during the reconnaissance include—

- Route suitability, primary and alternate.
- Trafficability of the route and position, bridge classifications.

- Obstacles and possible ambush sites.
- Position(s) for emergency occupation (hip shoot).
- Security along route and defensibility of position.
- Control measures to facilitate movement.
- Battery positions and azimuth(s) of fire.
- NBC contamination.
- Availability/accuracy of survey. Use an aiming circle or compass to check the grid azimuth to the EOL.
- Time and distance requirements.
- Order of march.
- Battery CSS area for ammunition and maintenance, if necessary.
- Cover and concealment.

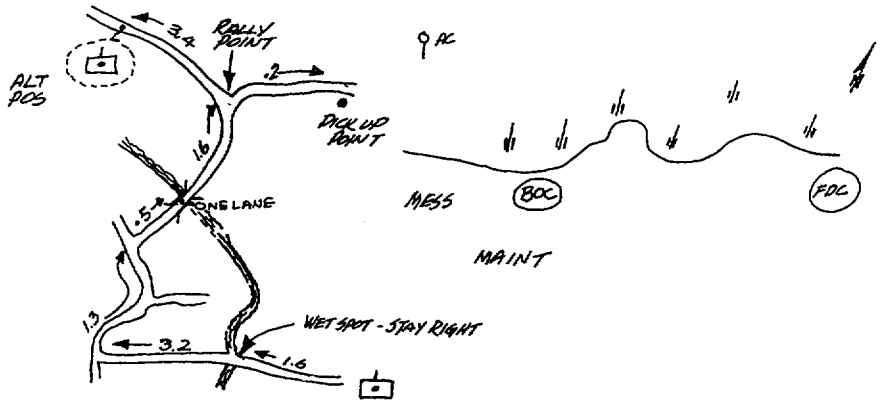


Figure 9-1. Commander's Sketch.

b. Advance Party. An advance party is a group of unit representatives dispatched to a planned new position in advance of the main body to prepare the position for the arrival of the unit and its equipment. A good advance party is critical to timely and orderly occupation of positions. The personnel in the advance party should be trained and competent. These personnel must be capable of accomplishing assigned tasks with little or no supervision. When possible, the advance party should have regularly assigned personnel for continuity and consistency in advance party operations.

(1) Composition. The composition of the advance party is usually stated in the unit SOP and is changed based on the tactical situation and assets available. Figure 9-2 lists minimal assets for an advance party.

PERSONNEL	EQUIPMENT
Battery Commander, First Sergeant, and Driver	Vehicle with radio, map, compass, chemical and nuclear detection equipment
Battery Gunnery Sergeant and/or Local Security Chief	Map and materials for preparing defensive diagram, aiming circle, and necessary wire communications equipment
Battery Operations Center	Fire direction and communications equipment, as necessary
Gun Guides	Compass, wire-communications equipment, and section gear necessary to prepare howitzer position
Communications Personnel	Necessary equipment to establish initial communications

Figure 9-2. Advance Party.

(2) Assembly of the Advance Party. The battery gunnery sergeant or local security chief assembles the required personnel and equipment for the advance party and ensures that equipment is operational. He coordinates security for the movement and for occupation of the new position. The commander briefs key personnel of the advance party. See paragraph 9104b. The unit SOP should have a prearranged signal or procedure that will specify the personnel, equipment, vehicles and their sequence in the march column, and the place of assembly.

(3) Firing Capability. Depending on the mission and tactical situation, the commander may take a howitzer section with the advance party. Taking a firing capability forward—

- Confuses enemy moving-target-locating radars, as part of the infiltration plan.

- Confirms suitability of the route and firing position when conditions are doubtful.
- Allows for conduct of a registration or an offset registration if use of BCS or BUCS is lost.

9106. Selecting the New Position

The battery commander selects the firing position and (if needed) a separate battery CSS area. If assigned a battery position area by the battalion, the battery commander reconnoiters the area to locate suitable positions for his battery. If a battery position area is not assigned, the battery commander positions the battery to meet the considerations discussed in paragraph 9104d.

a. Firing Position Characteristics. The essential characteristic of a firing position is that it permits the unit to accomplish its mission. Operations should not be delayed by seeking a perfect position. A desirable firing position should—

- Allow all weapons to deliver fire for maximum coverage of the supported unit.
- Afford defilade and concealment from ground observation. Flash defilade of 5 yards is sought for light artillery and of 10 yards for medium artillery. Too much defilade may limit the field of fire of the weapons in close defense of the position against ground attack or may restrict low angle fires.
- Be free of obstructions which affect the firing capability of a howitzer(s); e.g., a cliff, building, or high tree to the flank.
- Allow for 6400-mil firing capability.
- Be accessible and have separate routes for entrance and exit, preferably in the rear. The position should not be on an enemy high speed avenue of approach. Concealed routes to and from the battery are desirable, particularly if the position will be occupied and resupplied during daylight. The proximity of a helicopter landing zone is also desirable.
- Be on relatively level, firm ground. Very rocky, swampy, sandy, or uneven ground will slow the occupation of the position or prevent the effective operation of the piece. The position should be trafficable by all vehicles in the battery. Consider the weather and anticipated weather; e.g., rain, flash floods, snow.
- Be in small trees, in brush, or in isolated open spaces or irregular clearings in vegetated terrain. Good positions can often be found

along the edge of a road or trail, but away from crossroads or junctions which may attract hostile artillery fire. Also, the battery should not be along the edge of a primary route for supply. Positions at the forward edge of a tree line, or in small clumps of woods, or under a solitary line of trees are easily spotted by the enemy.

- Be away from prominent landmarks when positioned in open terrain. The unit should be randomly dispersed over the ground, making good use of contours.
- Be in quarries, in ruins, or under the roofs of buildings in a town.
- Allow for good communications, preferably by wire, with the supported unit and higher headquarters.
- Be large enough for dispersal of weapons and other installations if there is an air or counterbattery threat or in barren terrain.
- Be in a compact, easily defended position in mountains or heavily wooded areas, when friendly forces have air superiority, or when the battery is threatened by guerrilla or infiltration tactics. The battery position should be away from enemy concealed routes of approach.
- Allow for shelter and comfort of the battery personnel.
- Have survey control established or survey must be available in a short time. Hasty survey may be required.
- Be selected in consideration of the battery's future mission or displacement.

b. Types of Positions. The battery commander selects primary, alternate, and supplementary positions. These positions are selected to support the planned operation of the supported unit. However, the battery must remain flexible and ready to displace in any direction in case the operation, mission, or tactical situation changes.

(1) A **primary position** is the position from which the unit will accomplish its assigned tactical mission.

(2) An **alternate position** is the position to which the unit will move and accomplish its assigned mission should the primary position become untenable. The alternate position should be generally 800 to 1300 meters away from the primary position. This separation allows the unit to escape the effects of enemy indirect fire on the primary position, but close enough for rapid displacement. An alternate position should be selected for each primary position. The alternate position must have the same characteristics as the primary position. It should be reconnoitered and prepared for occupation

as time permits. Each section chief must know the route to the alternate position, because movement to that position may be by section.

(3) A **supplementary position** is a position selected for the conduct of a specific mission, such as an offset registration, a special fire mission, adjustment with a roving gun, or defense of the primary position. Supplementary position(s) for howitzers should be selected to cover likely enemy avenues of approach in the battery defense. Positions for offset registrations and roving guns should be far enough away that counterfire will not affect the primary positions.

9107. Organizing the New Position

The organization of the new position consists of those actions necessary to allow the battery to deliver fire. The organization is a continuous process that begins during RSOP and ends when the position is vacated. During RSOP, the advance party conducts those actions necessary for the immediate delivery of fire. When the battery's main body arrives, actions are taken for the delivery of continuous fire and the position improved. The longer a unit remains in a position, the more the position is improved.

a. Advance Party Operations. On arrival at the new position, the advance party halts and security personnel sweep and secure the battery position under the supervision of the local security chief. Security personnel move through the position and the surrounding terrain to ensure the area is clear of enemy personnel, boobytraps, mines, and NBC hazards. As the sweep is completed, personnel begin preparing the position for occupation. The extent of the preparation is time dependent—as much work as possible is done before the arrival of the main body. As the tasks are completed, a hasty local security is established and vehicle ground guides await the arrival of the battery at the pickup point. Advance party operations include the following tasks:

(1) The **commander** designates the azimuth of fire and selects positions for howitzers, aiming circles, the FDC and BOC, and other installations. He provides guidance to the local security chief on the plan of defense. He gives instructions concerning the preparation of the position to the battery gunnery sergeant. As time permits, he reconnoiters alternate and supplementary positions. He also supervises the preparation and occupation of the position.

(2) The **battery gunnery sergeant** assists the battery commander in organizing the battery position. He—

- Sets up and orients the aiming circle.
- Determines initial deflections, distances, and vertical angles from the aiming circle to the guns.
- Checks wire communications with each howitzer position.
- Establishes the track plan and vehicle dispersal area.
- Plans and rehearses the occupation with vehicle ground guides.
- Lays howitzers and prepares the XO's report.

(3) The **battery local security chief** plans the battery defense. See paragraph 9301.

(4) The **commander's driver** sets up and monitors the NBC detection equipment. He helps lay wire and guides vehicles into the position, as necessary.

(5) The **assistant executive officer** prepares the BOC for action. He—

- Receives initial deflections, distances, and vertical angles from the battery gunnery sergeant.
- Ensures wire is laid from the wire terminal to the BOC and checks wire communications with the gun line.
- Ensures communications for the FDC are prepared and ready when the FDC arrives; i.e., wire terminal established at the FDC site.
- Provides a vehicle guide to guide the FDC vehicle(s) of the main body into position.

(6) The **gun guides** prepare howitzer positions for occupation. Each gun guide—

- Emplaces a marking stake (to indicate the exact position of the panoramic telescope of the weapon on emplacement) and a guide stake (to orient the weapon on the azimuth of fire).
- Helps the battery gunnery sergeant determine the distance from the aiming circle to their gun positions.
- Records the initial deflection announced from the aiming circle.
- Lays wire from the wire terminal to the howitzer position and from the gun display unit to the BOC/FDC terminal, and checks wire communications with the BOC/FDC terminal and aiming circle.

- Other tasks, as required; e.g., digging trail pits, powder pits, etc. Each gun guide leads his section vehicle into position during occupation.

(7) The **communications personnel** establish battery communications.

b. Formations and Positions of Installations

(1) Howitzers. Howitzers are emplaced for mission accomplishment and survivability. The site should have maximum cover and concealment. The howitzers are dispersed consistent with control and the ability to deliver 6400-mil fire. The gun-line frontage varies with the threat and the terrain.

(a) Terrain gun positioning (figure 9-3) is used in situations requiring howitzers to be dispersed over a large area with maximum use of natural cover and concealment offered by the local terrain. The BCS and BUCS can compute individual piece locations to enable the delivery of effective fire with terrain gun positioning.

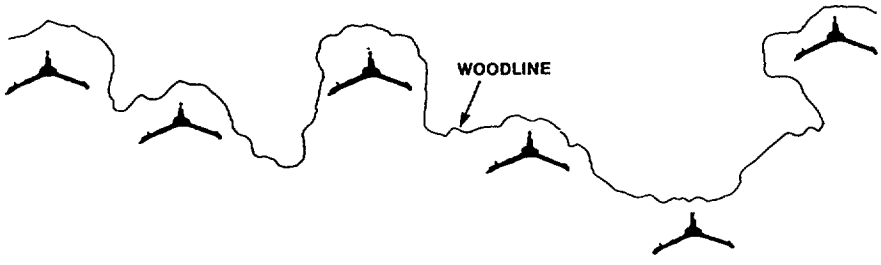


Figure 9-3. Terrain Gun Positioning.

(b) The star formation (figure 9-4) is used when the threat or terrain requires howitzers to be positioned in a tight and defensible position. This formation also provides excellent 6400-mil firing capability.

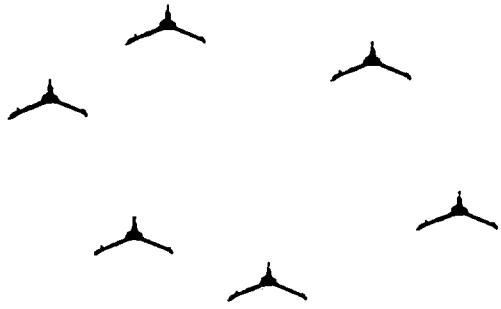


Figure 9-4. Star Formation.

(c) The **line** or **lazy W formations** (figure 9-5) can be used when a linear formation is acceptable. These formations are most often used for hasty occupations. These formations offer excellent command and control; however, they are vulnerable to air attack. This can be offset by dispersion and concealment.

Figure 9-5. Lazy W Formation.

(d) **Howitzer position numbering** is right to left and front to rear as they face the azimuth of fire. An artillery section is associated with each gun position. This association remains unchanged from position to position. If a howitzer becomes disabled en route to a new position, its position and associated number are left reserved for that howitzer. The BCS and BUCS are initialized with individual howitzer MV data correlated with a specific howitzer. The numbering procedure allows howitzers to be referred to based on location and eliminates the requirement to vary the data base in each position.

(2) Aiming Circle. The aiming circle should be placed at a point from which all howitzers may be seen and easily laid. The location may be in front of or to the rear of the gun line and should be free of magnetic attractions. When survey control is established, the aiming circle will be directly over the OS. Another aiming circle(s) may be required for line of sight to all howitzers.

(3) FDC. The physical location of the FDC can and should be varied to meet changing conditions. The location should provide defense against attack, particularly in static operations. It should also be on the flank of the gun line.

(4) BOC. Similar to the FDC, the BOC location depends on the tactical situation. The BOC should be positioned away from the FDC to facilitate continuous fire support in case the FDC is hit by enemy fire. Since the BOC may also serve as the battery CP, it must be positioned to facilitate the battery commander in the control and coordination of the battery. The local security chief may control the local security from this location. The BOC should have a terminal connected with the battery wire system. The site should be easily accessible without interfering with firing and should be in a concealed position and in defilade.

(5) Other Installations. Other installations are established, as required.

(a) The **ammunition dump** should be located to the flank of the firing position and be at least 100 meters from other installations. Dispersion, concealment, cover, and good drainage are desirable.

(b) The **switchboard** should be located in a common area where it can be manned and fixed. It should be dug in, connected into the unit wire system and exterior wire system, have cover and concealment, and be free of noise. As time permits, wire lines should be buried. Alternate wire lines are desirable.

(c) The **mess area** should be in a concealed and well drained site and in defilade. The site should be accessible without interfering with firing.

(d) The **vehicle dispersal area** should be located to the flank or rear of the cannons in an area that is accessible; has firm ground, good drainage, cover, and concealment; and provides room for dispersion of vehicles. A good dispersion of vehicles should be maintained, preferably by 50 meters or more. All vehicles not required at the various battery installations should be parked in the vehicle dispersal area.

(e) Sleeping areas should be established by section to facilitate locating personnel during darkness, to alert personnel for security or operational requirements, and to provide a measure of safety to personnel. The areas should have cover and concealment, be well drained, be away from the track plan, and if possible, provide for shelter and comfort for personnel; e.g., wind break.

(f) The **CSS area** can be located with the firing battery or can be located separate from the firing battery position, normally by 1500 to 2500 meters. This separation provides greater flexibility to battery operations, but increases security and command and control requirements.

(6) Track Plan. The track plan should make use of existing roads. Routes should follow natural terrain features, such as gullies and tree lines, and take advantage of natural overhead cover and concealment. Vehicle ground guides must know the track plan. An exact route for each vehicle may be dictated, when required. Provisions should be made to camouflage exits and entrance points, as tracks of vehicles exiting/entering a position may reveal an otherwise carefully camouflaged site.

c. A 6400-mil Sector of Fire. Actions to secure a 6400-mil firing capability should not reduce the unit's ability to deliver fire in the primary direction of fire. These actions include:

- Emplacing an additional pair of aiming posts and/or a collimator for each howitzer, if required.
- Emplacing azimuth stakes for rapid re-orientation of howitzers when making large shifts in direction.
- Constructing gun emplacements for all-round firing capability.

9108. Occupying the Position

The objective of the occupation phase of RSOP is to prepare to deliver fire. The battery is extremely vulnerable during this phase. Thus, the occupation must be rapid, orderly, and quiet. Occupations are enhanced by a well-established SOP, training, and a well-prepared position.

a. Daytime Occupation. On arrival at the position, vehicles move into the position without halting or closing the interval between vehicles. Vehicle ground guides lead their assigned vehicle from the pickup point to the appropriate location for unloading and/or parking.

(1) Laying of Howitzers. The unit is capable of delivering fire when the howitzers are laid. Various methods are available to meet the needs of the situation. Detailed procedures for laying are discussed in FM 6-50. Reciprocal laying of aiming circles or howitzers can overcome line of sight problems and expedite laying.

- Use the **orienting angle method** if an aiming circle, a line of known direction, and an accurate location are available.
- The **grid azimuth method** requires a declinated aiming circle. Declination is determining a declination constant to compensate for variation of the instrument. Variation of the instrument can be caused during manufacturing, from shock during handling, or due to a shift in magnetic North. Declination is conducted at a declination station established by survey parties, established by simultaneous observation, or scaled from a map.
- The **M-2 compass method** requires a declinated M-2 compass. One howitzer is laid by the compass and remaining howitzers are reciprocally laid. Accuracy of this method depends on the ability of the operator.
- The **aiming point-deflection method** requires line of sight between the howitzers and a distant aiming point (DAP) which is at least 1500 meters away. This method is used only for emergency firing positions. Howitzers will be laid parallel if the DAP is to the flank of the gun line. If the DAP is to the front, sheafs will converge. If to the rear, sheafs will diverge.
- The **howitzer back-lay method** requires a declinated aiming circle or compass. This method is used for emergency firing positions and when other methods are not possible.

(2) Security. Each section must have a predetermined sector of responsibility during the occupation. If the howitzer sections are dispersed over great distances, each section becomes responsible for its defense. It must defend itself until help arrives. As the unit settles into position, the security and defensive plan of the battery are formulated.

(3) Position Improvement. An order of work is established, based on the threat and the time that the unit is in position. The commander may establish an order of work as follows:

- Harden critical items of equipment.
- Prepare individual fighting positions.
- Establish security measures.
- Develop defensive plan.
- Prepare alternate position.

b. Occupation Following a Limited-Time Preparation. In some situations, there may not be enough time to prepare positions for occupation. Limited-time preparations are accomplished by—

(1) Establishing a priority of tasks to ensure—

- Selection of howitzer positions.
- Set up of aiming circle.
- Preparation of howitzer positions, to include placing panaromic telescope and marking stakes and recording of initial deflections.
- Minimum essential internal wire communications are established.
- Weapons location data entered into BUCS.

(2) Decentralization of Duties. The commander selects the position and designates the azimuth of fire. Gun guides select howitzer positions. The commander guides the entire unit into position. Vehicle ground guides then meet their vehicle as the vehicle approaches their positions. The AXO and battery gunnery sergeant conduct their normal duties as time permits.

(3) Preparing to Fire. The howitzers are laid using the most expeditious means. If wire communications are not available, voice commands are relayed from the aiming circle to the gun line. The situation may require firing to commence before making tests and adjustments.

Firing data is determined using the most expeditious means. The FDC/BOC initially should be set up close to the gun line so that fire commands can be relayed by voice.

(4) Organization and Improvement. As time allows, action is taken to organize and improve the position. Any inaccuracies in laying or boresighting are corrected. Communications within the unit are improved and normal installations are established.

c. Night Occupation. Night occupation reduces the unit's vulnerability to detection during occupation. However, night occupation **must** be smooth and orderly to avoid chaos and damage/loss of equipment and/or injury to personnel. Night occupation is slower than a daylight occupation. Light and noise discipline must be stressed. Night occupation is conducted following a daylight preparation (ideally), or following a night preparation. Should daytime preparation be impossible, night vision devices are vital.

(1) Vehicle Ground Guides. Guides must **know** their routes and the order of march. Guides should walk their route carefully, before dark and at dusk if possible, noting paces and features to assist navigation. As each vehicle approaches the pickup point and is recognized (i.e., an enemy vehicle may have infiltrated the column), the guide leads the vehicle into the position. Vehicle blackout drive and blackout marker lights should be turned off. If the driver does not have night vision goggles, the guide carries a flashlight with a filtered lens. If the driver fails to see the guide/light for some reason, he should halt immediately; i.e., the guide may have fallen down. When the vehicle arrives at its designated position, the guide signals the vehicle to halt. (Talking should be kept to a minimum).

(a) If the guide does not have night vision goggles, he must rely on his night vision skills. The use of silhouettes on the skyline (e.g., tall tree or the tip of a mountain) can help the guide maintain his orientation as he guides the vehicle into position. Navigational markings may be emplaced at keypoints; e.g., engineer tape, lightsticks, or a branch.

(b) Unit SOP should establish a technique for vehicle recognition. Example: A blink of a color-coded flashlight by the assistant driver.

(2) Lighting Devices. The advance party emplaces lighting devices on marking stakes, aiming posts, and instruments needed for laying; e.g., aiming circle. Unit SOP should establish procedures to ensure the correct reference light is sighted when using fire control and laying instruments at night; e.g., blinking lights in accordance with prearranged signals or using color-coded lights. During laying, only the aiming circle and the weapon being laid should have lights on. Too many lights cause confusion and destroy light discipline. At night, keep the laying instrument sighted on one piece until it is completely laid. The EOL is placed at sufficient distance to eliminate the possibility of parallax in the aiming circle. Parallax is the apparent displacement or the difference in apparent direction of an object as seen from two different points not on a straight line with the object.

(3) Loading and Unloading Equipment. Rapid displacements and night movements make it imperative that uniform load plans are established. The weapon position should be so organized that each Marine knows where each item of equipment is located at all times.

d. Emergency Occupation (Hip Shoot). An emergency occupation results when a call for fire is received while the battery is making a tactical movement. The convoy leader (normally the XO) must know exactly where he is during the road march and constantly be selecting possible emergency firing positions by map and visual reference.

(1) When a call for fire is received, the XO–

- Authenticates the fire mission.
- Ensures FDC personnel monitor the call.
- Signals the convoy.
- Selects the firing position and passes the coordinates to the FDC personnel.
- Designates the azimuth of fire.
- Lays the unit in the following order of preference: aiming point-deflection, grid azimuth, or howitzer back-lay methods.

(2) The FDC announces/indicates the azimuth of fire and computes initial data.

(3) Communications within the battery is by small-unit transceiver (if available) or by voice relay.

(4) Aiming points are established in the following precedence: DAP, collimator, or aiming posts.

(5) On completion of the mission, the unit moves on or continues position improvement.

9109. RSOP by Headquarters Batteries

a. Reconnaissance. The headquarters battery commander and S-6 conduct a reconnaissance to select the specific location of the headquarters main echelon. These officers are normally accompanied by the battery first sergeant, local security chief, representatives from the various staff sections, vehicle ground guides, and security personnel, as required. The headquarters battery commander assembles, briefs, and conducts the reconnaissance similar to the firing battery commander. Paragraphs 9105a, 9107a, and 9108c(1) and (3) are particularly applicable.

b. Selecting the Position. The location of the main echelon must meet the desires of the commander and the requirements of each staff section as much as possible. The headquarters battery commander selects the location for each element of the main echelon, in coordination with the S-6 and section representatives. The main echelon position should have—

- *Suitable Sites.* Areas are designated for the COC/FDC, radio antennae, vehicle dispersal, and as applicable for medical, supply, maintenance, and ammunition.
- *Cover and Concealment.* A position in defilade minimizes visual and radar observations by the enemy. Heavily wooded areas provide good concealment, but may hamper communications. In sparse or scattered vegetation, camouflage is necessary. In open terrain, the main echelon should be well dispersed.
- Defensible Terrain. If possible, the position should allow mutual protection with other units.

c. Occupation of the Position. After site selection, the headquarters battery commander plans the occupation. The occupation must be coordinated carefully with the S-3 and S-6. If continuous detailed control of the battalion must be maintained, a forward echelon will normally be formed from the personnel and equipment of the main echelon to occupy the new position as the first increment of the headquarters battery. The forward echelon's initial occupation is similar to that of

356-548 O - 93 - 6

the firing battery (i.e., security sweep, vehicle ground guides, prepare for operation, etc.). Once the forward echelon has completed the initial preparation of the position and when the tactical situation permits, the main echelon will pass control of operations to the forward echelon and then displace to complete occupation of that position or to leapfrog past the forward echelon to another position. The headquarters battery commander provides general supervision of occupation, as required.

d. Organization of the Position. The organization of the position depends on the size of the area, the technique of positioning used, the guidance of the commander and his staff, and the requirements for coordination between sections.

(1) **Traffic** within the position should be held to a minimum and controlled. Vehicles should be stopped at a dismount point and directed to a vehicle dispersal area. Foot traffic should be restricted to prescribed trails or paths. A local telephone should be connected from the dismount point area to the switchboard.

(2) The **COC (FDC, TPC, intel section)** should be located in an area outside the normal traffic flow of other activities. The COC should be marked for authorized entry only.

(3) The **message center** should be at the entrance of the position accessible to incoming messengers.

(4) A **switchboard** should be located to facilitate installation of wire. It should be in a covered area away from noise and interference. It must be protected from enemy attack.

(5) The **aid station** should be near a road or trail for rapid reception and evacuation of patients.

(6) **Sleeping areas** should be established by section.

(7) The **messing facility** must be easily accessible within the position. It should be near a road to facilitate supply.

e. Displacement. The method of main echelon displacement is based on the tactical situation and the requirement to continuously control subordinate units. The main echelon may displace as a unit when detailed control is not required. When continuous detailed control is required,

the main echelon will displace in increments. In incremental displacement, a forward echelon is normally formed from personnel and equipment of the main echelon to displace as the lead increment, occupy and conduct initial preparation of the new position, and assume control of operations. The remainder of the main echelon then displaces to complete occupation of that position or, depending on the tactical situation, to leapfrog past the forward echelon to another position. The timing and method of displacement must be closely coordinated with the S-3 and S-6 to ensure the required degree of control is maintained. Regardless of method, communications must be maintained continuously with the supported unit, reinforcing artillery, higher artillery headquarters, and between headquarters echelons. When displacing incrementally, the headquarters battery commander must plan and coordinate the composition of the lead increment which is temporarily designated the forward echelon during displacement and occupation of the new position until control of operations has been assumed from the main echelon. Each section performs the necessary tasks to prepare for displacement under the general supervision of the headquarters battery commander. The headquarters battery commander may form a quartering party for accomplishing common area tasks; e.g., mess area, field sanitation equipment, sleeping tents, etc. The quartering party is comprised of individuals from each section who perform common area tasks, then return to their work section. The headquarters battery must be prepared for hasty displacement because the headquarters echelons are a high priority target for the enemy.

f. Transfer of Control. When conducting incremental displacement, the main echelon maintains operational control while the forward echelon (formed from the main echelon) displaces and occupies the new position. At the new position, the forward echelon sets up equipment, establishes communications, and obtains an update to the tactical situation from the main echelon COC. When the officer in charge of the forward echelon's COC determines that it is operational and ready to assume control of operations, he notifies the main COC and control is transferred when the tactical situation permits. The main echelon then displaces to the new position and dissolves the forward echelon or leapfrogs to another position. In extreme situations during displacement, control of the regiment may be transferred to one of the battalions or control of the battalion may be transferred to one of the firing batteries.

g. Rear Echelon. The rear echelon is positioned based on the location of the main echelon, the tactical situation, security, supply, and accessibility. Good drainage, concealment, and adequate space for a vehicle dispersal area and maintenance facilities are desirable.

Section II. Displacement

9201. Introduction

Artillery displaces to provide continuous support, to maintain communications, and to enhance survivability. The terrain and tactical situation influence the distance and frequency of displacements. Generally, the distance of displacement is at least one third the maximum range of the howitzer. However, survivability moves may be a shorter distance. The route and timing of the displacement must conform to the operation of the supported or reinforced unit. The movement may be deliberate or hasty. Artillery can displace by ground or by helicopter.

9202. Considerations for Displacement

Movement of artillery must be coordinated for continuous support, adequate control during the movement, and survivability. Considerations include security requirements, enemy activity, time available to move, distance to be covered, the scheme of maneuver, and the availability of artillery.

a. Artillery must never get caught in a traffic delay. When two or more artillery battalions displace over the same route, the higher artillery headquarters coordinates the movement. When artillery must displace on a route used by other units, the maneuver commander coordinates the movement and establishes route precedence. DS units have route precedence over all other artillery.

b. During displacement, reliance is on radio communications. Displacements and the daily change of call signs/frequencies should be coordinated to prevent interference between the two actions.

c. Arrange for transfer of fire support responsibility as early as possible, when required. Priority targets must be covered during displacements.

9203. Methods of Displacement

a. Unit Displacement. The battalion displaces with all elements moving at once. Unit displacement is fast and can be easily controlled since no firing is required. This method is useful when a battalion is supporting a unit not presently in contact; when a battalion is making a long move; and when a reinforcing unit is available to deliver fires to the supported unit while the DS battalion is displacing. Considerations include the size of the convoy, traffic conditions, and the loss of flexibility once the movement has started.

b. Displacement by Echelon. The battalion displaces one or two firing batteries, an increment of the headquarters, and some CSS elements in one echelon while the rest of the battalion stays in position. When the first echelon is in position and ready to fire, the second echelon displaces. This method provides continuous but degraded support to the supported unit; facilitates command and control; and reduces the size of the convoys. It is useful when the supported unit is expecting/encountering light resistance. The commander's flexibility is limited. The commander normally goes with the first echelon; the XO stays with the second.

c. Displacement by Battery. Each battery moves only after the preceding battery has completed its move and is prepared to fire. This method provides maximum continuous fire support and centralized command and control, but is slow and difficult to control over any distance. It is used primarily by a battalion supporting a unit in contact and is normally accomplished in a series of short moves.

9204. Execution of Displacement

a. Artillery in DS. A unit in DS displaces when deemed necessary by the artillery unit commander based on the operations of the supported unit or when ordered by the higher artillery headquarters. The artillery commander coordinates the time of movement, the route, the method of displacement, and the new position area with the supported unit.

b. Reinforcing Artillery. An artillery unit with a reinforcing mission displaces on request of the reinforced artillery unit or when ordered by the higher artillery headquarters. The reinforcing unit notifies the higher artillery headquarters of the method of displacement, completion of displacement, and new position location.

c. Artillery in GS or GS-R. An artillery unit with a GS or GS-R mission displaces when ordered by the artillery regiment. The unit commander recommends to the regiment the position area, route, method of displacement, and time of displacement. For GS-R artillery, the regiment may assign the GS-R mission to another unit while the displacement is in progress.

9205. Hasty Displacement

The tactical situation may require the unit to displace with little warning or preparation time. The battery conducts a hasty displacement when it has some time available to expeditiously organize and conduct the displacement. This situation may arise because of an imminent enemy attack or a change in the friendly situation. The senior man in the position must quickly assess the situation and signal the hasty displacement by audible and visual means. An advance party is rapidly assembled and departs to the new position. A limited-time preparation of the new position may be required. Firing elements and a fire direction element depart after the advance party has left. Remaining elements close to the new position as soon as possible.

9206. Emergency Displacement

The tactical situation may require a battery to displace **immediately**. An emergency displacement is conducted when the battery must urgently leave its position to avoid casualities and damage to equipment. This situation normally occurs as a result of enemy attack. Time is not available for organization for the displacement. The displacement is guided by unit SOP, training, and small unit leadership. A reconnaissance party with minimum essential personnel, equipment, and vehicles meets at a predetermined point as rapidly as possible and departs to the new position. A limited-time preparation of the new position is made. **Mission essential equipment and equipment of value to the enemy** are loaded as rapidly as possible and moved to the rally point. See paragraph 9209. Mission essential equipment includes prime movers, howitzers, FDC and BOC, and enough communications, ammunition, and other assets to begin firing at the next position. Nonessential equipment is left in the position and recovered after the attack has ended and the unit is reassembled. In these situations, the senior man in position must rapidly assess the situation when deciding to signal an emergency displacement. He must consider the exposure of personnel and

equipment in executing the displacement; i.e., the unit's vulnerability may increase. During position improvement, a unit can enhance its capability to conduct an emergency displacement by practicing the following measures:

- Position vehicles close (e.g., near gun line, FDC, etc.), but dispersed.
- Operate with only mission-essential equipment and personnel.
- Down-load equipment/supplies only as needed.
- Prepare positions for rapid exit; e.g., camouflage nets suspended overhead with exit readily accessible, use radio vehicles and field expedient antennae for communications, etc.

9207. Survivability Moves

Survivability moves are frequent displacements to increase the artillery's chance of survival. These moves are used when it is not possible to harden positions or when firing positions do not allow wide dispersion. Factors affecting survivability moves include frequency of mission requirements and enemy detection and attack capability. Survivability moves must be completed quickly for continuing support of the maneuver unit. One way to do this is to move only the shortest required distance—1,000 to 1,500 meters. Survivability moves should not be started while the unit is under fire, as this will only increase the number of personnel casualties.

9208. Tactical Marches

A tactical march is the movement of a unit under actual or simulated combat conditions. There are several methods of moving in a tactical configuration. The commander decides which method or combination is best.

a. Types of Marches

(1) Open Column. Vehicles move in convoy at an interval of 100 meters. The open column should be used when making daylight movements on good roads that are not overcrowded; when enemy detection is not likely; when time is important; or when traveling considerable distance. The open column reduces driver fatigue, improves vision on dusty roads, eases passing of individual vehicles,

increases dispersion of vehicles against an air attack, and reduces the chance for the entire unit being ambushed. However, if the column is lengthy, column-integrity is difficult to maintain, and communications within the column are difficult.

(2) Close Column. Vehicles move at intervals of less than 100 meters. At night, drivers use the *cat-eyes* of the blackout markers on lead vehicles to keep an interval of 20 to 50 meters. During daylight, the close column is used when a need exists for maximum command and control; e.g., during periods of limited visibility or in built-up or congested areas. Close column enhances defensive firepower. However, the close column technique is vulnerable to ambush, causes slow movement in the convoy, and increases driver fatigue.

(3) Infiltration. Vehicles are dispatched individually or in small groups without reference to a march table. This technique should be used when the enemy has good detection and attack capability. It is ideal for covert operations, provides passive defense against air and artillery threats, and deceives the enemy as to the size of the unit. However, infiltration is slow and difficult to control. Small elements are vulnerable to ground attack, and individual vehicles may get lost.

(4) Terrain March. Terrain march is an off-road movement. Vehicles travel close to tree lines, along gullies, and close to hill masses. See figure 9-6. A terrain march should be conducted when enemy

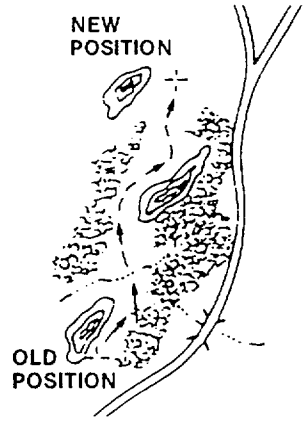


Figure 9-6. Terrain March.

detection and attack by artillery or air is likely. Terrain march avoids traffic delays and deceives the enemy about the size of the unit. It is useful when moving to an alternate or supplementary position. It can be combined with another type of march; i.e., terrain march begins at a point where enemy detection becomes likely or the unit becomes vulnerable. Terrain march is slow. It requires a detailed ground reconnaissance. In a terrain march, the movement may be complicated by soil conditions, vehicle tracks may compromise the new position, and the movement may be through another unit's area.

b. Disposition of Elements During a March. Artillery can move as part of the march column of the supported unit. The formation of the artillery in the march column will vary with the type of unit, the mission, and the tactical situation. Prior to the march, potential positions are selected by map reconnaissance and coordinated with the supported/reinforced unit. Firing units are dispersed within the column to assist their entry into firing positions. The order of march should be such that no firing battery has to pass another battery position to get to its position. There should be adequate intervals between serials for march dispersion. The interval also eliminates the need to halt the entire column for temporary delays in the march.

c. Support for the Column. The artillery commander must be prepared to direct artillery into firing position if the column is halted by enemy action or when immediate fire support is needed. The required battery(s) occupies its firing position, and the remaining elements stay with the column until otherwise directed. The artillery commander never allows his unit to be in a situation where his firing elements cannot furnish support, when required.

9209. Control Measures

The commander establishes measures to control the movement of the unit. Control measures are planned and confirmed/refined during the reconnaissance. The control measures are as follows:

a. Start Point (SP). The SP is normally a geographical feature identifiable on the ground and on a map at which the first vehicle of a convoy crosses at the specified time. During unit displacement, the SP is also the point that the battalion assumes march control of subordinate units. Subordinate units determine the route and time to travel to the SP.

b. Checkpoint(s). Checkpoints are normally geographical features identifiable on the ground and on a map along the route of march. A unit reports crossing checkpoints to its higher headquarters. Checkpoints are used when planning fires for the movement.

c. Release Point (RP). An RP is normally a geographical feature identifiable on the ground and on a map at which convoy control ceases as the last vehicle of the convoy crosses the point at the specified time. During unit displacement, the RP is also the point that march control is terminated by the battalion.

d. Pickup Point. The pickup point is a location normally within the position where vehicle ground guides meet their vehicles to lead them into position.

e. Rally Point. The rally point is normally a geographical feature identifiable on the ground and on a map used for assembly and recovery of vehicles and personnel following an enemy attack. On attack of the position, each section vehicle is quickly loaded with personnel and mission-essential equipment and moved to the rally point without delay. At the rally point, vehicles are dispersed, and personnel dismount, establish a hasty defense, and await further instructions. The rally point should be on the route to the alternate position. It is located far enough from the primary position to remove the unit from further danger, but not so far that drivers may become lost. **All drivers must know the location of the rally point.**

f. Navigation Aids. Various techniques and means are used to assist navigation along the route. In some terrain and conditions, this is essential to displacement. The following are various techniques and means to assist navigation along the route:

(1) The GPS is a space-based radio navigation system which provides position data to users.

(2) The PLRS can provide position location and navigation assistance to the unit.

(3) The PADS can be used to facilitate navigation by traveling with the lead unit and marking the route for other units.

(4) The odometer and compass allow a unit to navigate by dead reckoning. Mileage readings are determined from a map (1 km = .63 miles) or measured during a ground reconnaissance. Mileage readings to key turns on the route can be provided to drivers by strip map during the movement briefing.

(5) Route markers can be placed at key turns along the route during the reconnaissance.

(6) When required, personnel are placed at key turns. They should be posted in pairs near the destination or other friendly positions. This technique is useful when moving by/through another unit on the route.

9210. Preparing for Movement

a. Orders. The details given in the movement briefing depend on the time available, the tactical situation, and traffic conditions. The briefing is supplemented by strip maps, sketches, and march tables, as required. For format of the movement briefing, see paragraph 9104b.

b. Load Plans. Each vehicle has a load plan which prescribes the loading of personnel and equipment. A good load plan helps a unit move into a new position with all its equipment. Equipment most essential to the mission is loaded last.

c. Movement Preparations. When the command **prepare to march order** is given, each section prepares for movement **without** hampering the ability to deliver fire.

d. Disabled Vehicles. The battery may have disabled vehicles in position because of mechanical failure or enemy actions. The battery cross-loads equipment and moves to the new position. Towed loads may have to be shuttled. Disabled equipment is repaired by a maintenance contact team (MCT) or maintenance support team (MST), or evacuated to a maintenance collection point or facility.

e. Organization of the Column. The organization of the column varies with the tactical situation, the threat, and the position to be occupied. Convoy security generally reflects the enemy situation and capability. Considerations for organizing the column include:

(1) Command and control vehicles are placed at the front and rear of the column. The battery XO normally leads the main body during displacement.

(2) In most cases, howitzers are placed well forward in the column for rapid entry into position. The section to occupy the position the farthest from the entrance of the position should be positioned closest to the front of the column. SOPs should identify a signal (i.e., code word) to reverse the order of the howitzers, when required. If an attack on the convoy is expected, howitzers may be dispersed throughout the column. Machine guns are also distributed throughout the column, aimed alternately, with assigned PDF.

(3) Vehicles are appropriately prepared for convoy defense. Preparations may include sandbagging the vehicle floorboard, fenders, bed, and cab cover; removing the canvas and bows or rolling up canvas; lowering windshields; concealing headlights; and preparing a skirt or overhang of matting, chain link, etc. to protect tires and reduce vulnerability to rocket fire.

(4) If feasible, there should be two air guards per vehicle. One scans the sky to the front of the vehicle; the other scans the rear. Air guards systematically scan their assigned sectors watching for aircraft indicators (e.g., light reflections, smoke trails, or dust clouds) normally visible before the aircraft is seen. Air guards should be aware of potential trouble spots on the route (e.g., likely ambush points) and be especially alert at these locations.

(5) Depending on the assets available and the threat, escort, security elements, overwatch, or cover may be provided to the convoy. Such may be the case when moving a large column across open terrain. Aviation support may be combat air patrol, armed helicopters, low altitude air defense (LAAD) weapons, etc. Aircraft can also be used to assist convoy control and for radio relay. Ground support may be armored vehicles, antitank teams, engineers, covering artillery, etc.

(6) Passengers will have their weapons at the ready and be assigned directions of fire. Some weapons are designated as full automatic and some as semiautomatic for continuous fire.

(7) The NBC detection and monitoring equipment should be with the lead vehicle of the column. If there is an NBC threat, the unit should consider upgrading its MOPP level during movement.

(8) A forklift is placed in the column in consideration of its capability to keep up with the column and its need at the new position.

9211. March Discipline

a. Officers and noncommissioned officers ride where they can best control the march. The senior person in each vehicle is the vehicle commander and he is responsible for march discipline. He ensures obedience to traffic regulations, dispersion, blackout, rate of march, etc. Each vehicle commander must watch for signs, markers, signals, and other traffic.

b. Key personnel should be dispersed throughout the column to prevent loss of a disproportionate number of these persons, if attacked.

c. The column must keep moving. If a vehicle breaks down, a vehicle should be designated to stop and pick up the mission-essential personnel and equipment. If the disabled vehicle cannot be repaired in a reasonable time or cannot be recovered by the unit, the location and condition of the vehicle are reported to the commander for recovery. In most cases, the driver stays with the vehicle. The maintenance representative should travel to the rear of the column. He temporarily stops to assess/make repairs to disabled vehicles on the route. However, he must proceed ahead without lengthy delays to be available for other repairs, as needed.

d. When making turns, the lead vehicle should take necessary precautions to ensure that the trailing vehicle sees the turn; e.g., slow speed temporarily, hand signal, etc. This is particularly true on a winding or hilly road. The vehicles resume normal interval after the turn. This procedure will preclude a vehicle or portion of the convoy from becoming lost.

e. Signals should be established in the unit SOP for day and night movement. Color flags, pyrotechnics, hand and arm signals, vehicle horns, radio, etc., can be used. The SOP should address how signals will be relayed when line of sight is restricted; e.g., the column is stretched around a bend in a road or over a hill.

f. During administrative marches, halts are made at regular intervals or at selected sites to rest personnel, service vehicles, and check the loads. For extended vehicle marches, wooded areas, built-up areas, and winding roads are selected as halting places, since they provide concealment and hinder attack by enemy aircraft. Avoid stopping near crossroads, railroads, and other easily identifiable reference points. Normally, halts are not scheduled for tactical marches.

9212. Immediate Actions

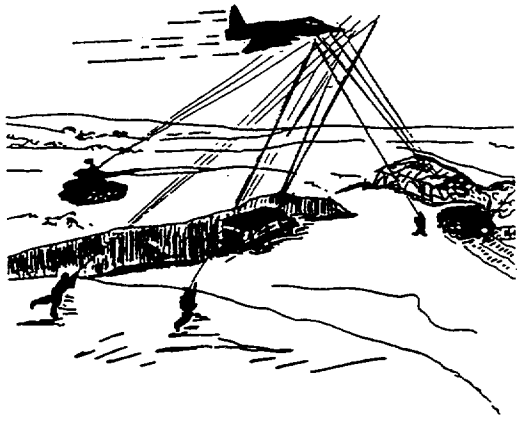
Artillery is vulnerable to attack during the march, particularly when the unit is moving into or out of a position and when it is confined to a road; e.g., steep banks, bridges, mud, sand, or snow. Artillery is an HVT, and the enemy will attempt to attack it during this period of vulnerability. Rehearsed immediate actions can increase survivability. In establishing immediate-action procedures, the commander considers the following:

- Enemy situation—what he expects to be attacked with.
- Resources available for countering an attack.
- Training of personnel in immediate action.
- Signals to be used for immediate action.
- How best to counter the threat.

a. Artillery Attack. The immediate action is to move out of the danger zone, request immediate counterfire (see paragraph 7301b), and report the situation to higher headquarters. If an artillery attack is suspected, try to avoid dangerous areas, move by open column, infiltration, terrain march, or under the cover of darkness or reduced visibility, and practice communications security. In open column, vehicles are dispersed by interval (i.e., 100 meters) and by lateral dispersion; i.e., vehicles move alternately on each side of the road.

b. Air Attack. The immediate action is for all available personnel to engage the aircraft immediately and report to higher headquarters. If the terrain permits, move vehicles into woods, behind buildings, in large ditches, or in any other available cover. Vehicles should disperse on both sides of the road, as personnel continue to deliver fire. If the terrain does not permit dispersion, the column should speed up as personnel deliver fire. All personnel should fire their weapons to form a wall of

bullets at an aim point ahead of the aircraft. See figure 9-7. Each vehicle's crew should initiate and control their own firing at an aim point. If an air attack is expected, use an extended convoy interval, and either break the convoy into small increments with at least 1,000 meters between increments or travel by infiltration. Make use of existing concealment along the route; e.g., shadows of trees bordering the road. Avoid hard-surfaced roads, if possible. On unpaved roads, adjust the convoy speed to reduce the dust generated by the convoy. Position air defense weapons, if available, at critical points on the route in advance and/or intersperse them in the column with emphasis on the lead and rear elements. Bridges, defiles, passes, and other locations are considered critical points.



AIMING POINT RULES

AIRCRAFT	COURSE	AIM POINT
Jet	Crossing	Two football fields in front of nose
Jet	Overhead	Two football fields in front of nose
Jet	Directly at you	Slightly above aircraft nose
Helicopter	Crossing	One-half football field in front of nose
Helicopter	Hovering	Slightly above helicopter body
Helicopter	Directly at you	Slightly above helicopter body

Figure 9-7. Engaging Enemy Aircraft.

c. Roadblock. The immediate action is to bring maximum firepower on and to the sides of the roadblock. Howitzer direct fire, supporting arms, automatic weapons, and/or other available support is used. If the roadblock cannot be dislodged, the unit must disengage, reassemble at the nearest feasible point, and resume its march on the alternate route. Roadblocks are usually mined. An attempt to crash through the roadblock may result in unnecessary losses which may further complicate the situation.

d. Ambush. There are two types of ambushes—blocked and unblocked. The principle is the same in both instances—get out of the killing zone, return fire, and report to higher headquarters. The commander must quickly assess the situation and determine his course of action. Small unit leadership is paramount. At night, the best defense for an ambush may be to deny the enemy the darkness by interfering with his night vision; i.e., illuminating the area.

(1) Blocked Ambush. Maximum fire should immediately be placed on the ambush force. Personnel in the killing zone return fire as vehicles disperse, then dismount and attack the enemy. Personnel not in the killing zone dismount, and leaders hastily assemble squads and assist in the attack. As required, howitzer direct fire, supporting arms, and other support are used. When the roadblock is cleared, the unit fights its way past the ambush. The unit should not become engaged with a stronger force or pursue an enemy withdrawing.

(2) Unblocked Ambush. The unit increases speed and moves through the ambush area, while personnel place maximum fire on the attackers. Make an immediate report of the enemy contact to higher headquarters.

9213. Other Movements

Detailed discussion of other movements and marches are in the following manuals:

- FMFRP 6-17 discusses helicopter movement.
- FM 55-30 discusses the organization and planning of marches and movement of personnel.
- FM 101-10-1 provides planning guidance for movements.
- FM 55-15 and TM 55-2200-0001-12 discuss rail movement.
- FM 55-9, FM 90-4, FM 55-12, and FM 101-10-1 discuss air movement.
- FM 55-15, FM 101-10-1, and FMFRP 6-17 discuss water movement.

Section III. Battery Defense

9301. Keys for a Defensive Plan

Attacks against artillery positions must be expected. The mission of artillery is to deliver fire; traditionally the artillery continues its mission and repels/sustains the attack. The artillery commander has the difficult task of planning a defense that provides adequate security for the battery without needlessly reducing his unit's ability to deliver fire. The artillery defensive plan must use passive security measures and active defensive measures.

The keys to an effective defensive plan are as follows:

- Know the threat.
- Avoid detection.
- Provide early warning.
- Make defensive preparations.
- Execute defensive action.

a. Know the Threat. Knowledge of the threat capability allows the commander to focus on those tactics and techniques that reduce his vulnerability. Battery positioning, organization of position, formation, dispersion, camouflage, employment of weapons and early warning assets, and the order of work are geared to the threat. This does not mean the commander disregards other threats—because the battlefield threat will change quickly. The commander may be faced with multiple threats. The commander assesses the threat(s) and focuses his efforts to maximize his available time and assets.

b. Avoid Detection. The best defense is to not be detected. A battery that is concealed or that cannot be recognized has greatly increased its odds for survival. The commander employs various tactics and techniques to avoid detection and to enhance survivability should it be detected.

(1) Use camouflage. The battery avoids detection by camouflaging the six factors of recognition: position, color, shape, shadow, texture, and movement. FM 5-103, *Survivability*, provides detailed information on camouflage techniques.

(a) Artificial Camouflage. Artificial camouflage is used to avoid detection. Pattern painting of equipment and a lightweight screening system (nets) are artifical camouflage techniques. When erecting nets, break up the shape of the equipment—a net draped over a howitzer looks like a net draped over a howitzer by an enemy air observer or intelligence analyst. The wheels/tracks of vehicles are not painted and are easily detected without camouflage. Nets should not restrict firing capability of weapons or exit from the position. Consider the placement of aiming posts.

(b) Natural Camouflage. Natural camouflage is used to blend the battery in with the environment. See figure 9-8. This is achieved in part by positioning. Make use of contours, trees, buildings, debris, and other surroundings. Positioning artillery in terrain which has changed since the map was printed (e.g., in ravines, gullies, etc.) decreases the chance of the enemy targeting the battery by map analysis.

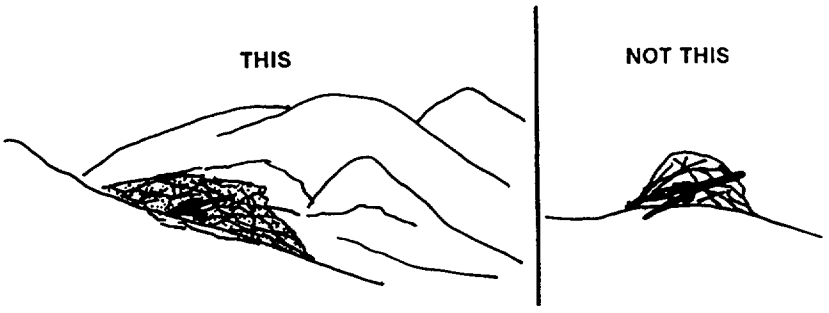


Figure 9-8. Using Natural and Artificial Camouflage.

(2) Reduce electronic signature. Properly site electronic equipment to reduce signature. Position all battery equipment to decrease exposure. Use directional antennae, remote antennae, and wire to avoid detection.

(3) Maintain light and noise discipline. This includes personnel and equipment; e.g., vehicle engines, generators, etc. Position and harden noise producing equipment for reduced detection and increased survivability.

(4) **Reduce weapons signature.** The muzzle flash of a howitzer can be seen at great distances, particularly in open terrain. Use defilade positions, propellent flash reducers, and gunnery techniques; e.g., massing fires, low trajectories, met + VE to avoid detection.

(5) **Establish a track plan.** Use existing roads and trails, when available. If none are available, roads and trails can be created with heavy vehicles to give the appearance that a unit has moved through the area. The roads and trails must have logical starting and ending points. Spoil, debris, and movement can degrade camouflage.

(6) **Use dispersion.** This is the least expensive method of avoiding detection and increasing survivability in terms of time and effort. Dispersion of equipment and installations minimizes the effect of an air or counterfire attack. Avoid grouping differing assets in proximity, as this will only increase the unit's chance of detection. For example, if the FDC is detected by EW and located near a howitzer position, the artillery section's chances for survival are decreased. The degree of dispersion depends on the terrain, the threat, and the degree of command and control required. As a guide, a battery should be dispersed with howitzers no closer than 100 meters apart. The FDC should be about 100 meters from either flank howitzer. However, less dispersion is desirable if the threat is a ground attack.

(7) **Practice operations security.** Signal security, information security, and physical security practices degrade the enemy's capability to detect a unit. Use short radio transmissions (less than 25 seconds), low power transmissions, and secure transmissions.

(8) **Displace, when possible, during periods of reduced visibility.** Make survivability moves, when required.

(9) **Practice deception.** See paragraph 7303b.

c. Provide Early Warning. Early warning increases the battery's capability to respond to an attack. Emphasis on this aspect of battery defense must be continuous. Early warning is obtained from all sources: organic sentinel posts (SPs) and listening posts (LPs), OPs, patrols, and other measures; adjacent units; and higher headquarters (e.g., air defense warnings).

(1) SP/LPs. These posts are situated on terrain which provides coverage of all routes of approach into the battery. The number of SP/LPs depends on the terrain, visibility, and communications capability. SP/LP coverage should interlock with each other, with obstacles, and with nearby units to prevent gaps. They should be far enough from the battery's defensive perimeter that the attack warning will allow time for implementing the defensive plan. This distance will vary with terrain, visibility, likely threats, and reaction time of the battery. At night, these posts are withdrawn into or near the defensive perimeter. These posts should consist of at least two-man teams armed with small arms and antitank weapons, be dug in, have good cover and concealment, be protected by obstacles (e.g., barbed wire), have good fields of fire, and be covered by fire from within the position.

These positions should be augmented with night observation and intrusion devices. A continuous wire circuit (hot loop) should be established between all posts and the battery. Alternate methods, such as sound devices, pyrotechnics, and runners should be ready. These posts are withdrawn on attack using planned withdrawal routes.

(2) Patrols. Avenues of approach and areas which might provide cover or concealment for enemy forces should be patrolled or kept under surveillance. Patrolling should be irregular but, at a minimum, conducted at dusk and dawn. The patrol route should intersect areas covered by SP/LPs and should be coordinated with adjacent units. The patrol composition will vary. If the patrol locates an enemy force, they should not engage the enemy unless necessary, but should keep the enemy under surveillance and notify the battery. For detailed information on patrolling, see FMFM 6-7, *Scouting and Patrolling for Infantry Units.*

(3) Monitoring the Tactical Situation. By monitoring the tactical nets of the supported unit, artillery can keep abreast of potential threats. As the threat becomes increasingly more defined, the artillery can then increase its manning of its defensive perimeter.

(4) Other Measures. The unit employs detection systems and guards, as required; e.g., NBC detection and monitoring teams, air guards, entrance points for control access into the position, etc.

d. Make Defensive Preparations. The battery must prepare to defend itself. The battery establishes its defense using organic weapons,

fortifications, obstacles, and a reaction force. The battery must be prepared to occupy its alternate position, if required. As time permits, defensive plans are made for the alternate and supplementary positions.

(1) Organizing the Defense. The local security chief organizes the battery's defensive preparation under the guidance of the battery commander. In developing the plan, the local security chief walks the surrounding area and determines how the battery might be attacked. Then, he can build his plan with emphasis on this avenue of approach(s). The organization of the defense includes—

- Defining the perimeter, designating primary (and supplementary) fighting positions and sectors of fire.
- Assigning howitzers supplementary positions. When possible, howitzers are employed in pairs for continuous engagement and increased probability of hit. Consider how the howitzer(s) will be moved to its supplementary position (route, prime mover) and how ammunition will be moved.
- Positioning weapons at key locations with good cover, concealment, mutual support, and overlapping fields of fire. Machine guns are given primary and alternate positions. PDFs and an FPL are designated.
- Positioning tank-killer teams with antitank weapons and in well concealed and hardened positions. These positions are covered by fire from other weapons. Primary and alternate positions are assigned to cover avenues of approach into the position. The ranges to likely engagement points are determined.
- Covering gaps by obstacles, barriers, observation, and by mutual support of adjacent units, when possible.
- Planning defensive fires on avenues of approach to delay an enemy attack. These fires can be delivered by other units.
- Assigning air guards sectors of scan. They should be rotated periodically to enhance alertness. If LAAD teams are available, they should be positioned in depth.
- Considering the coordination of infantry support (or attachment) to protect artillery against a severe ground threat.
- Arranging for ammunition distribution, communications, and signals.

- Providing protection of ammunition, personnel, and equipment from blast and small arms.
- Coordinating a manning requirement for an adequate degree of security, but not degrading the ability to deliver fire. Minimum, but adequate, personnel may be employed in perimeter security, then they may be reinforced when a threat develops. The perimeter may also be reinforced in reduced visibility. The key to such a defense is responsiveness.
- Ensuring all personnel know the defensive plan and rehearsing the plan as time permits. Each individual must know his responsibility and be ready to react rapidly to a threat. A defensive diagram is prepared to depict the defense.
- Ensuring the battery is prepared for first aid and evacuation of casualties to the aid station, if required.
- Designating a reaction force(s).

(2) Defensive Diagram. To help organize the defense, the local security chief prepares a defensive diagram. The defensive diagram is a graphic depiction of the position, surrounding terrain incidental to the defense, the positioning of weapons and other defensive resources (such as mines), the location of early warning assets, planned fires, and key installations. Once prepared, unit leaders study the defensive plan. The diagram is constructed as follows:

(a) Using BCS or BUCS, determine the coordinates of the battery center and plot it on a 1:50,000 map sheet. Identify the grid square(s) with key terrain features that could influence the defense.

(b) Place tick marks at 200-meter intervals on the sides of the selected grid square. Connect these tick marks to form grid lines within the selected grid square (200- by 200-meter blocks). See figure 9-9.

(c) Label each grid line *right and up* beginning at the lower left of the grid square. See figure 9-10.

(d) Correlate each 200- by 200-meter block with a 1,000-meter square on a 1:25,000 grid sheet. To do this, label the margin of a blank 1:25,000 grid sheet with coordinates corresponding with those of the 200- by 200-meter blocks. The center of the grid sheet should correspond to the coordinates of the battery center. See figure 9-11.

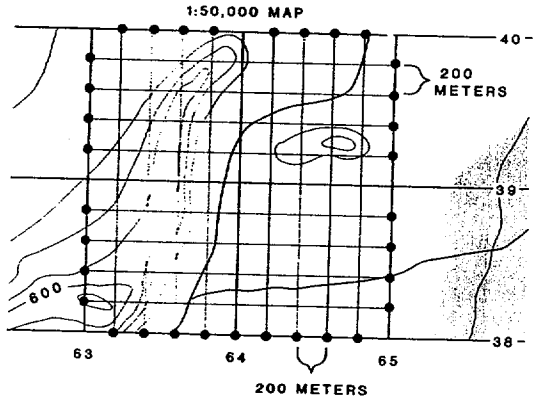


Figure 9-9. Tick-marking the Grid Square.

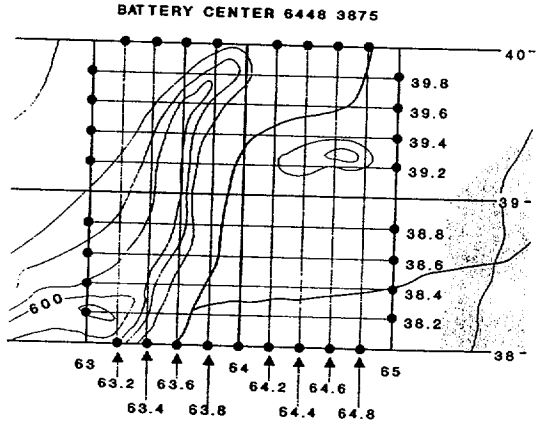


Figure 9-10. Labeling the Grid Sheet.

(e) Reproduce the detail from each 200-meter block into the corresponding grid square on the 1:25,000 grid sheet. Plot roads, key terrain, wood lines, etc. Plot the locations of defensive assets (e.g., howitzers, crew-served weapons, and antitank weapons) and their azimuth of fire or PDF. The locations of these assets can be determined by BCS or BUCS or by scaling from a map.

To use the BCS/BUCS, enter the polar coordinates from a known point, such as the OS, into the computer and determine the exact location. Complete the diagram by plotting key installations. See figure 9-11.

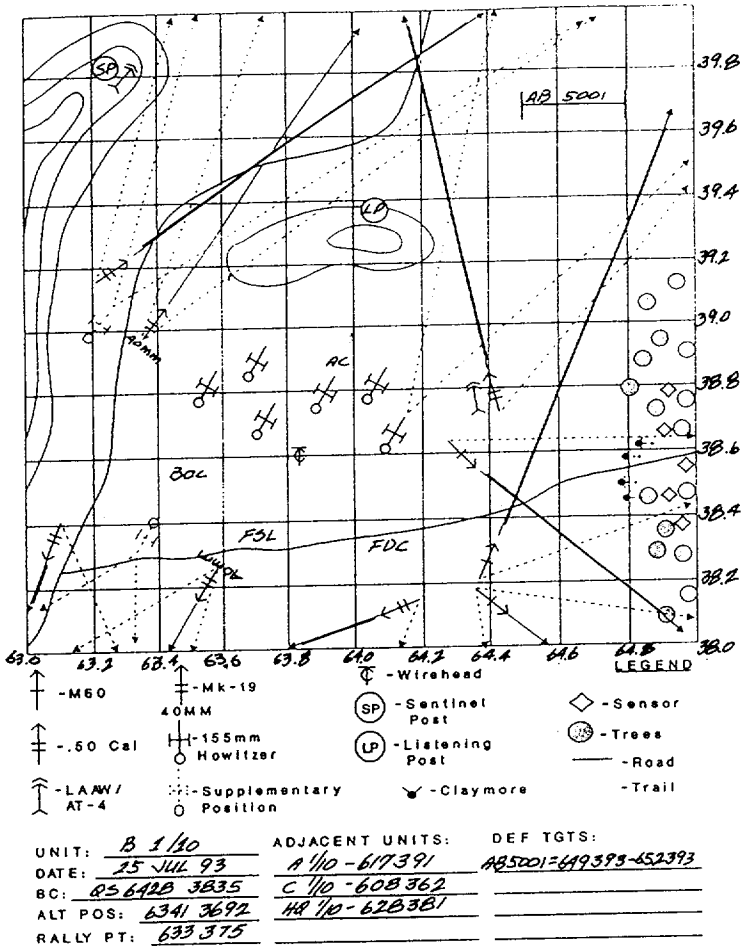


Figure 9-11. Completing the Diagram.

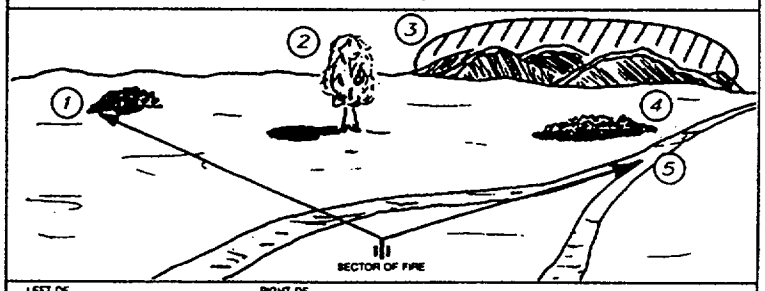
(3) Range Cards. After sectors of fire are assigned, a range card is prepared (in duplicate) for each direct fire weapon (howitzer and crew-served weapons). The range card has a sketch of the sector of fire and necessary data for the engagement of targets. The local

security chief collects completed range cards and uses them to construct sectors of fire on the defense diagram. Partially completed range cards are prepared for alternate and supplementary positions. Range cards should be revised continually throughout the occupation of the position.

(a) Howitzer range cards (figure 9-12) depict the sector of fire with targets and reference points and data necessary for the engagement of targets in limited visibility.

HOWITZER RANGE CARD

For use of this form, see FM 6-50. The proponent agency is TRADOC.



LEFT DF 3800 RIGHT DF 2031

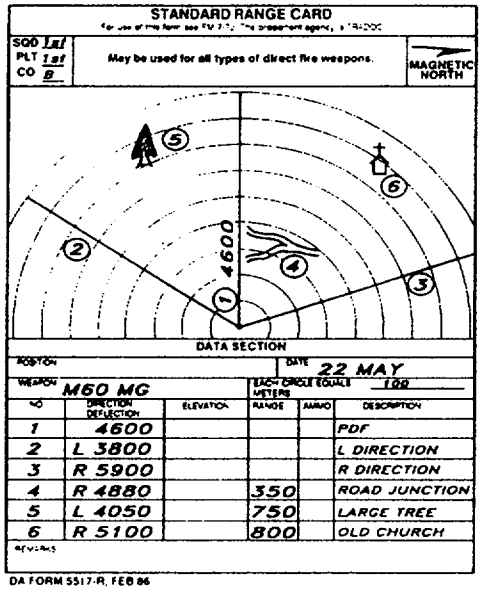
NO	SHELL	CHG	FZ	TI	DF	QE	RANGE	DESCRIPTION	REMARKS
1	HE	8	Q	–	3800	3	400	ROCK PILE	
2	HE	8	Q	–	3015	2	450	TREE	
3	HE	8	Q	–	2800	6	500	DEAD SPACE	SWEEP 200 yd
4	HE	8	Q	–	2447	4	300	HEDGE ROW	
5	HE	8	Q	–	2031	4	250	ROAD JUNCTION	

DA FORM 5899-R, AUG 88

Figure 9-12. Howitzer Range Card.

(b) Machine gun range cards (figure 9-13) show the sector of fire and have a data section for the engagement of targets in limited visibility. The sketch depicts the primary and secondary sector of fire, the location of the weapon, the azimuths of the left and right limits and/or the FPL, and any deadspace.

(4) Fortification and Obstacles. As time and resources permit, obstacles should be constructed to delay, stop, divert, or canalize an attack. Barbed and concertina wire, tank ditches, barricades,



STANDARD RANGE CARD

SQD 1st
PLT 1st
CO B

May be used for all types of direct fire weapons.

MAGNETIC NORTH

DATA SECTION

POSITION

DATE 22 MAY

WEAPON M60 MG

EACH CIRCLE EQUALS METERS 100

NO	DIRECTION DEFLECTION	ELEVATION	RANGE	AMMO	DESCRIPTION
1	4600				PDF
2	L 3800				L DIRECTION
3	R 5900				R DIRECTION
4	R 4880		350		ROAD JUNCTION
5	L 4050		750		LARGE TREE
6	R 5100		800		OLD CHURCH

REVISIONS

DA FORM 5517-R, FEB 86

Figure 9-13. Machine Gun Range Card.

trip flares, and boobytraps and mines (when authorized) may be employed to supplement natural obstacles. These must be covered by observation and fire for effectiveness and be beyond hand grenade range of protected installations.

(5) Hardening of Positions. Hardening is protection to ensure that a unit can function during and after an enemy attack. Hardening can be achieved by digging in, by using cover such as sandbags, timber, rubble, etc., or by berming up (parapets). The degree of protection depends on time, material, and manpower available and the amount of equipment and personnel to be protected. As a minimum, hardening consists of digging fighting positions on the perimeter, burying wire, sandbagging sensitive equipment such as collimators and tires, and protecting propellants. As time permits, howitzers, the FDC and BOC, and projectiles are protected. Engineer assets and/or local civilian earth-moving equipment can be used in the hardening efforts.

(6) Reaction Force. A group of battery personnel are designated as a reaction force. The reaction force is capable of immediate reaction to any enemy threat within and around the position. The size of the group varies with the threat but normally has approximately 25 personnel from the sections of the battery. The reaction force mans their normal working stations. When signaled, they muster at a predesignated location for action. They repel an enemy attack and/or reinforce the perimeter. The reaction force counters the threat at a sufficient distance outward to allow a buffer for the battery perimeter to be fully manned or to gain time for the battery to make a hasty displacement. The reaction force should be capable of employing in two teams. The reaction force should not pursue the enemy if the attack is repelled. The reaction force conducts day and night rehearsals for responsiveness and familiarization with the defensive area.

e. Execute Defensive Action. When an attack occurs, the commander or senior man in position quickly assesses the situation and determines a course of action. He considers the strength of the enemy and its effect on the unit's operational capability. Depending on this analysis, the commander reaches a decision:

(1) The battery **can** repel and/or sustain the attack. If this is the decision, the necessary actions are taken to counter the threat.

(2) The battery **cannot** repel and/or sustain the attack. If this is the decision, the battery executes a hasty displacement. The battery notifies its higher headquarters and proceeds to its alternate position. Consider preplanned fires/smoke to assist disengagement, if required.

9302. Reconstitution of the Battery

If a unit becomes ineffective as a result of enemy action, specific actions must be taken to reconstitute the unit or return it to a desired level of operational readiness. Cross training and an SOP facilitates reconstitution. The following actions are taken:

- Report situation to higher headquarters.
- Render first aid and evacuate casualties.
- Assess damage, repair equipment, when possible, and redistribute assets, as required.
- If attacked by NBC, decontaminate personnel and material.

(reverse blank)

Part III

Artillery Tactics

Tactics are the employment of units in combat. It is the ordered arrangement and maneuver of units in relation to each other and/or to the enemy in order to utilize their full potentialities. The ability to use artillery effectively is a skill mastered by experience, study, and observation. This discussion is not a set of formulas or procedures which can be applied directly; it is a guide. The discussion addresses artillery support for various operations. It is intended to provide—

- A refresher on artillery tactics for use by artillery commanders and staff officers during combat.
- An understanding of artillery employment and requirements for supported commanders.

(reverse blank)

Chapter 10

Artillery in Combat

10001. Principles of War

The principles of war apply to artillery as to all other arms. The principles of unity of command, mass, maneuver, economy of force, and surprise have special application for artillery.

a. Unity of Command. Unity of command promotes unity of action by placing all units involved in a task under one commander. The artillery regiment is under the same commander as the infantry regiments and separate maneuver battalions. All artillery in the division comes under the command of the artillery regimental commander.

b. Mass. Mass is the concentration of combat power at the decisive time and place. The artillery's gunnery techniques and command and control system allow for the massing of artillery fires. It is not necessary to physically mass the weapons. Often, massed fires can serve in lieu of troops in an area. The greater the range of the weapons, the larger the area in which fires can be massed without displacement of artillery units.

c. Maneuver. Maneuver is movement to place ships, troops, or fire in a position of advantage over the enemy. Mass and maneuver are interrelated. While mass implies the ability to concentrate a large volume of fire on a single target, maneuver implies the ability to transfer and distribute fire rapidly over a wide frontage from one point to another. Artillery moves its weapons, shifts its fires, or rapidly alters the organization for combat to place the bulk of fires where needed.

d. Economy of Force. Artillery is employed to obtain the maximum effect on target and strict control of ammunition expenditure. Artillery delivers fires to support mission accomplishment to the degree required (i.e., some targets must be neutralized or destroyed; others will require only suppression). Coordination must be such that the artillery is placed on those targets which cannot be engaged with equal or greater effect by other means.

e. Surprise. Surprise is important to artillery effectiveness and survivability. Artillery achieves surprise by practicing concealment and camouflage, displacement methods, deception measures, survey and MET, firing from unexpected directions and in unexpected volume, avoidance of stereotyped methods, and the judicious use of special ammunition. The greatest effect of artillery is achieved when surprise, massed fire is delivered on a target.

10002. Considerations

The basic considerations in the tactical employment of artillery are as follows:

- *Fire Support Requirement.* Allocation of artillery varies with the situation. Allocation of artillery solely for the purpose of uniformity should be avoided. For allocation to be effective, the artillery commander must completely understand what the supporting commander is trying to do.
- *Massing Ability.*
- *Exploitation of Weapon Capability.* Consider the capabilities of the weapons being employed when deciding how to employ artillery.
- *Facilitate Future Operations.* Artillery employment must anticipate future requirements and operations. It takes time to get artillery into position.
- *Exploitation of Mobility.* Artillery weapons are highly mobile. Artillery can be helicopter-lifted into areas not accessible by surface.

10003. Combat Tasks

Artillery has the following combat tasks:

- Coordinate artillery support.
- Acquire targets.
- Deliver conventional and chemical fire.
- Survive.
- Communicate.
- Maneuver.
- Maintain and resupply.
- Keep trained and ready personnel.

Chapter 11

Offensive Operations

11001. Offense

For success in the offense, the commander concentrates his forces to strike the enemy with power and violence at a decisive point. Maneuver is aggressive and firepower is forceful. Artillery's contribution is often vital to the success of the battle. Artillery efforts are integrated with the other efforts of the force. Often artillery fires may be the preponderance of the fire support available to the force.

11002. Artillery Support for the Offensive

Artillery supports all phases of an offense. It must be responsive to the unanticipated needs of the maneuver force, must support the maneuver force in all phases of its advance, and must protect the maneuver force during consolidation and reorganization. Artillery supports the offense by—

- Locating targets.
- Giving depth to the offense by deep fires on hostile reserves, by interdiction fires to restrict movement in rear areas, and by fires to disrupt the enemy's command, communications, and supply.
- Furnishing close and continuous fire support by neutralizing or destroying targets which threaten the success of the supported unit. It is employed, also, to neutralize enemy observation.
- Weakening the enemy's defense by creating gaps and pinning down selected enemy elements.
- Allowing freedom of action of the force by counterfire, suppression fires, screening fires, and flank protection.
- Assisting the force achieve concentration and surprise by weighting the battlefield, massed fires, chemical fires, and deception; e.g., maintain the normal volume of fires before an attack, fires in support of feints, etc.

356-548 O - 93 - 7

- Assisting the force gain and maintain the momentum of the attack by observation, shifting fires to exploit local successes, shifting fires from one assaulting unit to another, supporting the overall scheme of maneuver, and being mobile and prepared to support future operations.
- Strengthening the force by neutralizing the enemy's ability to react to an attack and by maintaining pressure on the enemy during and after an attack.

11003. Operations to be Supported

The types of offensive operations include: movement to contact, attack, exploitation, and pursuit. The artillery commander must understand each type of operation. Then, he studies the tactical situation, makes preparations, and develops tactics to best support the operation.

11004. Preparing to Support the Attack

Artillery actions accomplished during the preparation for an attack include:

- Organization for combat.
- Fire planning.
- Reconnaissance, selection, and occupation of position.
- Provisions for survey.
- Coordination of observation and liaison.
- Adjustment of mobile loads, prepositioning of supplies and equipment, and arrangement for CSS.
- Corrections for nonstandard conditions.

11005. Movement to Contact

A movement to contact is an offensive operation designed to gain or reestablish contact with the enemy. A movement to contact normally results in a meeting engagement. A meeting engagement occurs when a moving force, incompletely deployed for battle, engages an enemy at an unexpected time and place.

a. Enemy Situation. Movement to contact is conducted when the knowledge of the enemy's strength, location, and disposition is insufficient for deliberate planning. The enemy may be stationary or mobile and at a considerable distance from the friendly force. Thus, few planned targets will be available. Artillery must be prepared for calls for fire as the situation develops.

b. Friendly Situation. The supported force will include two elements: a security force and a main body. A security force is deployed between the main body and the enemy (to the front, flanks, or rear of the main body) to protect the main body. The security force may be assigned a screen, guard, or covering mission.

- A **screen** is a security force that observes, identifies, and reports information, but which only fights in self-protection.
- A **guard** is a security force that protects the main force by fighting to gain time, while also observing and reporting information.
- A **covering** force operates apart from the main force to intercept, engage, delay, disorganize, and deceive the enemy before he can attack the force covered. The covering force may also screen and guard. The covering force operates independently and may be capable of offensive action.

The security force moves to gain initial contact with minimum forces on one or more axes of advance. On contact, elements of the main body will deploy, as appropriate. Artillery moves to support the security force and main body. On contact with the enemy, the supported commander may either attack, bypass, or defend based on the situation and his mission. Artillery must be prepared to support either of these options.

c. Artillery Employment

(1) Organization for Combat. The organization for combat must allow support for each effort of the supported force. Key factors in the organization for combat include responsiveness to the lead unit, distance, the mission assigned to the security force(s), and flexibility. The DS mission is desirable for artillery supporting the security force. However, the distance between the security force and the main body may require attachment of supporting artillery to the security force. Reinforcing artillery may be assigned by attachment, groupment, or a reinforcing tactical mission. Remaining artillery,

normally assigned GS or GS-R missions, must remain available to the higher artillery commander to influence the action. On-order missions should be established to support the action-on-contact options. For example, the GS-R battalion may transition on order to a DS mission to support a flanking force on contact. Weapons-locating radars normally remain under the control of the regiment.

(2) Movement. Movement will be frequent. Artillery reconnaissance parties must operate immediately behind supported lead units. Key to artillery coverage is artillery LNOs keeping supporting artillery informed of the FLOT, operational plans, and problems in the execution. Priority of movement on routes is critical to artillery displacement. Artillery is dispersed in formation to support any action in any direction. Untimely moves must be avoided; i.e., firing units must be in position to support units during critical periods of the movement. Consider security of artillery units during displacements.

(3) Positioning. Positioning well forward will minimize the need for displacements. The DS battalion(s) will displace by battery, or if reinforcing artillery is available, by echelon. See figure 11-1. Consider the identification of COF nets for maneuver units for continuous support. GS and GS-R units will displace forward by echelon as the movement to contact progresses or as the situation dictates. Azimuths of fire must cover the axis of advance and the flanks.

Occupations will frequently be following limited-time preparations. Positions near roads will facilitate rapid entrance and exit, but should not block or impede the traffic flow. Batteries must be prepared to fire from emergency firing positions (hip shoots). Survey control and met stations must be pushed forward. Corrections for nonstandard conditions will be frequent.

(4) Delivery of Fire. Firing will consist of calls for fire from FOs with the security force (main effort) to complement direct fire suppression and build up fire superiority as enemy positions are uncovered. The artillery must be prepared to deliver immediate suppression and immediate smoke missions. FOs must be where they can see and maintain their orientation. FOs should accompany the lead unit. OPs may be positioned for overwatch of the advance. Provision must be made for calls for fire from other sources; e.g., reconnaissance teams, survey parties, etc. The higher artillery commander will use artillery under his control to attack deep targets; to deliver

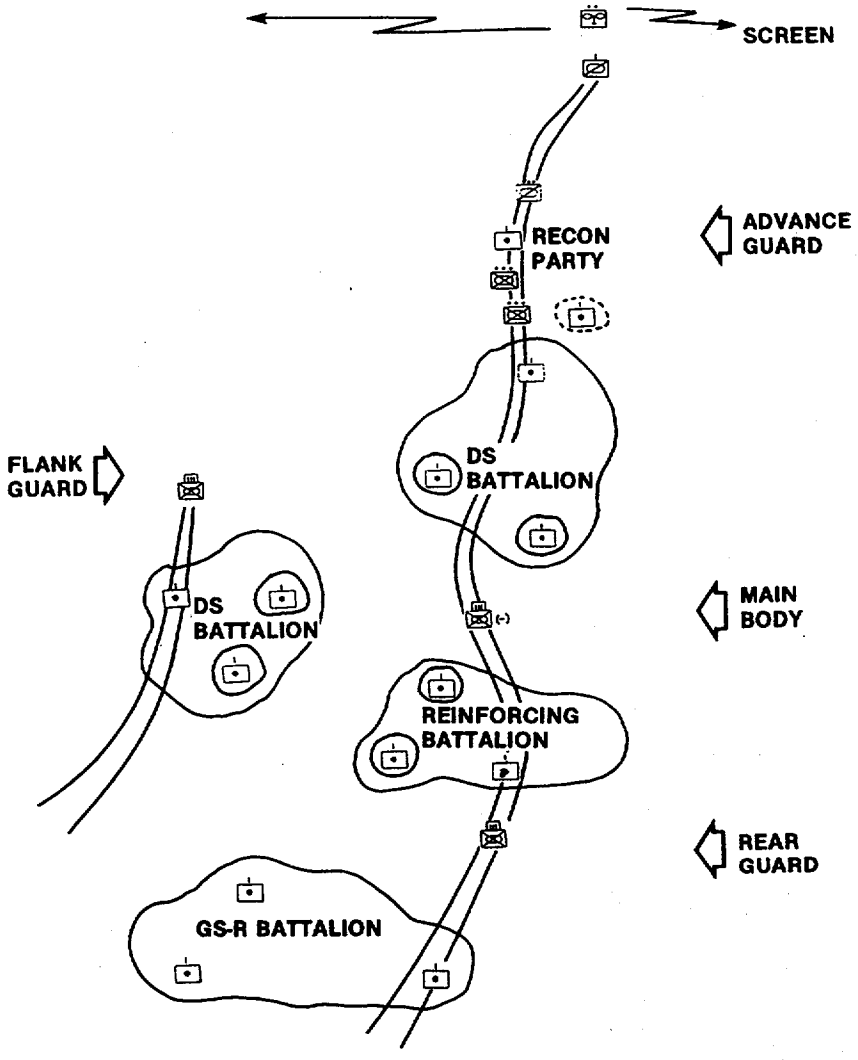


Figure 11-1. Support of a Movement to Contact.

fires to support the movement (e.g., screening, obscuration, counterfire and SEAD) or to react to unforeseen developments (e.g., blunt a counterattack). The artillery should be prepared to respond to quick fire support plans as the situation develops and the effort changes.

(5) Security. Because of the need for fast action, security measures will be expedient. The primary security measures used will be early warning, some camouflage, hastily prepared fighting positions, and a reaction force. Vehicles with mounted crew-served weapons can be positioned to cover major avenues of approach into the position. If the unit remains in position, further defensive preparations may proceed.

(6) CSS. The CSS plan must serve to relieve the batteries of the burden of resupply. CSS, particularly ammunition and POL, must be pushed forward. Ammunition should remain uploaded as much as possible. Consider the use of RRPs.

(7) Command and Control. Command and control will be difficult. The need to maintain communications will influence displacements and the configuration of headquarters echelons. Consider the use of relay sites and forward headquarters echelons to ensure continuous command and control.

11006. Attack

An **attack** is an offensive action characterized by coordinated employment of firepower and maneuver to close with and destroy or capture the enemy. Based on the time dedicated to gathering information, planning, preparation, and rehearsals, attacks may be categorized as deliberate or hasty.

a. Enemy Situation. An attack may be conducted when the enemy's strength, location, and disposition are sufficiently known for planning the coordinated employment of firepower and maneuver to defeat the enemy. The degree of the enemy's vulnerability to attack will dictate the amount of planning, coordination, and preparation conducted before execution of the attack. The artillery must be prepared to deliver a heavy volume of fire on planned targets and targets of opportunity critical to the success of the mission.

b. Friendly Situation. The supported force will be task organized to concentrate maneuver and fire power at a decisive time and place. The attack is usually conducted in four phases: close on the objective; isolate the site for penetration with fires; breach or penetrate to gain foothold;

and exploit the penetration. Following the successful assault, the attack may continue on to exploit and pursue the enemy, or the force will consolidate and reorganize. Main and supporting efforts will be conducted, with the main effort shifting as necessary to maintain the momentum of the attack. Artillery must support each effort, yet weight the main effort. The attack may be a single, rapid advance and assault to secure assigned objectives, or a series of phased or sequenced advances.

c. Artillery Employment

(1) Organization for Combat. Artillery must be immediately responsive to the attacking force, weight the main effort, and be available to the higher artillery commander to influence the action. The DS mission is desirable for artillery supporting attacking unit(s). The main effort is weighted by assigning reinforcing artillery, by positioning additional artillery units (e.g., GS or GS-R) or assigning their azimuth of fire, and/or by assigning priority of ammunition by type and quantity. **Weighting the main effort may result in less support to other units.** Some artillery must remain responsive to the higher artillery commander to support rapid changes in the battle. This can be achieved by assigning GS or GS-R missions, by a nonstandard mission (e.g., assign priority of fires of GS artillery to the supporting attack) if insufficient artillery is available, or by using DS artillery on a not-to-interfere basis. Weapons-locating radars will be controlled by the regiment. Some radar control may be given to battalions.

(2) Positioning. Based on the time available for planning the attack, artillery positions may be carefully selected and well prepared or rapidly selected and occupied without preparation. Ideally, artillery will occupy initial positions during periods of reduced visibility. Positioning will be as far forward as possible to provide continuous coverage for the attack. As a guide, 80 percent of the range of the weapon should extend beyond the supported force. These positions should meet deep support and accuracy requirements; e.g., targets can be engaged with optimum charges; be in terrain with cover, concealment, and defilade; and facilitate displacement as the attack progresses or effort shifts. If maneuver space is restricted, priority of artillery positions (particularly DS battalions) should be coordinated with the supported unit. In selecting artillery positions, consider the supported force's plan for deploying for battle; e.g., track vehicles cutting wire lines, helicopter crossing gun-target lines, etc. Consider engineer support to assist in preparation of positions. See figure 11-2.

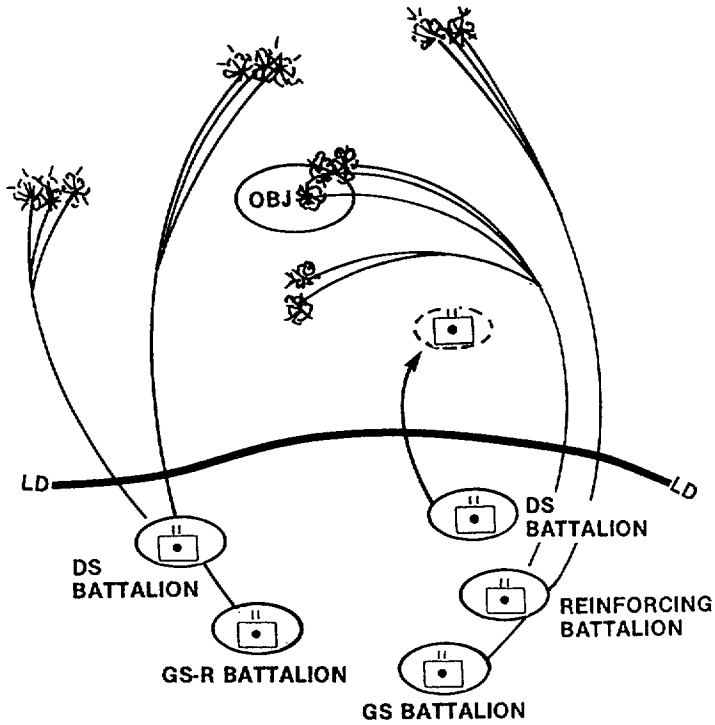


Figure 11-2. Support of an Attack.

(3) Delivery of Fire. Artillery fire planning and tactical fire direction will be initially centralized. Artillery commanders, LNOs, FOs, and artillery staffs work closely with the supported unit during the planning. Artillery fires are planned for three phases: preparatory fires delivered before and/or as the lead units cross the line of departure (LD), fires during the attack, and fires during the exploitation. If time permits, preparatory fires can be delivered to soften the enemy's defense, screen friendly movement, isolate the objective, create gaps or cause reaction, disrupt command and control, and deceive the enemy. Emphasis will be on volume, timing, and accuracy.

The artillery commander recommends to the supported unit commander whether a preparation should be fired, and if so its duration. FDOs will ensure they have corrections for nonstandard conditions, carefully select charges, be alert to firing restrictions (e.g., airspace coordination, etc.), and make provision for surveillance of critical targets; e.g., weapons locating radars employed in friendly mode. As the attack continues, DS artillery will deliver fires to lead maneuver elements to the objective and support their consolidation. These fires will be on planned targets (priority targets, series, etc.) and targets of opportunity. Expect a large expenditure of smoke ammunition for screening and obscuration. Remaining artillery will support the attack by reinforcing fires, counterfire, fires to keep the enemy fixed and isolated, and fires against enemy reserves, command and control, etc. As the objective is secured, artillery fires will be directed to support the exploitation.

(4) Movement. Movement will be influenced by the distance from the LD to the objective, organization for combat, and speed of the attack. If the distance to the objective is beyond the effective range of initial artillery positions, artillery must move to extend its coverage as the attack progresses. Such movement must be closely coordinated with maneuver elements to ensure continuous artillery support. The DS battalion(s) will move with its supported unit. Depending on the speed of the advance and the availability of reinforcing artillery, displacement will be by battery or echelon. Remaining artillery will move to maintain weight to the main effort and continue counterfire and deep fire support. Artillery must remain prepared to support the momentum of the attack, to shift its coverage if the main effort changes, and to support exploitation. A shift in coverage may be achieved by a change in priority of fires, a change in azimuths of fire, or if necessary, repositioning and/or change in organization for combat.

(5) Passage of Lines. If the attack includes a forward passage of lines, the passing force will assume responsibility for the zone of attack at a time and place agreed on between the passing and stationary commanders or when directed by higher headquarters. Fire support will be coordinated by the two units. In-place artillery will provide fire support during the passage, allowing the passing artillery to move with its supported unit. In-place artillery positioning must not interfere with the passage. Some of the main considerations for coordination of the passage include:

- Liaison, including communications links.
- Passage of fire support plans.
- Secrecy needs in the area.
- Position areas.
- Passage lanes, order of movement, recognition signals, routes, including start and release points.
- Method of displacement. Passing artillery normally moves by unit; e.g., battalion.
- Resupply operations.

(6) Security. Artillery must prepare their positions for the probable increased vulnerability which will result from heavy firing and increased communications. Initial positions will probably be hardened. Subsequent security will have to rely on cover, concealment, and terrain. Counterfire and air defense will be paramount.

(7) CSS. The CSS burden will be ammunition. Ammunition may be prepositioned in initial firing positions. However, as the attack progresses, ammunition resupply will depend on ammunition trains.

(8) Command and Control. Initially, command and control will be excellent. In the initial positions, wire will be used extensively.

11007. Exploitation

An **exploitation** is an offensive operation that usually follows a successful attack and is designed to disorganize the enemy in depth. The exploitation is a followup on initial gains against the enemy.

a. Enemy Situation. The enemy will be weakened by a previous or ongoing attack and will be attempting to reconstitute his defenses or to conduct an orderly withdrawal. Although defeated or severely damaged by the attack, the enemy is still a relatively coherent force.

b. Friendly Situation. The friendly force will combine maneuver and firepower to maintain offensive pressure on the enemy and to destroy his ability and will to fight. The operation is fast paced with numerous hasty attacks and decentralized operations extending over great distances. Artillery must anticipate the exploitation and employ positioning, reorientation, and, as required, movement and change in organization for combat to quickly transition its support.

c. Artillery Employment

(1) Organization for Combat. Artillery must be employed to support multiple operations occurring on a broad front. The organization for combat can promote this capability. DS, reinforcing, and GS-R missions should provide adequate response to exploiting forces. On order missions assist transition from attack to exploitation. If the nature of operations makes it difficult for communications and positive control, attachment of artillery to supported units may be required. Some situations may require the formation of an artillery groupment.

(2) Movement and Positioning. Support for exploitation demands fast, frequent movement with units well forward. Some movement and resupply may be by air.

(3) Delivery of Fire. Exploitation demands fire on targets of opportunity and support for quick fire support plans. Fires will be delivered to support hasty attacks, interdict reinforcement, and deliver counterfire.

(4) Security. As artillery units move forward, guard against attacks by bypassed enemy units, stragglers, or snipers. Security sweeps should be extended to ensure surrounding woods, houses, etc. are clear of enemy forces. Displacements and movements may occur rapidly, thus camouflage and fortifications may be deemphasized.

(5) CSS. Supply will become extended and difficult as the operation expands into multiple operations across a broad front. Ammunition and POL must be pushed forward with priority to artillery supporting the exploitation force.

(6) Command and Control. Plan for radio retransmission and/or relay. Make a contingency plan for linkup operations.

11008. Pursuit

A **pursuit** is an offensive operation designed to catch or cut off a hostile force attempting to escape, with the aim of destroying it. The pursuit normally follows a successful exploitation, but any type of offensive operation may give way to pursuit.

a. Enemy Situation. The enemy will be an incoherent force whose resistance has broken down and who is attempting to flee the battlefield. Noncohesive isolated pockets of resistance may be left behind, but little or no command and control will remain. Targets will be running, scattered, and immobile enemy pockets which are bypassed.

b. Friendly Situation. As the offensive operation progresses into pursuit, the force may evolve into a direct pressure force and an encircling force. The direct pressure force may attack on a broad front with multiple axes if the enemy is completely disorganized and fleeing along several LOCs. High mobility is the basic characteristic of the pursuit. The encircling force may consist of mechanized units, mortorized units, helicopterborne infantry, or a combination thereof, employed in a series of flanking attacks and/or deep blocking operations. Artillery supports each force. The battlefield will be fluid, and good liaison is required to allow artillery support for ever-changing situations. In addition to normal liaison assignments, liaison should be effected between artillery with direct pressure forces and artillery with encircling forces. This liaison is particularly important in preventing friendly artillery fire from falling on the pursuing forces as they converge.

c. Artillery Employment

(1) Organization for Combat. Artillery must be employed to support multiple operations occurring on a broad front. The organization for combat can promote this capability. DS, reinforcing, and GS-R missions should provide adequate response to pursuit forces. On order missions assist transition to pursuit. If the nature of operations makes it difficult for communications and positive control, attachment of artillery to supported units may be required. Some situations may require the formation of an artillery groupment.

(2) Movement and Positioning. Support for pursuit demands fast, frequent movement with units well forward. Some movement and resupply may be by air. A 6400-mil firing capability may be required to engage bypassed enemy.

(3) Delivery of Fire. Pursuit demands fire on targets of opportunity and support for quick fire support plans. Plan to deliver suppression fires, massed fires, and special munitions; i.e., FASCAM.

(4) Security. As artillery units move forward, guard against attacks by bypassed enemy units, stragglers, or snipers. Security sweeps should be extended to ensure surrounding woods, houses, etc., are clear of enemy forces. Displacements and movements may occur rapidly, thus camouflage and fortifications may not be employed. Enemy air attacks are less likely, and therefore, certain security measures may be deemphasized.

(5) CSS. Supply will become extended and difficult as the operation expands into multiple operations across a broad front. Ammunition and POL must be pushed forward. Encircling forces operating independently should be initially supplied with sufficient supplies to gain their objective without resupply. This may require additional transportation be attached to these forces. In emergencies, resupply by air may be necessary. Maximum loading of vehicles, use of additional fuel cans, conversion of administrative vehicles to haul supplies, etc., will increase supply capacity and thereby lessen resupply requirements. The mobility of artillery supporting the pursuit forces must not be sacrificed.

(6) Command and Control. Plan for radio retransmission and/or relay. Make a contingency plan for linkup operations.

(reverse blank)

Chapter 12

Defensive Operations

12001. Defense

Defense is a coordinated effort by a force conducted for the immediate purpose of causing an enemy attack to fail. Defensive operations may also seek to gain time; concentrate forces elsewhere; wear down enemy forces as a prelude to offensive operations; and retain tactical, strategic, or political objectives. While in a defensive posture, the force remains ready to exploit enemy errors or weakness by offensive action.

a. Types of Defense. In general, there are two types of defense: position and mobile. The position defense attempts to retain terrain; the mobile defense intent is to destroy the enemy force. Conceptually, these two defenses define the extreme types of defense. Actual defenses will normally include aspects of both types. See figure 12-1.

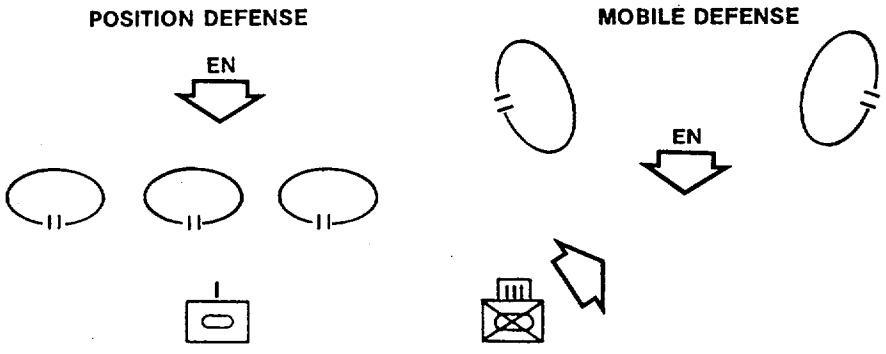


Figure 12-1. Types of Defense.

(1) Position Defense. Position defense disposes the bulk of the defending force in selected tactical localities where the decisive battle is to be fought. Principal reliance is on the ability of the forces in

the defended localities to maintain their positions and to control the terrain between them. The reserve is used to add depth, to block, or to restore the battle position by counterattack. The position defense focuses on the retention of terrain by absorbing the enemy into a series of interlocked positions. The defending force then destroys the attacker.

(2) Mobile Defense. Mobile defense uses maneuver, fire, and terrain to seize the initiative from the enemy. The mobile defense requires depth. It permits the enemy to advance into a position that exposes him to counterattack by a strong mobile reserve.

b. Organization of the Defensive Sector

(1) Rear Area. The rear area extends forward from the rear boundary of a command to the rear of the area of responsibility of the next lower level of command. Rear operations are conducted in this area to ensure freedom of action by sustaining the force and providing security for that sustainment.

(2) Main Battle Area (MBA). The MBA extends from the FEBA to the rear boundaries of the forward subordinate units of any command. It is in this area and the security area that close operations are conducted to project decisive power against enemy forces using maneuver and combined arms.

(3) Security Area. The security area is the area forward of the forward edge of the battle area (FEBA) out to the forward positions initially assigned to security forces. See figure 12-2. The GCE commander may extend the lateral boundaries of subordinate units forward of the FEBA, giving them responsibility for the security area within sector to the forward limit of their boundaries, or he may assign a security force to operate across the entire GCE front. The security force may be a screen, a guard, a covering force, or a combination thereof. (The definition and purpose of a screen, guard, and covering force are discussed in paragraph 11005b).

(4) Deep Operations. Deep operations isolate, shape, and dominate the battlespace to influence the conditions under which close operations are conducted. Deep operations are primarily conducted beyond the security area and are usually the focus of the MAGTF commander. The principal goals of deep operations are to interdict enemy supplies, destroy command and control nodes, isolate front line troops from their follow-on echelons, and shape the battlefield to restrict the freedom of action of the enemy commander.

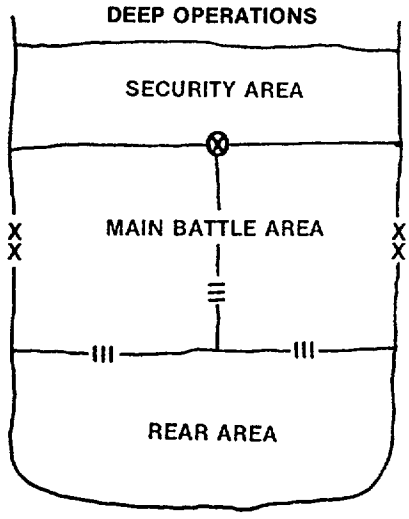


Figure 12-2. Organization of the Division's Defensive Sector.

12002. Artillery Support for the Defense

Artillery supports all phases of defensive action. Artillery delivers fires to—

- Slow, stop, canalize, delay, and confuse the enemy by engaging at long range and at critical points during his advance.
- Isolate enemy echelons, and break up formations or at least hinder the launching of a coordinated attack.
- Obscure enemy observation or screen friendly operations.
- Cover disengagement and repositioning of supported forces.
- Disrupt the enemy's attack by counterfire and counterpreparation fires.
- Impede the enemy's attack by close defensive fires and hold the enemy by fire until a counterattack can be launched.
- Break up the enemy's assault by barrages as a part of FPF.
- Support the counterattack and associated limited offensive actions.
- Cover a withdrawal, if necessary.

12003. Operations in the Defense

a. Enemy Situation. Knowledge of the enemy and a continuous flow of information about the enemy enables the defending commander to develop an effective battle plan. All intelligence sources are used to gain information on the enemy's strength, composition, disposition, and main effort. As the enemy advances, he faces an ever-increasing volume of fire from all supporting arms and eventually direct fire weapons. If the enemy is mechanized, artillery engages those types of vehicles most vulnerable to artillery fire. Other targets are fixed for engagement by other supporting arms.

b. Friendly Situation. The MAGTF conducts defensive operations throughout its zone. Long-range fires are delivered beyond the security area to influence future operations. As the battle progresses, security forces conduct delaying operations to trade space for time by slowing down the enemy's momentum and inflicting maximum damage on the enemy without becoming decisively engaged. Eventually, the security force hands over the battle to the main forces of the MBA. Artillery must provide coverage to these forces throughout the defensive battle.

c. Artillery Employment

(1) Organization for Combat. Initially, the organization for combat should provide authority for fire planning, designation of priority of fires, and positioning at the highest practical level. The organization depends on the mission of the defensive forces, the size of the defensive area, the availability of artillery, and the capability of the higher artillery headquarters to exercise control. Transition of artillery support from security forces to the main forces in the MBA requires assignment of on-order missions.

(a) Deep Operations. The MAGTF may employ some artillery in support of deep operations. Long-range artillery, such as MLRS, are particularly capable of providing this support.

(b) Screen. Artillery coverage for a screen depends on the size of the security area. If the security area is shallow, adequate support may demand assigning priority of fires of an artillery unit or a nonstandard mission which gives the screen precedence in calling for fire. If distance and communications preclude this, the screen force may include attached artillery.

(c) Guard. The guard must have responsive artillery support. Artillery serves in DS of the guard or, if distance dictates, attached to the guard.

(d) Covering Force. The covering force requires the greatest commitment of artillery support. The nature of the covering force's operation will generally require the attachment of artillery to the covering force. The amount of artillery depends on the size of the covering force. If the artillery in the MBA has a mixed caliber of weapons, the covering force artillery attachment should consist of representative calibers to deceive the enemy as to the location of the MBA. The artillery unit may have a CBR platoon detachment.

(e) MBA. Artillery in the MBA should organize for responsiveness to the higher headquarters, where intelligence is being received. Artillery must also respond to subordinate forces defending the MBA. Assigning GS and DS missions may accomplish this. Artillery must prepare to support the mobile reserve (mobile defense) or a counterattack force on deployment (normally by using an on-order DS mission). Weapons-locating radars should remain under regimental control. However, some radars may be placed under the control of battalions.

(f) Rear Area. Artillery coverage for the rear area depends on the availability of artillery and the threat. Artillery may be assigned a contingency mission. These units must make prior plans commensurate with the action expected. Liaison with the supported headquarters should be effected to help integrate artillery fires into battle plans.

Some artillery may be able to support rear areas from its present position. If distance prevents this, artillery may have to use supplementary positions or reconnoiter the rear area for positions and routes. If friendly aircraft are used for rear area support, be prepared to provide SEAD. Prior plans should be made to move artillery to its rear area positions by helicopter. When required, artillery may be attached to the rear area security forces.

(2) Positioning. Positioning artillery for defensive operations requires careful planning and extensive preparation. Generally, artillery units prepare positions in depth to support the defense. Batteries prepare their initial positions and at least select positions they intend to occupy in later stages of the battle. As time and assets permit, batteries should prepare these selected positions. The selection of

artillery positions should be in consideration of the supported force's movement; i.e., artillery positions should provide continuous support without interfering with maneuver. See figure 12-3.

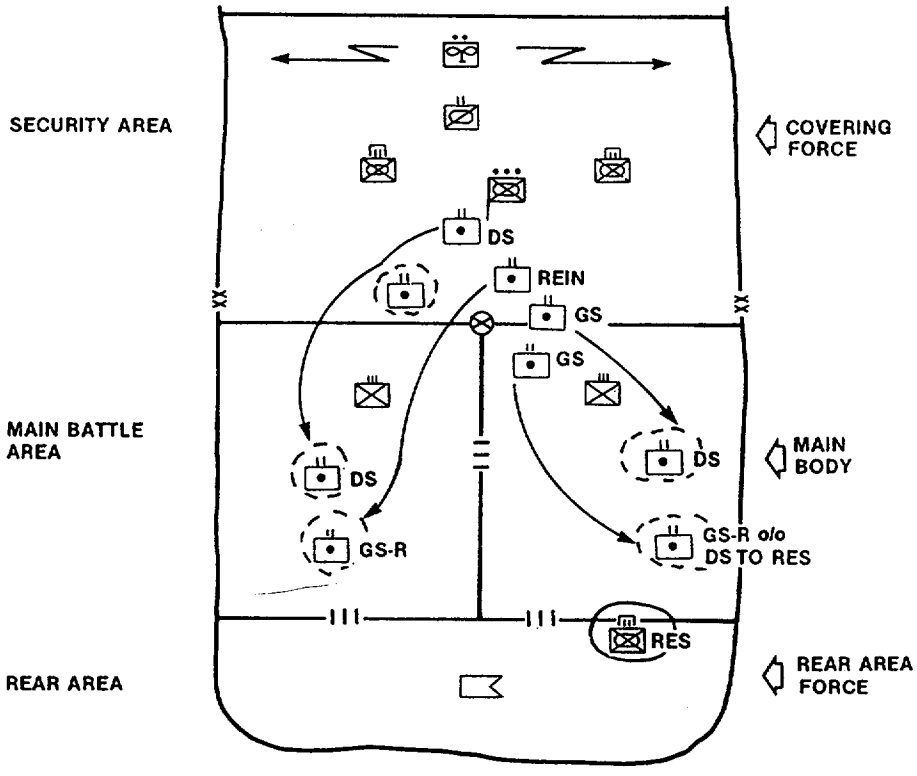


Figure 12-3. Support of a Defensive Operation.

(a) Security Area. Artillery should not be extended into the security area farther than is necessary to deliver fires. As a guide, artillery should be 2 to 6 kilometers behind the line of contact. This positioning depends on the terrain and the employment of target acquisition and intelligence gathering assets. Artillery must closely coordinate positioning with the security force to ensure continuous coverage, yet not interfere with its delaying action. Primary positioning considerations are protection, ability to mass and shift fires, and keeping displacements to a minimum. To facilitate rapid exit for repositioning during the delay, artillery units

should be near roads. Forward artillery should carry only mission essential equipment.

(b) MBA. Several factors influence positioning in the MBA. The factors are terrain, disposition of the supported force, enemy main attack, and additional fire support requirements. General guidance for positioning follows:

- Initially, artillery positioned in the MBA will be well forward to allow fires in support of security forces and fires for the higher commander to influence the action. Some MBA artillery can be forward of the FEBA in supplementary positions. This artillery must have enough time and resources to prepare and occupy their primary positions behind the FEBA. Consider placing liaison personnel with the covering force artillery to enhance responsiveness and to gain firsthand experience of the covering force's actions and fire support needs.
- If the rear area forces do not have assigned artillery, some artillery in the MBA may be positioned (i.e., 6,400-mil coverage, position selection) to respond to a rear area fire support requirement.
- Artillery re-positions in response to the main effort of the enemy. Generally, artillery will be to the flanks of the enemy's main effort so it can mass fires on the enemy in killing zones. This may be achieved by shifting azimuths of fire and/or positioning (movement) of units. Artillery should weight the most vulnerable area of the defense.
- Artillery must be positioned to respond to other fire support requirements such as a mobile reserve or a counterattack force.

(3) Movement. Artillery must be prepared to displace quickly to provide continuous coverage and enhance survivability. Equipment and supplies should be uploaded as much as possible for rapid movement. Units should reconnoiter rearward for rapid movement to the rear, possibly under pressure. Units should select and survey positions in advance. During displacement, RSOP parties will have little time to prepare the position for occupation; i.e., the battery will often be displacing as the RSOP party prepares the position. Displacement will be by echelon, when possible, with consideration given to displacement of artillery by helicopters. Higher artillery headquarters must coordinate movement of DS artillery with GS artillery for

continuous support. Generally, GS/GS-R units displace rearward first; DS and reinforcing artillery move into the MBA just prior to the maneuver forces. Artillery movement must be closely coordinated with the supported unit movements to preclude interference with maneuver defensive efforts; e.g., artillery masking tank or other direct fire weapons.

(4) Delivery of Fire. Initially, all artillery focuses on deep fires to erode the enemy's command, control, and logistics ability. As the enemy enters the security area, DS (or attached) artillery fires on vulnerable targets in formation and on chokepoints and supports disengaging and repositioning actions of the supported force. GS artillery will augment the DS fires, isolate echelons, cover obstacles, provide screening and obscuration fires, and provide fire as DS artillery displaces. Counterfire activities will likely be intense. All artillery should mass fires when large concentrations of enemy forces present a vulnerable target. Artillery fires are used to deny movement and to help control terrain or to defeat attacks as they are mounted. MBA artillery will deliver fires to pressure the enemy and to assist disengaging forces that are withdrawing from the security area. As the enemy advances into the MBA, artillery masses fires on the enemy's assault in killing zones; fires on strong points; reinforces fires of direct fire weapons; fires to blunt the penetration; and if required, delivers barrages as part of FPFs. Targets of opportunity and planned targets are engaged. A counterpreparation is planned and may be executed. Optimum artillery support results from accurate corrections for nonstandard conditions and observed fires. Artillery must be prepared to support a counterattack.

(5) Security. Initially, artillery security should be well established. During the delay, security in subsequent positions will decrease. When security force artillery occupies its prepared defensive positions in the MBA, security measures will again be well established. Depending on time and assets available, these positions should be hardened. During the battle, artillery must remain prepared to occupy alternate positions.

(6) CSS. Combat trains must relieve forward batteries of the CSS burden. Ammunition should remain uploaded in forward positions, with stockpiles prepositioned in subsequent positions.

(7) Command and Control. Initially, control is centralized making maximum use of wire. Forward command and control cells may

facilitate control. Close coordination between the MBA and security area forces requires exchanging targets and passing the status of the battle. As the battle commences, control is decentralized. As forces withdraw from the security area, control of all supporting arms and responsibility for the security area passes to the main force in the MBA. This *handover* occurs at a point designated by the higher headquarters. The handover will generally include a passage of lines. A smooth handover requires liaison between artillery commanders; identifying communications needs; and identifying positions and routes, the passage of the fire support plan, and the coordination of other information; e.g., lanes for passage, signals, communications details, firing requirements, resupply, mission for passing artillery at new position, etc.

12004. Withdrawal

A withdrawal operation is a planned operation in which a force in contact disengages from an enemy force. A withdrawal may be conducted either without enemy pressure, or under pressure. Key to supporting the withdrawal is arranging a withdrawal schedule for artillery units that allows for continued fire support and planning/delivering fires to support disengagement and to prevent enemy interference; e.g., suppression fires, screening fires, counterfire. Consider ammunition requirements and resupply during the operation.

a. Withdrawal Without Enemy Pressure. A withdrawal without enemy pressure should optimally occur during periods of reduced visibility and incorporate a deception plan. Plans include provisions for withdrawing under pressure. Normal fires, radio traffic, vehicle movement, and other activities should continue to contribute to the deception effort. Artillery of representative calibers should remain in place to cover the withdrawal. Detailed deception fires should confuse the enemy and prevent him from interfering with the withdrawal. Artillery in place must closely coordinate with artillery moving.

b. Withdrawal Under Enemy Pressure. In a withdrawal under enemy pressure, a force must fight to disengage. Armored and mechanized units may break away rapidly, but less mobile units usually rely on deception, obstacles, indirect fires, or use of terrain masking. Maneuver forces will normally leave an overwatch or covering force in position to support the disengagement of the main body and maintain a mobility advantage over the enemy. The main body disengages to the

rear, using fire and maneuver until it is no longer hampered by enemy fires. Artillery is organized for maximum flexibility. Centralized control is retained to the maximum degree feasible. Artillery must provide all possible support to assist maneuver forces in disengaging and discourage the enemy from pursuing. Artillery fires are employed to deceive, disrupt, or destroy the enemy, to delay his advance, to neutralize his artillery, and to support limited counterattacks and tank sweeps. Primary targets are enemy forward forces, fire support means, and local reserves. Positions are well forward to exploit range of weapons. Positions to the rear are selected and occupied as required to provide continuous support. As appropriate, artillery should displace by echelon. However, timing is critical to ensure that the maximum number of artillery units support the withdrawing forces while avoiding the chance of being overrun. As the disengagement progresses, GS artillery displaces first; DS artillery and reinforcing artillery displace at the last possible moment. GS artillery may have to provide close support for short periods. Lower echelon artillery commanders should receive control of displacement to facilitate timing and coordination.

12005. Breakout and Defense of Encircled Forces

In some combat situations, a supported unit may have to hold certain areas or stay behind in enemy-held territory. Encircled forces must act quickly to save themselves. The supported commander may be ordered to conduct a breakout or a defense of the encircled position. If breakout is the choice, the force breaks out quickly before escape routes are blocked. If defense in place is the choice, plans are made for subsequent linkup with a relieving force. Major considerations for the artillery when supporting an encircled force include:

- 6400-mil coverage.
- Massing capability where practical.
- Aerial resupply of ammunition.
- Increased need for SEAD fires.
- Reorganization of target acquisition commensurate with the assets on hand to ensure adequate coverage.
- Fire support communications should be reorganized to ensure minimal overloading of fire support nets.
- Survival techniques must be stressed.
- Coordination with outside fire support agencies is effected.

Chapter 13

Operations in Special Environments

13001. Overview

Operations in special environments are those operations in which terrain, weather, nature of the operations, or a combination thereof creates a need for special techniques, tactics, training, and equipment. Special operations include cold weather, mountain, desert, jungle, riverine, river crossing, amphibious, helicopterborne, air movement, and built-up/urban area operations. This chapter identifies considerations for these special operations. CSS, FO, and raid considerations are contained in FMFRP 6-17, FMFM 6-8, and FMFM 7-32, *Raids* (under development).

•

13002. Cold Weather Operations

ORGANIZATION FOR COMBAT	MOVEMENT/POSITIONING	DELIVERY OF FIRE	SECURITY	COMMAND AND CONTROL
Unit density is usually low, thus attachment of artillery may be required.	Movement of wheeled vehicles restricted and slow. Artillery is nearly road bound. 105 mm howitzers can be sled-mounted and towed by BV-202/BV-206. Chains required for prime movers. Consider the need for wreckers. Heavy vehicles move with difficulty in deep snow or muskeg. Large battlefield requires movement. Navigation difficult. Air movement affected by ice fog. Movement by helicopter makes large signature. CSS to artillery positioned by helicopter may be difficult.	Ammunition effects are reduced by snow, increased by ice. HE/Q and ICM ineffective in deep snow. HE/Q can be used to start avalanches. MTSQ fuses are effective. Chemical agents are adversely affected. Particles of WP may become buried in snow and cause hazard to friendly troops. Cold affects weapons. Rates of fire are reduced until weapons have warmed. Ammunition preparation is slow. Range correction factor of +100m per 1,000m is not uncommon. Survey difficult. Survey control points and markers become obscured. Survey parties need equipment for over-the-snow travel. Radar operations hampered by extreme cold.	Hardening of positions is difficult. Construction of barriers, parapets, etc. on frozen ground may require explosives. Engineers may be attached to artillery for snow clearing, hardening of positions, and fortifications. Track plans must be strictly enforced to prevent compromise of position by tracks in snow. DS and attached artillery may be located adjacent to or within perimeter of infantry. Concentrations of shelters make unit vulnerable to attack. Camouflage discipline must be strictly enforced.	Communications primarily by radio. Wire use restricted to existing trails and roads. Wire may be laid by aircraft. Wire must be kept in warm place until laid. Due to decreased mobility, communications security and electronics security have added importance. Artillery commander must ensure supported unit aware of limitations of artillery in cold.

13002. Cold Weather Operations—Continued

ORGANIZATION FOR COMBAT	MOVEMENT/POSITIONING	DELIVERY OF FIRE	SECURITY	COMMAND AND CONTROL
	Positions selected for tactical utility, protection from the elements, and ease of CSS. Firing positions may be on or near roads, in farm yards, etc. Positions will often have limited space. Old positions can be used as supplementary positions or for ammunition storage. Two methods of snow-clearing positions are racetrack and driveway methods (figure 13-1). Positions require increased time for preparation. Dunnage may be required. Ahkios (man-portable sleds) can be used to move equipment and ammunition in position.	Firing platform stability is a problem in deep snow. Ensure positions are away from possible avalanche-prone areas. FASCAM may settle in deep snow and reduce effectiveness. Projectile plugs should be left in place or fuses immediately mated with projectiles to prevent condensation, ice, or snow in fuse well.		

13002. Cold Weather Operations—Continued

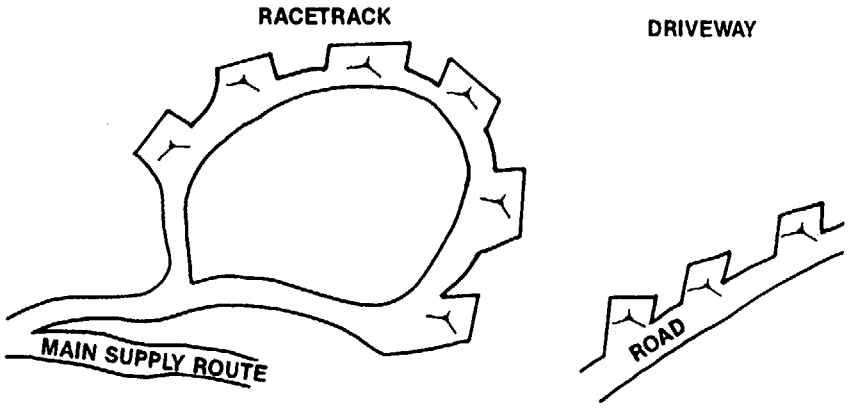


Figure 13-1. Methods of Positioning in Cold Weather Operations.

13003. Mountain Operations

ORGANIZATION FOR COMBAT	MOVEMENT/POSITIONING	DELIVERY OF FIRE	SECURITY	COMMAND AND CONTROL
Terrain often requires use of multiple maneuver columns, thus attachment of artillery may be required.	Movement of vehicles slow and restricted to roads and improved trails, which are usually scarce. Winding roads and steep slopes create difficulty for towed weapons. Self-propelled artillery traction difficult when road is rocky or icy. Can be overcome by grousers (cleats) on the tracks. Potential for bottlenecks. Artillery needs route precedence. Helicopter movement may be restricted by altitude limitations. Positions will usually be scarce and access limited. Priority of positioning should be for artillery. High altitude lowers load capacity of vehicles.	High angle fires often required because of masks of positions and for defilade fire. Observed fires and frequent corrections for nonstandard conditions are required. Consider check rounds. Massed fires are less effective because of enemy dispersion. However, chokepoints and passes are ideal targets. Counterfire is particularly effective due to high angle fire. Positions can be predicted because of few available positions. Rocky ground enhances lethality of HE; airbursts effective on reverse slopes; ICM, smoke, and illum fires difficult to adjust and maintain due to winds.	All-round security critical because of terrain.	Decentralized in the attack; centralized in the defense. Radio communications often degraded; use of radio relays required. Antennae must be carefully sited and masked. Wire laying restricted to roads. Cross-country wire difficult to lay and maintain. Control cells may be formed to stay with batteries.

13004. Desert Operations

ORGANIZATION FOR COMBAT	MOVEMENT/POSITIONING	DELIVERY OF FIRE	SECURITY	COMMAND AND CONTROL
Wide dispersion of forces may require attachment of artillery. Desert battles tend to be centralized.	Wheeled vehicle movement difficult with heavy loads. Roads are normally poor. Displacements will usually be frequent because of fluidity of battlefield. Units should carry mission-essential loads. Movements should occur during periods of reduced visibility when possible. Day movement causes dust signature. Helicopter operations difficult due to dust. RSOP and survey must be continuous. Often, air reconnaissance is used. Terrain gun positioning is widely used to take advantage of terrain. Consider potential changes in weather when selecting positions. Navigation difficult. Use caution in operating in wadis, particularly if rainstorms are likely.	HE/Q and delay, ICM, and FASCAM smothered by deep sands. Airbursts, smoke, illum, and Copperhead are very effective. Long-range fires and obscuration and screening fires can be expected. Rapid changes in weather require frequent changes in corrections for non-standard conditions. Radars are highly effective. Most targets will be hardened. Survey control points are few and far between. Astronomic observation and resection may be required. Soft sand causes problems in firing of weapons. Plan for increased consumption rate of ammunition.	Security takes on added importance. Artillery vulnerability is increased by firing signature and openness of terrain. Positions must be well dispersed, hardened, and camouflaged. Deception should be practiced, but is difficult.	Radio communications generally excellent, but vulnerable to EW and damage by sand, heat, etc. Wire is easy to install in most areas. For short ranges, visual and sound signals may be used. Some areas may have dead spots.

13005. Jungle Operations

ORGANIZATION FOR COMBAT	MOVEMENT/POSITIONING	DELIVERY OF FIRE	SECURITY	COMMAND AND CONTROL
Communications may necessitate decentralized control. Supported units often conduct decentralized or independent operations.	Limited trafficability for wheeled and tracked vehicles on few existing roads. Loads must be kept light. Air movement essential. Mutually-supporting positions should be selected when possible. Positions are usually scarce and may be inaccessible by road. Thus, air resupply will be required. Positions may have to be cleared. Positions are normally compact for control and security. Positions for radars usually limited.	Firing platforms may be required for stability in swampy areas. 6400-mil firing capability may be required. Canopy of jungle affects ammunition effectiveness and functioning. HE delay needed to penetrate canopy. Radars have reduced range and accuracy. Close-in fires may be frequent. High angle fires are common. Survey control slow and must be established when feasible. Humidity may degrade range.	All-round security and hardened positions must be established. Positions in thick vegetation areas increase vulnerability to ground attack. Integrated security plans are established.	Radio communications are restricted by line of sight, dense vegetation, and adverse weather conditions. Range of radios is usually reduced by as much as 40 percent. Antennae siting are critical. Field expedient and directional antennae are used. Antennae may have to be elevated to achieve line of sight. Wire laying restricted to roads. Wire can be laid by helicopter.

13005. Jungle Operations – Continued

ORGANIZATION FOR COMBAT	MOVEMENT/POSITIONING	DELIVERY OF FIRE	SECURITY	COMMAND AND CONTROL
	Air reconnaissance and aerial photographs useful. Positions are often hampered by soft terrain. Engineer support or dunnage may be required. Distance between march elements are reduced and other security measures intensified because of limited visibility and natural obstacles. Flank security is a continuing requirement. Thorough RSOP essential.	Ammunition must be protected from moisture. Unobserved or predicted fires are often used. Adjustment by sound and the use of creeping fires are common. HE/Q can be used in low tree canopy or grassland, often producing a splintering effect.		

13006. Riverine Operations

ORGANIZATION FOR COMBAT	MOVEMENT/POSITIONING	DELIVERY OF FIRE	SECURITY
Widely dispersed force may require attachment of artillery. Quantity and caliber of artillery may be limited by lack of positions and water transport assets.	Movement primarily by landing craft and helicopter. Artillery may have to be positioned in hostile area before attack begins. Tidal conditions and water level may affect movement. Bouy markers should be placed on howitzers and prime movers to help recovery in event of sinking. Naval radar aboard escort watercraft can be used for position location. Position locations for barge/boat-mounted artillery should have: 1) Steep banks below surface, 2) Wide streams to front and rear to reduce danger from ground attack, 3) Limited avenues of approach over land, and 4) Areas that minimize anchorage problems.	Batteries must be prepared for direct fire for self-defense. Fires without observation may be inaccurate because of lack of survey control and valid MET data. If afloat, FDCs are generally semi-permanent on separate landing craft. Fires can be delivered from the LCM-8 or barges while anchored to the bank.	Additional forces for the security of prepositioned artillery. Position areas may be small and in insecure areas. Cover and concealment may be limited. Naval element gunboats and assault support patrol boats provide boat security. CAS, CIFS, supporting artillery are requested for route security as required.

356-548 O - 93 - 8

13007. River Crossing Operations

ORGANIZATION FOR COMBAT	MOVEMENT/POSITIONING	DELIVERY OF FIRE	SECURITY	COMMAND AND CONTROL
Artillery is organized for combat consistent with type of crossing to be conducted (hasty or deliberate) and intended mission after crossing. When practicable, centralized control is desired. In the defense, artillery may be attached to security forces deployed across river.	Most artillery will cross the river when continuous fire support can be delivered from the far bank. DS artillery displaces when first phase objectives are seized and positions are available for artillery. Some artillery may be airlifted to reduce congestion at the crossing site. In the assault, final positions are moved into at the last possible moment under the cover of darkness. Positions should be well forward and in depth to range beyond the bridgehead line. Also, positioning should facilitate rapid crossing. RSOP is accomplished by map. There is little flexibility in selecting initial positions.	GS and GS-R units may provide close supporting fires as DS and reinforcing move. Prior to, during, and immediately following crossing, artillery may deliver illum, smoke, and deception fires. Fires can be used to screen noise of crossing. In the defense, fires may be planned on probable crossing sites, fires to canalize the enemy and stall his attack astride the river, and to support a counterattack. Fires are delivered in depth.	When supporting force crosses river, local security becomes critical.	May be complicated during times when elements are on both sides of the river.

13008. Amphibious Operations

ORGANIZATION FOR COMBAT	MOVEMENT/POSITIONING	DELIVERY OF FIRE	SECURITY	COMMAND AND CONTROL
Artillery is dispersed among available naval shipping. Thus, decentralization is required. As artillery lands, centralization is re-established as dictated by the situation.	Artillery should land and begin operations as soon as conditions permit. Artillery RSOP parties are usually brought ashore in the early stages of the landing, with artillery units landed as on-call serials. Initial position areas are planned from map reconnaissance, and if possible by air. RSOP parties will be larger in the initial phase of the operation than in other operations. Survey control must be established ashore. Beach trafficability may be a problem. Matting and partially deflated tires may be used. Vehicles must be prepared for fording. Artillery may be landed by landing craft or helicopter. Landing plan must permit artillery to land in formation with adequate personnel/equipment to support the fire support plan and scheme of maneuver.	Tactical and technical fire direction must be decentralized initially to allow for flexibility. Be prepared for inter-Service call for fire. Artillery may be positioned on offshore islands to support assault. Survey generally not present initially.	Artillery vulnerable while on the beach. Units must move across the beach as rapidly as possible.	Senior artillery commander is usually an embarkation unit commander. Communications while afloat and during ship-to-shore are dependent on ship communications plan. Normally, radio will be the primary means. Most artillery traffic will be on LF/arty command/FD and artillery command nets. During planning, consider billeting, ship guards, messing, police, loading (ships platoon), staging areas, landing, security.

13009. Helicopterborne Operations

ORGANIZATION FOR COMBAT	MOVEMENT/POSITIONING	DELIVERY OF FIRE	SECURITY	COMMAND AND CONTROL
Decentralized operations may be required for support to small task forces.	Mutual support between artillery units is desirable. 6400-mil firing capability. Reconnaissance may be limited to air, with the battery commanders conducting reconnaissance during the assault with elements of the supported force. Battery formations often dictated by the terrain of the LZ. Ammunition should be placed close to howitzers on occupation. Positions should have area for LZ. Recon and HST teams may be available for terminal guidance of aircraft. Loads should be positioned to reduce fly-over of battery consistent with wind direction.	Individual piece corrections may be required.	All-round security required. Make use of defilade and natural obstacles.	Close liaison between artillery and helicopter units required. Primary means of communications is radio. Wire restricted to installations within LZ and rear areas.

13010. Built-up/Urban Area Operations

ORGANIZATION FOR COMBAT	MOVEMENT/POSITIONING	DELIVERY OF FIRE	SECURITY	COMMAND AND CONTROL
Centralized control during initial phases; decentralized control during later phases to support semi-independent action of small units.	Movement during night or periods of reduced visibility when possible. Few displacements, often by platoon or section. Positions should be selected that minimize masking, provide several routes of escape, and afford as much cover and concealment as possible. Use of existing structures (garages, office buildings, highway overpasses) is recommended. Special techniques for emplacing howitzers, such as spades against a curb when the ground is not suitable for emplacement may be required. Explosives may be required to soften emplacement of howitzers.	Both direct and indirect fires are delivered for supported units. Destruction of fortifications may require assault fire techniques. High angle fires may be required. Need for accurate MET and survey increases, as most targets are point targets. ICM and VT effects reduced by structures, although they are effective against personnel on rooftops. HE delay used for penetration effects. Illum, chemical incendiary ammunition, and smoke are effective. Ammunition expenditures will be heavy.	Fortification of position.	Radio communications impaired by buildings. Wire can usually be run overhead. Make use of civilian communications. More use of messengers and prearranged audio and visual signals.

13010. Built-up/Urban Area Operations – Continued

ORGANIZATION FOR COMBAT	MOVEMENT/POSITIONING	DELIVERY OF FIRE	SECURITY	COMMAND AND CONTROL
	RSOP parties should be well armed, as they may have to clear areas to be occupied. Extensive route reconnaissance is required. Target acquisition devices somewhat degraded. Radars should be emplaced to cover likely areas of enemy indirect fire weapon employment. Radars should not be placed in the midst of an urban area because of masking.	Lasers and precision-guided munitions permit destruction of targets with minimum rubble of adjacent buildings. But tall buildings may hamper laser use. Batteries must be prepared for hasty survey techniques Magnetic instruments are impaired.		

13011. Artillery Raids

ORGANIZATION FOR COMBAT	MOVEMENT/POSITIONING	DELIVERY OF FIRE	SECURITY	COMMAND AND CONTROL
Extremely decentralized.	Battery moves rapidly into position by air or ground means. The position may be across the FEBA. Only bare necessities are taken. The number of howitzers taken forward depends on target analysis, effects required, and aircraft availability (if airlifted).	Raid is extremely short; used to deliver fire on an HVT. A mixture of HE, WP, and ICM provides excellent effects for a raid. FASCAM and DPICM are also useful. Firing data can be precomputed. Fire the highest charge possible to increase standoff range.	Security elements accompany raid. Attack helicopters may provide cover.	Detailed planning, surprise, and speed are key factors in execution. Effective SOP is essential.

13012. Fire Base Operations

ORGANIZATION FOR COMBAT	MOVEMENT/POSITIONING	DELIVERY OF FIRE	SECURITY	COMMAND AND CONTROL
Generally centralized.	Position should be in an open field, possibly on a hilltop, so unit can clear kill zones, have interlocking fields of fire, and maximize grazing fire. Howitzers should be no more than 50 meters apart and preferably in star formation for 6400-mil capability and defense of position. The firing position should allow for a pickup and/or landing zone.	High angle fires may be required. Indirect fire data should be determined to cover dead space and avenues of approach to the fire base and to target likely enemy mortar positions and/or assembly areas around the fire base. XO's minimum QE should be determined for eight sectors of fire.	Concealment is a primary concern. A strong defensive perimeter is essential. A small-arms cache should be placed in the center of the battery in case the position is overrun. Engineer support should be obtained to harden individual howitzer firing positions. As a minimum, each position should have: • Covered ammunition racks. • A personnel bunker. • Direct fire sector with a fighting trench. • Two covered ready racks. Fire bases should be mutually supporting.	Wire should be used extensively, and buried at least 12 inches.

13012. Fire Base Operations—Continued

ORGANIZATION FOR COMBAT	MOVEMENT/POSITIONING	DELIVERY OF FIRE	SECURITY	COMMAND AND CONTROL
			Units may have to provide their own perimeter illum. If using a star formation, the center howitzer can perform this mission while other howitzers are engaging in direct fire. Infantry support may be available for defense of the fire base. Patrols should extend to the range of enemy mortars.	

(reverse blank)

Appendix A

Artillery Weapons and Ammunition

1. Introduction

This appendix provides information on artillery weapons and ammunition. For detailed information, see technical manuals.

2. Selected Characteristics of Artillery Weapons

WEAPON	M101A1	M198	M109A3
WEIGHT (lbs)	4980	15750	53940
TIME TO EMPLACE (min)	1	4	.5
TRANSPORT CAPABILITY			
Ground	5-ton	5-ton	SP
Helo	CH53D	CH53E	No
Fixed-Wing Transport	All	All	C-5A
MAXIMUM RATE OF FIRE Per tube (rounds per minute)	10	4	4
SUSTAINED RATE OF FIRE Per tube (rounds per minute)	3	2 *	1
HIGH EXPLOSIVE			
Effective casualty radius (1 round)	30m	50m	50m
Weight of proj. (fuzed) (lbs)	33	95 ***	95 ***
TRAVERSE (mils)	400 left 409 right	6400 **	6400
MAXIMUM SPEED (mph)			
Towing—cross country	10	5	—
Towing—secondary roads	30	25-30	—
Towing—improved roads	45	45	—
SP speed	—	—	35
CRUISING RANGE (miles)	—	—	220

* Two rounds per minute or as determined by thermal warning device.
** 6400 traverse using speed shift; 400 left/right without speed shift.
*** 95 lbs for M107 Family; 103 lbs for M483 Family; 138 lbs for Copperhead Self-Propelled.

PROJECTILES[1]	DODAC	MAXIMUM RANGES			FUZE ACTIONS
		M101A1	M102	M119	
M546 APERS-T	1315-C513	11,600	12,400	12,400	Comes set for MA. Can be set to 100 sec.
M360 gas, GB	1315-C441	11,000	11,500	11,500	PD
M60 gas, H, HD	1315-C442	11,000	11,500	11,500	PD
M629 gas, TAC CS	1315-C468	11,000	11,500	11,500	MT
M1 HE (deep cavity)	1315-C445	11,000	11,500	11,500	CP, PD, MTSQ, VT
M444 ICM, HE	1315-C462	11,000	11,500	11,500	MT modified
M548 RAP, HE	1315-C463	14,500	15,100	15,100	PD; VT
M327 HEP-T	1315-C448	Direct Fire			BD
M314A3 illumination	1315-C449	11,000	11,500	11,500	MT
M84 HC, smoke, BE	1315-C452	11,000	11,500	11,500	MT
M60 WP, smoke	1315-C454	11,000	11,500	11,500	PD
M760 HE	1315-C743	No	No	14,000	PD

[1] Most 105mm rounds come complete with primer, propellant, projectile, and fuze. The exceptions are the HE, HERA M548, and some lots of WP M60 that come without fuzes. CP, PD, MTSQ, or VT fuzes, as appropriate, must be drawn as separate items for these rounds. See KEY TO FUZES block below for fuze DODACs.

KEY TO FUZES. DODAC = 1390 PLUS DODIC NUMBER AS SHOWN

TYPE	CURRENT	DODIC	REPLACEMENT	DODIC	FUTURE
CP delay nondelay	M78A1 M78A1	N330 N331	None None	– –	None None
PD SQ/D SQ/D	M557 M572	N335 N311	M739 M739	N340 N340	None None
MAMT	M563	NA	None	–	None
MT	M565[1]	N248	M577[2]	N285	ET XM762
MTSQ	M564	N278	M582[2]	N286	ET XM767
VT	M513 M514	N412 N411	M728 M728	N463 N463	M732 DODIC N464

[1] M548 MTSQ fuze is being issued and used instead of M565 until stocks are exhausted. See TM 43-001-28 for additional details.

[2] M577 and M582 can be set for either MT or SQ action but not for both. No PD backup on these fuzes.

PROJECTILES	DODAC	PROPELLING CHARGES (SEE 155mm PROPELLING CHARGES)				MAXIMUM RANGE	FUZE ACTIONS
		M3 SERIES	M4 SERIES	M119 SERIES	M203		
M107 HE	1320-D544	Yes, but not zone 1	Yes	Yes	No	18,100	CP, PD MTSQ,VT
M549A1 RAP	1320-D579	No	Yes, but zone 7 only	Yes, but not M119	Yes	30,000	PD
M449A1 ICM	1320-D562	Yes, but not zone 1	Yes	Yes	No	18,100	MT
M485 illum	1320-D505	Yes, but not zone 1	Yes	Yes, but degraded reliability	No	17,500	MT
M483A1 DPICM	1320-D563	Yes, but not zone 1 or 2	Yes	Yes	No	17,500	MT
M864 BB DPICM	1320-D864	No	Yes	Yes	Yes	TBD	MTSQ M577
M692 ADAM-L	1320-D501	Yes, but not zone 1 or 2	Yes	Yes	No	17,740	MT
M731 ADAM-S	1320-D502	Yes, but not zone 1 or 2	Yes	Yes	No	17,740	MT
M116A1 HC	1320-D506	Yes, but not zone 1	Yes	Yes	No	18,100	MT
M110A1 WP	1320-D550	Yes, but not zone 1	Yes	Yes	No	18,100	PD, MTSQ
M110 H/HD	1320-D543	Yes, but not zone 1	Yes	Yes	No	18,100	PD, MTSQ
M687 binary [1]	1320-D594	Yes, but not zone 1 or 2	Yes	Yes	Probably compatible	TBD	PD, MTSQ
M121 chemical	1320-D568	Yes, but not zone 1	Yes	Yes	No	18,100	PD, VT
M795 HE [1]	1320-D529	Yes, but not zone 1 or 2	Yes	Yes	Yes	22,400	PD, MTSQ (M732 VT only)
M825 smoke	1320-D528	Yes, but not zone 1 or 2	Yes	Yes	Yes	22,600	MT
M718 RAAMS-L	1320-D503	Yes, but not zone 1 or 2	Yes	Yes	No	17,740	MT
M741 RAAMS-S	1320-D509	Yes, but not zone 1 or 2	Yes	Yes	No	17,740	MT
M712 Copperhead	1320-D510	Yes, but no requirement for zones 1 through 3	Yes	Yes	No	16,400	BD (comes already installed)
M804 practice	1320-D513	Yes, but not zone 1	Yes	Yes	No	18,100	PD, MTSQ, VT (M732 only)

[1] Type classified, but not in production.

PROJECTILES	DODAC	PROPELLING CHARGES (SEE 155mm PROPELLING CHARGES)				MAXIMUM RANGE	FUZE ACTIONS
		M113 SERIES	M4 SERIES	M119 SERIES	M203		
M107 HE	1320-D544	Yes, but not zone 1	Yes	Yes	No	18,100	CP, PD MTSQ,VT
M549A1 RAP	1320-D579	No	Yes, but zone 7 only	Yes, but not M119	No	23,500	PD
M449A1 ICM	1320-D562	Yes, but not zone 1	Yes	Yes	No	18,100	MT
M485 illum	1320-D505	Yes, but not zone 1	Yes	Yes, but degraded reliability	No	17,500	MT
M483A1 DPICM	1320-D563	Yes, but not zone 1 or 2	Yes	Yes	No	17,500	MT
M864 BB DPICM	1320-D864	No	Yes	Yes	No	TBD	MTSQ M577
M692 ADAM-L	1320-D501	Yes, but not zone 1 or 2	Yes	Yes	No	17,740	MT
M731 ADAM-S	1320-D502	Yes, but not zone 1 or 2	Yes	Yes	No	17,740	MT
M116A1 HC	1320-D506	Yes, but not zone 1	Yes	Yes	No	18,100	MT
M110A1 WP	1320-D550	Yes, but not zone 1	Yes	Yes	No	18,100	PD, MTSQ
M110 H/HD	1320-D543	Yes, but not zone 1	Yes	Yes	No	18,100	PD, MTSQ
M687 binary [1]	1320-D594	Yes, but not zone 1 or 2	Yes	Yes	No	TBD	PD, MTSQ
M121 chemical	1320-D568	Yes, but not zone 1	Yes	Yes	No	18,100	PD, VT
M795 HE [1]	1320-D529	Yes, but not zone 1 or 2	Yes	Yes	No	TBD	CP, PD, MTSQ, VT, (M732 only)
M825 smoke	1320-D528	Yes, but not zone 1 or 2	Yes	Yes	No	17,500	MT
M718 RAAMS-L	1320-D503	Yes, but not zone 1 or 2	Yes	Yes	No	17,740	MT
M741 RAAMS-S	1320-D509	Yes, but not zone 1 or 2	Yes	Yes	No	17,740	MT
M712 Copperhead	1320-D510	Yes, but no requirement for zones 1 through 3	Yes	Yes	No	16,400	BD (comes already installed)
M804 practice	1320-D513	Yes, but not zone 1	Yes	Yes	No	18,100	PD, MTSQ, VT (M732 only)

[1] Classified, but not in production.

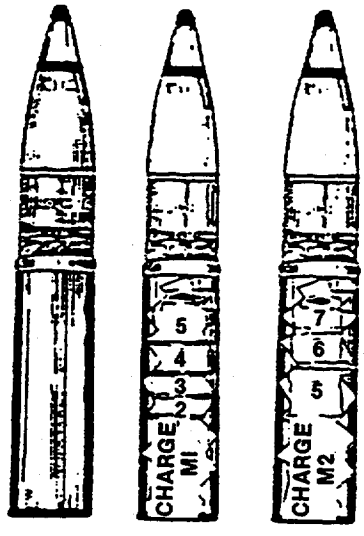
3. Ammunition

a. Types of Ammunition

Semi-Fixed

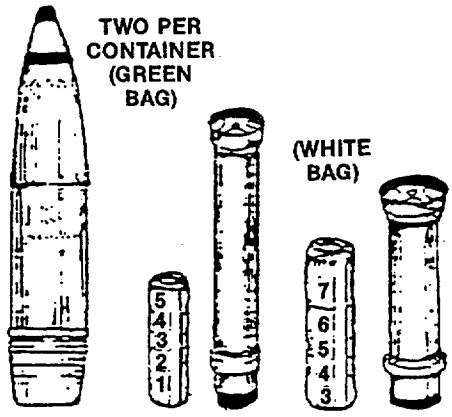
Semi-fixed ammunition has a propellant divided into increments or charges, tied together, and stored in the cartridge case which is loosely fitted to the projectile. After the number of increments is adjusted for a specific fire mission, the cartridge case is rejoined with the projectile, and the complete round is loaded into the weapon. This ammunition is issued fuzed or unfuzed. Semi-fixed ammunition is used for the 105mm howitzer.

Semi-Fixed Ammunition



Separate-Loading

Separate-loading ammunition is issued as four separate components: primer, propellant, projectile, and fuze. The components are unpacked, prepared for firing, and loaded into the weapon separately. Propellants are of three types: green bag, white bag, and red bag.



b. Shell-Fuze Combinations

High Explosive Shell, Point Detonating Fuze (HE, Q) 105mm and 155mm

HE Projectile Nomenclature: 105mm–M1; 155mm–M107
Fuse Q Nomenclature: 105mm and 105mm–M557 and M739

HE Q is a bursting-type projectile filled with TNT or composition B. It produces fragmentation and blast over a wide area on impact. Optimum effectiveness is gained by using the lowest charge without causing excessive dispersion. M557 fuzes are subject to premature detonation by heavy rain or hail. This shell-fuze combination is effective against standing personnel, personnel prone on ground, unarmored vehicles, and light material. It is particularly effective in high angle fire. Effectiveness is reduced on personnel dug in, on uneven ground, and against buildings or earthworks. Some detonation will occur when fired in trees.

High Explosive Shell, Delay Fuze (HE, Delay) 105mm and 155mm

HE delay is a function obtained by rotating a set screw on the point detonating fuze to cause a .05 second delay in detonation after impact. This shell-fuze combination is used for penetration of overhead cover or to obtain airburst by ricochet. Use the highest practicable charge for ricochet effect. HE delay is effective against unarmored vehicles,

earth and log fortifications and some masonry and concrete targets, personnel in light frame structures, lightly covered emplacements, and dense woods. It is not effective against heavy armor or heavy masonry or concrete.

High Explosive Shell, Proximity Fuze (HE, VT) 105mm and 155mm

VT Fuze Nomenclature: 105mm—M513 Series, M728, M732; 155mm—M728, M732

HE VT has a radio-activated fuze which functions when it receives the reflection of a self-transmitted radio signal. The fuze has a nonadjustable height of burst of either 7 meters or 20 meters above the target, depending on the fuze series. A wet or marshy target area will increase the height of burst. The greater the angle of fall, the closer the burst will be to the ground. When the target is close to friendly troops, the lowest practicable charge should be used to obtain a large angle of fall. This shell fuze combination has propellent restrictions. HE VT is useful in situations where an airburst is desired without the need to adjust the height of burst. It is particularly useful when engaging long-range targets, at night, and for high angle fire. Light foliage has little effect on the VT fuze, but heavy foliage will cause detonation.

High Explosive Shell, Mechanical Time Superquick Fuze (HE, MTSQ) 105mm and 155mm

MTSQ Fuze Nomenclature: 105mm and 155mm—M501 Series, M564, M577, M582

HE MT contains a graduated time mechanism set prior to firing to activate at a predetermined time interval. The height of burst is normally set to activate 20 meters above the target, or on impact. However, the height of burst usually requires adjustment. Use the highest practicable charge to minimize the height of burst error. M564 fuzes are subject to premature detonation by heavy rain or hail. HE MT is effective against exposed personnel or personnel in uncovered trenches or fighting positions. It is unreliable in high angle fire because of a large PE/HOB in long times of flight.

High Explosive Shell, Concrete Piercing Fuze (CP) 105mm and 155mm

CP Fuze Nomenclature: 105mm and 155mm—M78 Series

The CP fuze is of special, heavy metal construction for use against concrete targets. These fuzes come in two types: nondelay to clear away

rubble and shatter effects and a delay type (0.025 seconds) for penetration followed by fragmentation and blast to be used in fire for effect. This shell fuze combination should not be used in area neutralization fire.

White Phosphorus (WP) Shell 105mm and 155mm

WP Projectile Nomenclature: 105mm—M60 Series; 155mm—M110 Series

This is a burster, tube-type projectile filled with WP. On detonation, WP is expelled over a limited area. This projectile is most often fuzed with the point detonating fuze (M557 or M739). However, it can be fuzed with a mechanical time (MT) fuze (M564 or M582) to produce an airburst. WP is used for marking, screening, obscuring, and incendiary effects. It is useful against vehicles, POL storage areas, etc.

Smoke Shells 105mm and 155mm

Smoke Projectile Nomenclature: 105mm—M84 Series; 155mm—M116 Series, M825

Shell smoke is an expelling charge-type projectile which contains canisters filled with a pyrotechnic smoke mixture (hexachloroethane-zinc) (HC-M84 or M116). When an MT fuze (M501, M565, or M577) activates, these canisters are expelled from the rear of the projectile, producing smoke for 40 to 90 seconds. The projectile usually requires adjustment. The smoke has more screening effect than WP but has a longer buildup time. The HC smoke projectile is being replaced with the M825 improved smoke round. The M825 provides 5 to 10 minutes smoke and requires no adjustment. The M825 uses felt wedges impregnated with WP to facilitate rapid dissemination. An MT fuze activates a charge causing base ejection and ignition of the WP felt-pad wedges in a large area. Unburned WP can cause a hazard to friendly forces; therefore caution must be exercised when operating in these areas.

Illuminating Shell (illum) 105mm and 155mm

Illuminating Shell Nomenclature: 105mm—M314 Series; 155mm—M485

Shell illum is an expelling charge-type projectile which contains an illuminant canister and parachute assembly. On activation of an MT fuze (M565, M577, M501—105mm), the canister/parachute assembly is expelled from the base of the projectile, and the illuminant suspends from the parachute providing 450,000 (105mm) to 1,000,000 (155mm) candle power of battlefield illumination.

Improved Conventional Munitions 105mm and 155mm

ICM Projectile Nomenclature: 105mm—M444; 155mm—M449
DPICM Projectile Nomenclature: 155mm—M483A1

This is an expelling charge-type projectile that contains submunitions (grenades). Upon activation of an MT fuze (M565, M577—155mm; M548 MOD—105mm) or an electronic time (ET) fuze (M724), these grenades are ejected over the target area. There are two types of ICM: antipersonnel (ICM) and antimaterial (DPICM).

Shell ICM contains 18 grenades (105mm) or 60 grenades (155mm). When the grenade strikes the target, it hurls a steel ball filled with explosive 5 or 6 feet into the air, where it detonates and scatters over the target area. ICM has maximum effectiveness against troops in the open. Some effect can be gained on troops in fighting positions.

Shell DPICM (155mm) contains 88 dual purpose armor defeating and antipersonnel grenades. When the projectile is detonated, a high explosive-shaped charge grenade suspended from a ribbon streamer is expelled. On impact, a shaped-charge jet is expelled downward through the body of the grenade, while the rest of the grenade bursts outward producing fragmentation. The jet is capable of penetrating approximately 2.75 inches of homogenous armor plate. DPICM is effective against vehicles such as armored personnel carriers and trucks. Little effects are produced against hard material targets.

The effects pattern of ICM is generally uniform and in a circular shape. The size of the pattern varies with the caliber, characteristics of the target area, and the height of burst. Six 105mm howitzers can deliver an effects pattern of 105 meters in radius; six 155mm howitzers, 150 meters. The height of burst may require adjustment. Deep snow (over 6 inches) can reduce the effects by more than fifty percent. All ICM grenades are subject to duds. At the optimum HOB, the dud rate is normally less than two percent. On some types of terrain, it may be as high as fifteen percent. It is more effective than HE on area personnel targets because a greater area is covered uniformly with a greater density of fragmentation. Caution should be exercised when firing DPICM in trees, since the ribbon streamers may become hung in the trees, creating obstacles to friendly troops moving in the area.

High Explosive Plastic-Tracer Projectile (HEP-T) 105mm

HEP-T Projectile Nomenclature: 155mm—M327

This projectile is a thin-walled, plasticized projectile containing a high explosive filler (composition A3), a nonadjustable propellant, and a built-in base detonating fuze (M91). HEP-T is used for antitank and antipersonnel in the direct fire mode.

High Explosive, Rocket-Assisted Projectile (RAP) 105mm and 155mm

RAP Nomenclature: 105mm—M548; 155mm—M549 Series

Rocket-assisted projectiles have high fragmentation steel cases filled with composition B or TNT. An integral rocket motor is positioned on the rear which functions along the trajectory, increasing the range of the projectile. Accuracy of the RAP is reduced at longer ranges due to the uneven burn of the rocket motor. However, the RAP will produce more fragmentation over a larger area than the standard HE projectile. The RAP can be fuzed with point detonating fuze (M557, M739), MT fuze (M582 series), or ET fuze (M767). See TMs for limitations on fuze and propelling charge combinations.

Antipersonnel Projectile (Beehive) 105mm

Beehive Projectile Nomenclature: 105mm—M546

This projectile contains a cartridge with 8,000 dart-like flechettes. The MT fuze (M563) can be set to activate at the muzzle or at a preset time for direct fire against personnel. As the projectile functions, these flechettes are propelled toward the target. Do not fire Beehive over the heads of friendly troops.

Chemical Agent Projectiles (Gas) 105mm and 155mm

Chemical Agent Projectile Nomenclature: 105mm—M360 (GB), M60 (CS), 155mm—M110 (HD), M121 (GB or VX)

This bursting, tube-type projectile contains chemical agents which are expelled to cause casualties to enemy personnel and to contaminate habitable areas or to harass personnel (CS). These projectiles may contain the following agents: HD, GB, VX (155mm), and CS (105mm).

See appendix H. These projectiles are fuzed with a point detonating fuze (M557, M739). Additionally, the M121 projectile can be fuzed with a proximity fuze (M728, M732), MTSQ (M564), or ET fuze (M767).

Cannon Launched Guided Projectile (CLGP or Copperhead) 155mm

The Copperhead projectile is an antitank round that has the capability of homing in on its target after being fired. It is employed in indirect fire to destroy or neutralize moving and stationary hard point targets such as armor, mechanized vehicles, and field fortifications. Targets must be illuminated during the latter phase of the terminal portion of the trajectory by either a ground or airborne laser which provides reflective laser energy for terminal homing.

Family of Scatterable Mines (FASCAM) 155mm

RAAMS Projectile Nomenclature: M741 (S), M718 (L)
ADAM Projectile Nomenclature: M731 (S), M692 (L)

FASCAM refers to expelling charge projectiles used to deliver antitank or antipersonnel mines. FASCAM includes **area denial artillery munitions (ADAM)** and **remote antiarmor mine system (RAAMS)**. These projectiles are fuzed with either an MTSQ fuze (M577) or an electronic fuze (M724).

ADAM projectiles are antipersonnel projectiles that contain submunitions used to deny the enemy use of certain areas for a short period. This action is accomplished by firing the ADAM so that 36 submunitions per projectile are ejected over the target area. After each submunition comes to rest on the ground, 7 sensor trip lines will deploy up to 20 feet from each mine. Disturbance of the trip line completes an electronic circuit. A thin layer of liquid propellant, which by gravity rests under the kill mechanism, is initiated, shattering the plastic munition body and projecting the kill mechanism upward. At approximately 2 to 8 feet above the ground, the kill mechanism detonates, projecting approximately 600 steel fragments in all directions. If the mine has not detonated or functioned within the factory set time, it will automatically self-destruct, thereby clearing the area. The self-destruct times are 48 hours (long) or 4 hours (short).

RAAMS projectiles are antitank projectiles that contain submunitions used to deny or delay access to a particular area for a specific period. Each projectile contains nine mines that can be expelled into the target area. The mines are scattered over an area and become armed within seconds after landing. Any metallic object, such as tank, self-propelled vehicle, or other type unit, passing over the mines will cause them to activate and damage or destroy the equipment. These mines also have self-destruct mechanisms. Scattered among the mines are some that have an antidisturbance firing mechanism.

c. Propellants

M3 Series Propelling Charge (Green Bag) 155mm

Green bag propellant is used for firing charges 1 through 5. The propellent increments are loaded in cloth bags which are fastened together by cloth straps. The M3 series contains two types of propellants: M3 and M3A1.

M4 Series Propelling Charge (White Bag) 155mm

White bag propellant is used for firing charges 3 through 7. The propellent increments are loaded in cloth bags fastened together by cloth straps. The M4 series contains two types of propellants: M4A1 and M4A2.

M119 Series Propelling Charge 155mm

The M119 series contains two types of propellants: M119A1 and M119A2. M119A1 is a propelling charge designated as charge 8 and extends the range of the 155mm howitzers using the M795 HE projectile. The propelling charge is a single-increment white bag charge. M119A1 has a donut-shaped flash reducer at the forward end that precludes non-ignition of the rocket motor of the RAP. M119A2 is a charge 7 red bag propellant. The propelling charge is a single increment red bag charge.

M203 Propelling Charge 155mm

The M203 is an 8 super charge designed to supplement the standard M3, M4, and M119 series charges and to provide extended range for the M198. The M203 is a single increment red bag charge. The charge is used to fire the RAP.

d. Interchangeability of Ammunition. NATO forces are to use AOP-6, *Land Forces Ammunition Interchangeability Catalogue in Wartime*, in order to identify ammunition which can be interchanged and fired by each national weapon system in war.

e. Ammunition Field Storage. The four greatest hazards to ammunition in the battery area are weather, enemy fire, improper handling, and careless smokers. Regardless of the method of storage, these hazards must be considered. Some general considerations for storage of ammunition include:

- Stack ammunition by type, lot number, and weight zone.

- If ammunition is being stored on the ground, use at least 6 inches of dunnage under each stack.

- Keep ammunition dry and out of direct sunlight by storing it in a vehicle or covering it with a tarp. Be sure adequate ventilation is provided.

- If offloaded, provide ammunition as much protection from enemy indirect fires as time and available materials allow. If sandbags are used for protection, keep the walls at least 6 inches from the stacks and the roof at least 18 inches from the stacks to ensure proper ventilation.

- Particular attention must be paid to ammunition temperature. At least two artillery sections should be designated to keep track of the powder temperature. A powder thermometer is inserted into the top powder increment in the canister, and care must be taken to ensure the thermometer does not touch metal. FDOs should update propellent temperature at least every hour if not every half hour, especially in the morning when the temperature rises quickly, and after sunset.

- Only enough ammunition to meet current needs should be prepared for firing.

f. Care and Handling of Ammunition

- Never tumble, drag, throw, or drop individual projectiles or boxes of projectiles.

- Do not allow smoking, open flames, or other fire hazards around ammunition storage areas.

- Never make unauthorized alterations or mix components of one lot with another.

- Do not fire ammunition that has been rammed and then extracted.

- Leave the eyebolt lifting plug or closing plug screwed into the fuze well until the round is to be fuzed.

- Store WP ammunition upright on its base at all times, away from combustible materials, and away from other ammunition, if possible.

- Inspect projectiles for leakage, dents, or cuts on the rotating band that go through the round, loose grommets, improper assembly, and cleanliness.

- Fuzes must be protected from shock. When fuzing a round, inspect to ensure threads are clean and serviceable and the fuze is screwed flush with nose of the projectile without a gap.

- Never lift a projectile fuzed with a time fuze with a hand around the fuze. A slip might change the fuze setting.

- M564 and M548 fuzes must not be dropped, rolled, or struck under any circumstances. Caution should be exercised to ensure these fuzes do not strike the breech of a weapon during loading.

- Any MT fuze that is set and not fired must be reset to SAFE, and the safety wires, if applicable, must be replaced before the fuze is repacked in the original carton.

- Never fire a projectile without a fuze or with a fuze that is not authorized for that projectile.

- Keep powder containers closed tight to keep moisture out and keep them dry and cool.

- Propellent bags must be firm, clean, and well laced or tied and the increments inserted in the proper sequence.

- Keep flash reducers dry and in their sealed containers until needed for use. M119A2 charge 7 red bag propellant is manufactured with flash reducers attached and should not be removed.

- Protect primers from shock and moisture.

- Do not fire unused powder increments. Store this powder away from the weapon until they can be burned or otherwise disposed of. The procedures for burning powder are discussed below.

Procedures for Burning Powder

Select a burning site at least 200 meters from grass and loose debris as well as personnel and equipment.

Arrange a row of increments in a single layer not more than 12-inches wide oriented in the direction of the wind.

Lay a train of combustible material about 15 feet long, perpendicular to and at the downwind end of the row of charge increments. Light this train at the end farthest from the increments.

When burning powder in a tactical environment, ensure the burning does not compromise the camouflage and concealment effort.

(reverse blank)

Appendix B

Artillery Estimate of Supportability

CLASSIFICATION

Copy no. ____ of ____ copies
Issuing headquarters
PLACE OF ISSUE
Date/time of issue

ARTILLERY ESTIMATE OF SUPPORTABILITY

Ref: (List applicable references; e.g., maps.)

1. MISSION

(State the mission of the command.)

a. Artillery Concept. (State the artillery concept to support the mission.)

b. Previous Decisions. (State any previous decisions by the maneuver commander, such as employment or nonemployment of chemical munitions.)

2. SITUATION AND CONSIDERATIONS

a. Characteristics of the Area of Operations. (Refer to the Intelligence Estimate.)

b. Enemy Capabilities and Most Probable Course of Action. (Refer to the Intelligence Estimate.)

c. Friendly Forces. (State the friendly artillery forces available for the operation or refer to the planning document or other document setting forth available forces.)

(Page number)

CLASSIFICATION

d. Courses of Action. (The proposed courses of action are stated in full.)

e. Assumptions. (State any assumptions on which the estimate is based, including assumptions regarding anticipated enemy action.)

3. ARTILLERY ANALYSIS

a. Considerations Having Equal Effect. (State all considerations of the analysis that have equal effect on all proposed courses of action.)

b. Courses of Action. (Each course of action is discussed from a strictly artillery point of view. All influencing factors are considered. Considerations include, but are not limited to, the ability of artillery to cover the zone action of the supported unit; positioning and displacement requirements; ability to mass fires; ability to provide CSS; security of artillery; weapons ammunition; troops available; and effects of terrain and weather on observation, ammunition effectiveness, artillery operations, and communications.)

4. EVALUATION

(Each course of action is evaluated in turn. Advantages and disadvantages of each course of action are enumerated.)

5. CONCLUSIONS

a. Best Course. (This is a statement of which course of action can best be supported from an artillery point of view.)

b. Other Courses. (Other courses of action are listed in their order of supportability, and a statement is made of their salient disadvantages.)

(Page number)

c. Significant Problems. (This is a statement of significant problems to be solved and limitations to be taken into account. Measures required to solve the problems should be included.)

/s/ _____

_____

(Page number)

Appendix C

Artillery Fire Plan

CLASSIFICATION

Copy no. __ of __ copies
Issuing headquarters
PLACE OF ISSUE
Date/time group

TAB B (Artillery Fire Plan) to APPENDIX 12 (Fire Support) to ANNEX C (Operations) to Operation Order _____

Ref:

Time Zone:

1. SITUATION

   (Provide appropriate details of the general situation bearing particularly on artillery support.)

2. ORGANIZATION FOR COMBAT

   a. Organic Artillery

   b. Reinforcing Artillery

3. EXECUTION

   (This paragraph provides information needed by the support unit for the employment of artillery. Examples: the planned establishment of artillery support for the operation [e.g., order and timing of landing or debarking of artillery units], position areas, displacement plan [linked to maneuver], firing capabilities, zones of fire, firing restrictions, information on counterfire and fire plan processing, employment of liaison and observers, procedures for calling for fire as required [e.g., assignment of COF net to maneuver units],

(Page number)

CLASSIFICATION

processing of calls for fire from observers other than forward observers [e.g., air observers, UAVs, reconnaissance teams, etc.], methods of attack if different from SOP [e.g., immediate suppression, SEAD]. The information is listed in separate lettered subparagraphs.)

4. ADMINISTRATION AND LOGISTICS

(Make reference to Annex D [Logistics], Annex P [Combat Service Support], and/or administrative/logistic orders. Identify ammunition availability, allocations, and ammunition management measures.)

5. COMMAND AND SIGNAL

(Identify command relationships as required, signal information, and information pertaining to headquarters echelons and command posts [e.g., location of artillery headquarters afloat and initial positions ashore].)

a. Command Relationships. (As required.)

b. Signal

c. Command Posts/Headquarters Echelons

ACKNOWLEDGE RECEIPT

BY COMMAND OF . . .

SIGNATURE

ENCLOSURES:
1—Artillery Targets
2—Initial Position Area/Fire Capabilities
3—Artillery Target Overlay
4—Artillery Fire Support Tables
5—Observation Plan
6—Survey/Met Plan

(Page number)

ENCLOSURE 1 (Artillery Targets) to TAB B (Artillery Fire Plan) to APPENDIX 12 (Fire Support) to ANNEX C (Operations) to Operation Order _____

* A target list worksheet may be used.

ENCLOSURE 2 (Initial Position Area/Fire Capabilities) to TAB B (Artillery Fire Plan) to APPENDIX 12 (Fire Support) to ANNEX C (Operations) to Operation Order _____

Ref: Map:

(The overlay depicts initial position areas assigned to artillery units and their fire capabilities [an arc fan drawn to the limit of their firing range]. Unit boundaries are also depicted on this overlay.)

ENCLOSURE 3 (Artillery Target Overlay) to TAB B (Artillery Fire Plan) to APPENDIX 12 (Fire Support) to ANNEX C (Operations) to Operation Order _____

Ref: Map:

(The overlay contains artillery target, fire support coordination measures, and unit boundaries.)

356-548 O - 93 - 9

ENCLOSURE 4 (Artillery Fire Support Tables) to TAB B (Artillery Fire Plan) to APPENDIX 12 (Fire Support) to ANNEX C (Operations) to Operation Order _____

(This enclosure contains the schedules of fire for artillery units for the operation. Scheduling worksheets may be used. Successive tables are numbered as follows: 4-1, 4-2, etc.)

ENCLOSURE 5 (Plan of Observation) to TAB B (Artillery Fire Plan) to APPENDIX 12 (Fire Support) to ANNEX C (Operations) to Operation Order _____

(This enclosure contains information concerning observation. The plan is prepared as a supplement to the collection plan of the supported unit and higher headquarters. The plan outlines mission statements for the collection of specific information, reporting requirements [e.g., as acquired, on a time schedule], positioning, and sectors of coverage of the various assets employed by the artillery [e.g., FOs, artillery OPs, radars, air observers, and UAVs employed under artillery control]. The plan may associate a specific firing unit to a means of observation. Instructions for the exchange of information, requirements for visibility diagrams, and cueing of weapons-locating radars are examples of information applicable to this enclosure.)

ENCLOSURE 6 (Survey/Met Plan) to TAB B (Artillery Fire Plan) to APPENDIX 12 (Fire Support) to ANNEX C (Operations) to Operation Order _____

(This enclosure provides information concerning survey and meteorology operations. Requirements and methods of dissemination are addressed. Support requirements to other units/agencies [e.g., radar beacon teams] are identified.)

Appendix D

Multiple Launch Rocket System

1. General

The MLRS is highly mobile, rapid-fire, free-flight rocket delivery means designed to complement cannon artillery in all fire support roles. MLRS provides potential for interdiction fires against HPTs. MLRS has an onboard, self-location, directional control, ballistic computation, and digitial communications system in one piece of equipment. The system consists of the launcher; launcher pod/containers; ammunition resupply vehicles and trailers; and a command, control, and communications system. Each launcher has the onboard capability to receive a fire mission, determine its location, compute firing data, orient on the target, and fire up to 12 rockets. All 12 rockets can be fired in less than 60 seconds and can be aimed at single or multiple aimpoints. Rockets can be fired individually, or a designated number can be fired at specified intervals. Rockets can be delivered 15 to 30 kilometers. The MLRS can interface directly with the weapons-locating radar. Ammunition resupply is by the M985 heavy expanded mobility tactical truck (HEMTT) and the M989A1 heavy expanded mobility ammunition trailer (HEMAT). Each HEMTT and HEMAT can carry 48 rockets.

2. Purpose

The Marine Corps does not currently have MLRS. However, U.S. Army MLRS units may be placed under Marine Corps control for operations. The purpose of this appendix is to provide information about MLRS employment by the MAGTF. For detailed discussion of MLRS, see TC 6-60, *Multiple Launch Rocket System (MLRS) Operations.*

3. Organization

The U.S. Army MLRS battalion has a headquarters, headquarters and service battery, and three firing batteries with nine launchers each.

The battalion can conduct operations as a single unit or can detach batteries to perform separate tactical missions or in separate operations. The MLRS firing battery consists of a headquarters platoon, an ammunition platoon, and three firing platoons.

4. Munitions

The central component of the MLRS is the self-propelled launcher loader. Each rocket can be loaded with dual purpose (antipersonnel/antimateriel) bomblets. The bomblets of one rocket cover an area roughly equivalent to three football fields. The launcher can be reloaded in 10 minutes. The fire comparison between the 155mm howitzer and MLRS follows:

Firepower Comparison

	MLRS	155mm Howitzer
Range	30 km	17.5 km
Submunition	644 per rocket	88 per round
Equivalent	1 rocket	7.32 rounds
Equivalent	1 launcher load (12 rockets)	3.6 battalion volleys * (88 rounds)
Equivalent	1 battery (9 launchers, 108 rockets)	33 battalion volleys * (792 rounds)

* 24-howitzer battalion

5. Employment in USMC Operations

a. Organization for Combat. MLRS units, like artillery units, are organized for combat by the designation of a command relationship and by the assignment of a tactical mission. Tactical missions may be assigned to an MLRS battery operating independently. When operating under USMC control, the MLRS unit should be placed within the artillery regiment. The regiment exercises control of the MLRS unit

by the assignment of the GS mission. An MLRS unit can perform only nonstandard versions of GS-R and reinforcing missions, because it lacks the personnel and equipment to establish liaison with the unit.

b. Employment. The employment of the MLRS unit will be similar to the employment of a Marine artillery battalion with a GS mission. Position area selection, fire planning, and fire mission assignments are made by the higher artillery headquarters. MLRS operations are characterized by rapid emplacement, engagement, and displacement of widely dispersed launchers. Considerations for employing MLRS include:

- MLRS batteries are typically employed in three platoons: one **hot** platoon that can fire in less than 2 minutes, one **cool** platoon that can fire in 8 to 10 minutes, and one **cold** platoon that may need 30 minutes to fire. Therefore, MLRS units may need at least 30 minutes to execute a fire plan of any type. In scheduling MLRS fires, each launcher is given a separate line on the scheduling worksheet.

- Because of the large footprint and destructive power of MLRS, MLRS fires are normally directed 2 kilometers beyond the FLOT.

- A general guideline for positioning MLRS behind the FLOT is firing platoons—5 to 15 kilometers; battery headquarters—10 to 25 kilometers; battalion headquarters—20 to 40 kilometers. MLRS is positioned initially forward in the MBA. MLRS is not normally positioned in the security area in the defense because of increased security risks, communications problems, availability of survey control, availability of suitable firing positions, and limited logistical support.

c. Communications. The MLRS unit will be on the following communications nets (communications equipment and personnel augmentation may be required):

- Regimental Command Net (HF).
- Regimental Tactical Net (VHF).
- Regimental Fire Direction Net (VHF).
- Radar Telling Net (VHF), as required.
- Regimental Survey/Met Net (VHF), as required.
- Regimental Communication Coordination Net (HF/VHF).

d. CSS. Because MLRS has unique equipment and ammunition, close coordination with the MLRS unit will be required to ensure adequate CSS. The MLRS can be transported by C141 and C5 aircraft.

(reverse blank)

Appendix E

Nuclear, Biological, and Chemical Operations

1. General

Artillery units must be capable of conducting NBC defense **and**, when required and authorized, capable of delivering nonconventional munitions.

2. NBC Defense

The artillery regiment has trained NBC defense teams (MOS 5702/5711). The regimental headquarters battery will establish an NBC control center team. Each battalion has a trained NBC control center team, NBC surveillance/monitor team, and a decontamination team. The mission of these teams is to reduce casualties, damage, and interruption of operations where chemical or biological agents or nuclear weapons are encountered.

a. NBC Officers. The regiment has one NBC officer with MOS 5702. An officer in a battalion is assigned and trained for additional duty as an NBC officer. This officer should attend a formal NBC defense school. NBC officers provide technical assistance to their respective commanders and to subordinate commanders, as appropriate. NBC officers prepare and submit NBC reports to higher, adjacent, and subordinate headquarters, as required. They make fallout and chemical hazard predictions and make recommendations on the appropriate MOPP level. They maintain the unit's accumulated radiation dose and make appropriate recommendations concerning these levels. The NBC officers supervise NBC reconnaissance and advise the commander on the best route to cross or bypass an NBC contaminated area. They supervise the operation of the NBC control center and decontamination site at their level.

b. NBC Control Center Teams. NBC control center teams collect, evaluate, collate, and disseminate information concerning friendly and enemy NBC operations to the commander, his staff, higher headquarters, and supporting units. The regiment and battalions have NBC specialists (MOS 5711) to assist NBC officers.

(1) Regimental NBC Control Center Team. The regimental NBC control center is the collection and dissemination control point for NBC matters for the artillery. The team conducts parallel computing/plotting with the division NBC control center. The center receives, consolidates, and validates NBC reports and downwind messages, tracks NBC intelligence, maintains an NBC situation map and appropriate NBC records, maintains accumulated radiation doses, and disseminates reports to higher, adjacent, and subordinate units, as required. The center coordinates surveillance/monitor activities within the regiment.

(2) Battalion NBC Control Center Teams. Battalion NBC control center teams function similarly to the regimental NBC control center team using simplified control center procedures.

c. NBC Surveillance/Monitor Teams. NBC surveillance/monitor teams are two-man teams that travel routes coordinated by the NBC control center. They measure types and levels of contamination along their assigned routes. The regimental and battalion control centers each employ two such teams. These teams use chemical/biological agent detection kits and any other means available to detect and identify these agents. They determine radiation levels of specific objects, locations, or regions of interest to the unit. The teams initiate continuous minitoring for radiological fallout on receipt of an appropriate NBC report (NBC-3) or when nuclear weapons have been used. The teams submit field reports (NBC-4), keep accurate records, and mark contaminated areas with standard contamination markers.

d. Preparation for an NBC Attack. When warned of an NBC threat, the unit takes precautionary measures to reduce vulnerability. Maximum use is made of terrain features for cover, concealment, and shielding. Backup and alternate command, control, and communications procedures are identified. Unit SOPs should address procedures for an NBC defense. When a strike warning message is received, vehicles are placed behind masking terrain; electrical devices are turned off and antennae disassembled and tied down; and all loose items (particularly

flammables) are placed in a sheltered position. MOPP status is increased consistent with the mission, temperature, work rate, and commander's guidance. Chemical detector paper is affixed to visible, horizontal surfaces of protective clothing and on equipment, munitions, etc. Unit decontamination equipment is checked to ensure it is ready for action and to ensure that there is an available water source with a supporting road network. Potential decontamination sites are located and reported to the higher artillery headquarters. Alarms are set up and monitored.

e. Decontamination

(1) Decontamination Sites. Decontamination may be conducted by the regiment and battalions/batteries. Normally, deliberate (complete) decontamination is performed at the regimental decontamination site using combined decontamination teams/equipment from the battalions. Battalion/battery decontamination usually consists of hasty (partial) decontamination only.

(2) Decontamination Teams. Decontamination teams perform the necessary unit decontamination of supplies, equipment, personnel, and small areas as practicable after a chemical, biological, or nuclear attack. The composition of these teams is situational dependent, but a general guide is deliberate personnel decontamination—15 team members per battery; deliberate equipment decontamination—25 team members per battery.

f. NBC Communications. NBC warnings are passed over artillery tactical nets; other NBC traffic is passed over artillery command nets.

g. MOPP Level. The MOPP level will be set by the commanding officer at the higher level. Subordinate commanders may raise the MOPP level depending on the situation but may not lower the level established by higher headquarters without permission. There are five MOPP levels:

LEVEL	OVERGARMENT	OVERBOOTS	MASK	GLOVES
0	Carried	Carried	Carried	Carried
1	**Worn**	Carried	Carried	Carried
2	**Worn**	**Worn**	Carried	Carried
3	**Worn**	**Worn**	**Worn**	Carried
4	**Worn**	**Worn**	**Worn**	**Worn**

h. Nuclear Survivability. Commanders should consider and practice defensive reactions to specific warnings of pending enemy nuclear attack. SOPs should establish procedures for reconstitution of command and control.

3. Chemical Delivery

Toxic chemical weapons can be delivered by artillery weapons only when authorized by appropriate higher authority. Before initial release, artillery chemical munitions are maintained in the rear under ordnance personnel control at a chemical ammunition supply point (CASP). After release, firing units will receive the chemical projectiles, a release message, and a fire mission directing that chemical ammunition be fired. The release message should specify the number of weapons released, the time frame for use, the area for use, and any constraints.

a. Organization for Combat and Positioning. Although centralized control is desirable, distances and deployments may dictate decentralization. DS battalions may be attached to major combat elements. Their position areas will be determined by the deployment and mission of the supported force. Remaining artillery will be employed by the higher artillery commander to ensure maximum participation in the chemical battle consistent with the capabilities of the weapons. Units may be positioned in smaller concentrations; e.g., platoon positions, multiple headquarters echelons, etc.

In general, chemical delivery units will be employed throughout the depth of the zone. Shorter range artillery will require firing positions relatively near the FEBA. In addition, these units will require assembly areas and firing positions deeper in zone. These units should be positioned where they do not provide a lucrative target to the enemy. Units will be positioned laterally and in depth to promote the most effective continuous support.

Units not used to deliver chemical fires should be disposed in depth—

- To support maneuver elements in action against enemy penetration or infiltration.
- As a passive measure against nuclear/chemical attack.
- To provide for artillery unit replacement.
- To support maneuver elements in subsequent phases of the operation.

When the use of nuclear or chemical weapons is imminent, artillery must be capable of redeploying as soon as practicable because maneuver will be limited during the initial nuclear or chemical exchange. Therefore, the artillery must consider artillery dispositions during conventional war so that it can accomplish its mission with minimum displacement if called on to render chemical support.

b. Considerations for Employment

(1) Tactical Use. These weapons are effective against personnel protected from blast and fragmentation effects of other weapons. Toxic chemical agents may be used alone or with other fires. Nonpersistent agents should be delivered as surprise fire to achieve maximum results (i.e., delivered as a TOT mission); persistent agents can be placed on the target over a period of time. In the defense, toxic chemical agents may be employed to produce casualties, blow down or canalize the enemy attack along avenues of approach favorable to the defender, and force the enemy into dispositions that facilitate friendly counterattack.

(2) Chemical Contamination. The commander and his staff must be concerned with chemical contamination. The area of the residual contamination is relatively small. The contamination is usually limited to the target area. The hazards may vary from nuisance effects to varying degrees of casualty-producing effects. Troop safety will depend on the protective posture assumed by the friendly forces. When militarily-significant toxic chemical weapon effects are predicted to extend beyond a unit's zone of action, coordination with the adjacent commander is required.

c. Handling Chemical Munitions. Handling of chemical projectiles requires no special handling once they have been released from the CASP. Prior to acceptance of these munitions, an external inspection will be made of all rounds. The inspector will wear a field protective mask, protective gloves, and if available, a chemical protective apron. The inspection is to confirm that there are no outward signs of leakage or damage. Since they are a different class of explosives, chemical munitions should be segregated from other types of ammunition. Security and protective measures should match those given to conventional ammunition. They should be stored a minimum of 50 meters downwind of the last howitzer position. They should be reinspected periodically, especially after moves.

If a leak is discovered, personnel in the local area should mask for protection from the vapor hazard. Masks alone are sufficient for those personnel not actually in contact with the projectiles and contaminated equipment, because the agent will evaporate. Personnel handling the projectile will be in MOPP-4. Keeping the leaking point high, the projectile is placed into two layers of plastic. The battery commander should decide, on the basis of the tactical situation, whether to call explosive ordnance disposal for evacuation, or to abandon the round(s) in place. If the latter is chosen, bury the projectile at least 4 feet deep, mark the site with a contamination marker, and report the location and details to the higher artillery headquarters. Emergency destruction is not authorized. After the projectile has been disposed, personnel and equipment exposed to the liquid agent should be decontaminated.

d. Emergency Action Procedures. Nuclear and chemical weapons are under national control. A system is required to relay control orders from the National Command Authorities (NCA) through intermediate headquarters to the chemical delivery units. The NCA are the President and the Secretary of Defense or their duly deputized alternatives or successors. Reliable and trained personnel must be available to receive and act on emergency action procedure messages within the artillery organization. Effective measures are taken to ensure that chemical weapons are not subject to an unauthorized or inadvertent act that could degrade their performance. Specially trained personnel at the artillery regiment provide technical expertise on chemical employment to the regimental commander and to personnel at subordinate levels.

Appendix F

Reports

AMMUNITION REPORT

Line

105mm	**ON HAND**
CA HE	_____
CB HE RAP	_____
CC HEP-T	_____
CD ILLUM	_____
CE HC SMK	_____
CF WP	_____
CG ICM	_____
CH APERS-T	_____
CI (AS REQUIRED)	_____

155mm	**ON HAND**
DA GREEN BAG	_____
DB WHITE BAG	_____
DC 7 RED (M119 SERIES)	_____
DD 8 RED	_____
DE (AS REQUIRED)	_____
DF HE	_____
DG HE RAP	_____
DH COPPERHEAD	_____
DI HC SMK (M116 SERIES)	_____
DJ WP (M110 SERIES)	_____
DK WP (M825)	_____
DL DPICM	_____
DM APICM	_____
DN ADAM-S	_____
DO ADAM-L	_____
DP RAAM-S	_____
DQ RAAM-L	_____
DR ILLUM	_____
DS (AS REQUIRED)	_____

Fuzes	**ON HAND**
BA PD	_____
BB MT (BASE EJECTION)	_____
BC MTSQ	_____
BD VT	_____
BE CP	_____

356-548) - 93 - 10

DISPLACEMENT REPORT

TYPE REPORT: DISREP

A. UNIT CALL SIGN

B. DTG OF DISPLACEMENT

C. DESTINATION *

D. NUMBER OF WEAPONS

FIRE CAPABILITY REPORT

TYPE REPORT: FIRECAP

A. UNIT CALL SIGN

B. LOCATION *

C. AZIMUTH OF FIRE

D. NUMBER OF WEAPONS

E. DTG POSITION ESTABLISHED

F. REMARKS

COMMAND POST REPORT

TYPE REPORT: CPREP

A. UNIT CALL SIGN

B. LOCATION *

C. DTG CP ESTABLISHED

---

* Encrypt if not sent on a covered net.

SPOT REPORT

A. UNIT ENGAGED

B. DTG OF ACTIVITY

C. LOCATION OF ACTIVITY

D. DESCRIPTION OF ACTIVITY

E. RESULTS OF ACTION TAKEN

G. FRIENDLY MIA

H. FRIENDLY WIA

I. ENEMY KIA

J. EPWs

K. DETAINEES

L. CAPTURED WEAPONS (NUMBER, TYPE, LOCATION WHERE CAPTURED

M. REMARKS

ARTILLERY COUNTERFIRE INFORMATION (ACIF)

ARTILLERY COUNTERFIRE INFORMATION
(FM 6-121)

RECEIVED BY	FROM	TIME	NUMBER

SECTION I - BOMBREP, SHELREP OR MORTREP (Cross out items not applicable.)

UNIT OF ORIGIN (Current call sign address group or code name)	POSITION OF OBSERVER (Encode if No or Important OP or Sec F gives info on location)	DIRECTION (Grid bearing of FLASH, SOUND or GROOVE of SHELL (state which) in mils unless otherwise stated) (Omit for aircraft)	TIME FROM	TIME TO	AREA BOMBED SHELLED OR MORTARED (Grid ref—in Clear) or (grid bearing to impact in mils and distance from observer in meters—ENCODED) (Dimensions of the area in meters) by (the radius) or (length and width)	NO. AND NATURE OF GUNS (Mortars, rocket launchers, aircraft or other methods of delivery)	NATURE OF FIRE (Adjustment, fire for effect, harassing ETC.) May be omitted for aircraft.)	NO., TYPE, AND CAL. (State whether measured or assumed) of SHELLS ROCKETS (or MISSILES) BOMBS ETC.)	TIME TO FLASH TO BANG (Omit for aircraft)	DAMAGE (Encode if required)
	B	C	D	E	F	G	H	I	J	K

SECTION II -LOCATION REPORT | **SECTION III - COUNTERFIRE ACTION**

REMARKS	SERIAL NUMBER (Each location which is produced by a locating unit is given a serial number)	TARGET NUMBER (If the weapon/activity has previously been given a target number it will be entered here)	POSITION OF TARGET (The grid reference or grid bearing and distance of the located weapon/activity)	ACCURACY (The accuracy to which the weapon/ was located. CEP in meters and the means of location if possible)	TIME OF LOCATION (The actual time the location was made)	TARGET DESCRIPTION (Dimensions if possible): 1. radius of target in meters 2. target length and width in meters.	TIME FIRED (Against hostile target)	FIRED BY	NUMBER OF ROUNDS - TYPE OF FUZE AND PROJECTILES
L	M	N	P	Q	R	S	T	U	V

DA FORM 2185-R, 1 May 78 (Conforms with STANAG NO. 2008) Edition of 1 Nov 67, is obsolete.

RADAR REPORT

(1) SECTION:		(2) LOCATION:		
(3) SEARCH ZONES	LEFT	RIGHT	MIN	MAX
(a) PRIMARY	(1)	(2)	(3)	(4)
(b) ALTERNATE	(1)	(2)	(3)	(4)
(4) EMISSION LIMITS	(a) TIME	(b) #TGTS		
(5) CUEING AGENCY (By call sign, in order of priority)	(a)	(b)	(c)	
	(d)	(e)	(f)	
(6) REPORTING CHANNELS	(a)	(b)		
(7) STATUS	(a) UP:	(b) DOWN:	(c) MOVING:	
(8) ZONES/GRID POINTS				

	(1)	(2)	(3)	(4)	(5)	(6)
(a)	/	/	/	/	/	/
(b)	/	/	/	/	/	/
(c)	/	/	/	/	/	/
(d)	/	/	/	/	/	/
(e)	/	/	/	/	/	/
(f)	/	/	/	/	/	/
(g)	/	/	/	/	/	/
(h)	/	/	/	/	/	/
(i)	/	/	/	/	/	/

INSTRUCTIONS:

(1) Radar section number.

(2) UTM grid coordinates.

(3) Left and right edges of the azimuth of search; Minimum range of (a) primary and (b) alternate search zones.

(4) (a) Maximum time (sec) that radar may radiate at any one time;
(b) Number of targets radar will detect before stopping radiation even if the time limit has not expired.

(5) Call sign; listed in order of priority.

(6) Call sign: in order of priority.

(7) Status of radar at time of report (usually sent by radar team).

(8) Abbreviation of type of zone and UTM grid coordinates (6-digit) that define the zone.

FIRING REPORT

REPORTING UNIT CALL SIGN

A. TARGET NUMBER

B. FIRING UNIT

C. TARGET LOCATION

D. TARGET DESCRIPTION

E. SOURCE OF TARGET INFORMATION

F. TIME FIRED

G. TYPE AND AMOUNT OF AMMUNITION FIRED

H. SURVEILLANCE

NBC-1-CHEMICAL

(Flash Precedence) (No Encryption Required)

(Required Lines: B, D, H, ZB and either C or F)

A. NBC-1-CHEMICAL

B. POSITION OF OBSERVER

C. DIRECTION OF ATTACK

E. DTG OF END OF ATTACK

F. LOCATION OF AREA ATTACKED

G. TYPE OF ATTACK (bomb, arty, spray, etc.)

H. TYPE OF AGENT/TYPE OF BURST (airburst, ground burst)

I. NUMBER OF ROUNDS OR AIRCRAFT

S. DTG WHEN CONTAMINATION DETECTED

Y. DOWNWIND DIRECTION AND SPEED

ZA. CODED SIGNIFICANT WEATHER

ZB. REMARKS, MOPP LEVEL, AND TIME ENTERED

NBC-2-CHEMICAL

(Immediate Precedence)
(No Encryption Required)

(All Lines Required)

A. STRIKE SERIAL NUMBER (assigned by higher HQ)

D. DTG OF ATTACK *

F. LOCATION OF TARGET *

G. DTG OF START OF ATTACK

H. TYPE OF AGENT/BURST *

Y. DOWNWIND DIRECTION/WINDSPEED *

ZA. CODED SIGNIFICANT WEATHER *

* From NBC-1

NBC-3-CHEMICAL

(Immediate Precedence)

(All Lines Required)

A. STRIKE SERIAL NUMBER (from NBC-2)

D. DTG OF ATTACK (from NBC-2)

F. LOCATION OF TARGET (from NBC-2)

H. TYPE AGENT/BURST (from NBC-2)

PA. COORDINATES OUTLINING AREA OF ATTACK AND DOWNWIND HAZARD AREA (or "010" for radius of hazard if windspeed is less than 10km/h)

PB. EXPECTED DURATION OF PERSISTENT AGENT IN AREA

Y. DOWNWIND DIRECTION/WINDSPEED (from NBC-2)

ZA. CODED SIGNIFICANT WEATHER (from NBC-2)

(reverse blank)

Appendix G

Example of Artillery Execution Matrix

UNIT	DECISION POINTS				
	1	2	3	4	5
A	GRID 035221; FIRE SERIES FORD	GRID 038279 WHEN "C" IN PLACE			
B	GRID 041222; FIRE SERIES FORD	GRID 042280 ON ORDER			
C	GRID 033215; DISPLACE 042288 AT PL BLUE	———			

(reverse blank)

Appendix H

Glossary

Section I. Abbreviations and Acronyms

AC ..... aiming circle
ACE ..... aviation combat element
ACIF ..... artillery counterfire information form
ADA ..... air defense artillery
ADAM-L ..... area denial artillery munitions-long duration fuze
ADAM-S ..... area denial artillery munitions-short duration fuze
AFSC ..... assistant fire support coordinator
alt ..... alternate
AMC ..... at my command
AMREP ..... ammunition report
AOP ..... allied ordnance publication
APERS-T ..... antipersonnel-tracer
APICM ..... antipersonnel improved conventional munition
arty ..... artillery
AXO ..... assistant executive officer
AZ ..... azimuth

BB ..... base bleed
BC ..... battery center
BCS ..... battery computer system
BD ..... base detonating (fuze action)
BE ..... base ejection
BLT ..... battalion landing team
Bn ..... battalion
BOC ..... battery operations center
BOMBREP ..... bomb report
btry ..... battery
BUCS ..... backup computer system

C^3 ..... command, control, and communications
cal ..... caliber
CAS ..... close air support
CASP ..... chemical ammunition supply point
CATF ..... commander, amphibious task force

CBR ..... counterbattery radar
CEOI ..... communications-electronics operations instruction
CFL ..... coordinated fire line
CIA ..... Central Intelligence Agency
CIFS ..... close-in fire support
CLF ..... commander, landing force
CLGP ..... cannon launched guided projectile
COC ..... combat operations center
COF ..... conduct of fire
comd ..... command
comm ..... communications
coord ..... coordination
CP ..... command post; concrete piercing (fuze action)
CPREP ..... command post report
cr ..... crater
CRG ..... counterfire reference grid
CS ..... o-chlorobenzyl-malononitrile
CSS ..... combat service support
CSSE ..... combat service support element

DAP ..... distant aiming point
DCT ..... digital communications terminal
def ..... defense(ive)
DIA ..... Defense Intelligence Agency
DISREP ..... displacement report
DMD ..... digital message device
DODAC ..... Department of Defense Activity Code
DODIC ..... Department of Defense Identification Code
DPICM ..... dual purpose improved conventional munition
DS ..... direct support
DTG ..... date/time group

engr ..... engineer
EOL ..... end of orienting line
EPW ..... enemy prisoner of war
ET ..... electronic time (fuze action)
EW ..... electronic warfare

FASCAM ..... family of scatterable mines
FD ..... fire direction
FDC ..... fire direction center
FDO ..... fire direction officer
FEBA ..... forward edge of the battle area
FIRECAP ..... fire capability report
FIREP ..... firing report
FLASHREP ..... flash report

FLOT ..... forward line of own troops
FMF ..... Fleet Marine Force
FO ..... forward observer
FPF ..... final protective fire
FPL ..... final protective line
FSC ..... fire support coordinator
FSCC ..... fire support coordination center
FSCL ..... fire support coordination line
FSL ..... field storage location
FSSG ..... force service support group

GB ..... sarine
GCE ..... ground combat element
GMET ..... graphical munitions effects table
GPS ..... global positioning system
GS ..... general support
GS-R ..... general support-reinforcing

H ..... mustard
HB/MPI ..... high-burst/mean point of impact
HC ..... hexachloroethanezinc
HD ..... distilled mustard
HE ..... high explosive
HE/Q ..... high explosive/quick
HEAT ..... high explosive antitank
HEMAT ..... heavy expanded mobility ammunition trailer
HEMTT ..... heavy expanded mobility tactical truck
HEP-T ..... high explosive plastic-tracer
HERA ..... high explosive, rocket assisted
HF ..... high frequency
how ..... howitzer
HPT ..... high pay-off target
HQ ..... headquarters
HVT ..... high value target

ICM ..... improved conventional munition
illum ..... illuminating
IPB ..... intelligence preparation of the battlefield

JMEM ..... joint munitions effectiveness manual

KIA ..... killed in action
km/h ..... kilometer per hour

LAAW ..... light antiarmor weapon
LAI ..... light armored infantry

LD ..... line of departure (operations ashore)
LF ..... landing force
LNO ..... liaison officer
LOC ..... lines of communications
LP ..... listening post

m ..... meter
MAGTF ..... Marine Air-Ground Task Force
MAMT ..... muzzle action mechanical time (fuze action)
Mar ..... Marine
MBA ..... main battle area
MCT ..... maintenance contact team
MDS ..... meteorological data system
MEF ..... Marine expeditionary force
met ..... meteorology
METT-T ..... mission, enemy, terrain and weather, troops and support available-time available
MEU ..... Marine expeditionary unit
MIA ..... missing in action
MLRS ..... multiple launch rocket system
mm ..... millimeter
MOD-FIST ..... modified-fire support team
MOPP ..... mission-oriented protective posture
MORTREP ..... mortar report
MOS ..... military occupational specialty
MRL ..... multiple rocket launcher
MSR ..... main supply route
MST ..... maintenance support team
MT ..... mechanical time (fuse action)
MTO ..... message-to-observer
MTSQ ..... mechanical time super quick (fuze action)
MULE ..... modular universal laser equipment
MV ..... muzzle velocity

NA ..... not applicable
NBC ..... nuclear, biological, and chemical
NCA ..... National Command Authorities
NGF ..... naval gunfire
NSFS ..... naval surface fire support

OIR ..... other intelligence requirements
OL ..... orienting line
O/O ..... on-order
OOB ..... order of battle

OP ..... observation post
OS ..... orienting station

PADS ..... position and azimuth determining system
PCFF ..... priority in calls for fire
PD ..... point detonating (fuze action)
PDF ..... principal direction of fire
PE/D ..... probable error in deflection
PE/HOB ..... probable error in height of burst
PE/R ..... probable error in range
PLRS ..... position location reporting system
POL ..... petroleum, oils, and lubricants
pos ..... position
pt ..... point

Q ..... quick (fuze action)
QE ..... quadrant elevation

RAAMS-L ..... remote antiarmor mine system-long duration
RAAMS-S ..... remote antiarmor mine system-short duration
RAP ..... rocket assisted projectile
REC ..... radioelectronic combat
regt ..... regiment
Rein ..... reinforced
Res ..... reserve
RLT ..... regimental landing team
RP ..... release point RP ; rally point RP

RR ..... radar ranging
RRP ..... repair and replenishment point
RSOP ..... reconnaissance, selection, and occupation of position
RSTA ..... reconnaissance, surveillance, and target acquisition

SCP ..... survey control point
SEAD ..... suppression of enemy air defense
sec ..... second
SHELREP ..... shelling report
SMK ..... smoke
SOP ..... standing operating procedure
SP ..... start point SP ; sentinel post SP

SPOTREP ..... spot report
SQ ..... super quick (fuze action)

SQ/D ..... super quick/delay (fuze action)
SRIG ..... surveillance, reconnaissance, intelligence group

T ..... towed
tact ..... tactical
TAOR ..... tactical area of responsibility
TAREP ..... target report
TDA ..... target damage assessment
tgt ..... target
TIO ..... target information officer
TIS ..... target information section
TM ..... technical manual
TNT ..... trinitrotoluene
T/O ..... table of organization
TOT ..... time on target
TPC ..... target processing center
TSS ..... target selection standards
TVA ..... target value analysis

UAV ..... unmanned aerial vehicle
UHF ..... ultra high frequency
unk ..... unknown
UTM ..... universal transverse mercator

VE ..... velocity error
VHF ..... very high frequency
VT ..... variable time (fuze action)
VX ..... (nerve agent)

WEO ..... weapons employment officer
WIA ..... wounded in action
WP ..... white phosphorus

XO ..... executive officer

Section II. Definitions

A

administrative control – (DOD, NATO) Direction or exercise of authority over subordinate or other organizations in respect to administrative matters such as personnel management, supply, services, and other matters not included in the operational missions of the subordinate or other organizations. (Joint Pub 1-02)

advance party – A group of unit representatives dispatched to a planned new position in advance of the main body to prepare the position for the arrival of the unit and its equipment.

aiming circle – An optical instrument used to orient the tube of an indirect-fire weapon in a desired direction. The instrument can measure both horizontal and vertical angles.

aiming post – A striped rod used in pairs as a close-in aiming point.

alternate position – **1.** A position to which the artillery battery moves when the primary position becomes untenable or unsuitable for carrying out the assigned task. **2.** The position given to a weapon, unit, or individual to be occupied when the primary position becomes untenable or unsuitable for carrying out its task. The alternate position is so located that the weapon can fulfill its original task. (FMFRP 0-14)

ammunition report – A report used to maintain an accurate ammunition status of firing units.

area fire – A volume of fire delivered in a prescribed area, generally for neutralization effects.

area target – (DOD, NATO) A target consisting of an area rather than a single point. (Joint Pub 1-02)

artillery fire plan – A part of the operation plan of the supported unit or force which contains the necessary information and instructions pertaining to the employment of artillery. The fire plan consists of three parts: the basic document, the target list, and schedules of fires.

artillery groupment — Temporary formations used when one unit must exercise greater control over another unit than is inherent in a reinforcing mission. When a suitable artillery headquarters is unavailable, an artillery battalion or battery may be attached to another of like size to form an artillery groupment.

assault fire — (DOD) **2.** In artillery, extremely accurate, short-range destruction fire at point targets. (Joint Pub 1-02) (Part 2 of a 2-part definition.) Indirect fire and laying procedures are used to set off deflections and quadrants of less than 1 mil.

assign — (DOD, NATO) **1.** To place units or personnel in an organization where such placement is relatively permanent, and/or where such organization controls and administers the units or personnel for the primary function, or greater portion of the functions, of the unit or personnel. (Joint Pub 1-02) (Part 1 of a 2-part definition.)

attach — (NATO) **1.** To place units or personnel in an organization where such placement is relatively temporary. Subject to limitations imposed in the attachment order, the commander of the formation, unit, or organization receiving the attachment will exercise the same degree of command and control thereover as he does over the units and persons organic to his command. However, the responsibility for transfer and promotion of personnel will normally be retained by the parent formation, unit, or organization. (Joint Pub 1-02) (Part 1 of a 2-part definition.)

azimuth of fire — The direction, expressed in mils, that a battery is laid (oriented) on when it occupies a position.

B

backup computer system — A hand-held computer used as the primary backup to the battery computer system.

barrage fire — (DOD, NATO) Fire which is designed to fill a volume of space or area rather than aimed specifically at a given target. (Joint Pub 1-02)

base-ejection shell — A type of projectile that ejects its payload from the base, such as the ICM projectile.

basic load of ammunition — The amount of ammunition a unit is authorized to maintain to initiate combat and sustain itself until resupplied.

battery center – (DOD, NATO) A point on the ground, the coordinates of which are used as a reference indicating the location of the battery in the production of firing data. Also called **chart location of the battery.** (Joint Pub 1-02)

battery computer system – An automated data processing system located in the firing battery. It consists of three major components: the battery computer unit, the power distribution unit, and gun display unit. It is used to compute accurate firing data and as a digital communications interface.

battery operations center – A facility established to serve as an alternate FDC and as the battery command post.

boresighting – The process by which the optical axes of the weapons sights are aligned parallel to the axis of the cannon tube. The primary methods of boresighting are with the alignment device, a distant aiming point, or the testing target.

C

caliber – **1.** The diameter of the bore of a weapon; obtained in rifled weapons by measuring between opposite lands. **2.** The diameter of a projectile. **3.** The unit of measure used to express the length of the bore of a weapon. The number of calibers is determined by dividing the length of the bore of the weapon (from breech face of the tube to the muzzle) by the diameter of its bore.

call for fire – (DOD, NATO) A request for fire containing data necessary for obtaining the required fire on a target. (Joint Pub 1-02)

charge – The propellant of semifixed or separate-loading ammunition.

checkpoint – A feature identifiable on the ground and on a map along a route of march.

close column – A convoy in which vehicles move at intervals of less than 100-meters.

close supporting fire – (DOD, NATO) Fire placed on enemy troops, weapons, or positions which, because of their proximity present the most immediate and serious threat to the supported unit. (Joint Pub 1-02)

command and control system – (DOD) The facilities, equipment, communications, procedures, and personnel essential to a commander for planning, directing, and controlling operations of assigned forces pursuant to the missions assigned. (Joint Pub 1-02)

command post report – A report is used to report the time of opening and closing of the CP and the location of the new CP.

common grid – The determination of weapons and target acquisition systems relative to one another.

concentrated fire – (NATO) 2. Fire from a number of weapons directed at a single point or small area. (Joint Pub 1-02) (Part 2 of a 2-part definition.) In Marine artillery, the term *massed fire* is synonymous with concentrated fire.

contingent zone of fire – (DOD) An area within which a designated ground unit or fire support ship may be called upon to deliver fire. (Joint Pub 1-02)

converged sheaf – (DOD) The lateral distribution of fire of two or more pieces so that the planes of fire intersect at a given point. (Joint Pub 1-02)

counterbattery fire – (DOD, NATO) Fire delivered for the purpose of destroying or neutralizing indirect fire weapons systems. (Joint Pub 1-02)

counterfire – (DOD, NATO) Fire intended to destroy or neutralize enemy weapons. (DOD) Includes counterbattery, counterbombardment, and countermortar fire. (Joint Pub 1-02)

counterfire reference grid – A series of 5-kilometer squares covering a zone of action used to rapidly orient target acquisition assets and firing units to a target area.

counterintelligence – (DOD, NATO) Those activities which are concerned with identifying and counteracting the threat to security posed by hostile intelligence services or organizations, or by individuals engaged in espionage, sabotage, subversion or terrorism. (Joint Pub 1-02)

countermechanized fire – Fire delivered against active enemy mechanized units. (NWP 22-2/FMFM 1-7, *Supporting Arms in Amphibious Operations*)

countermortar fire — Fire especially directed against enemy mortars.

counterpreparation fire — (DOD, NATO) Intensive prearranged fire delivered when the imminence of the enemy attack is discovered. (DOD) It is designed: to break up enemy formations; disorganize the enemy's systems of command, communications, and observation; decrease the effectiveness of artillery preparation; and impair the enemy's offensive spirit. (Joint Pub 1-02)

covering fire — (DOD, NATO) **1.** Fire used to protect troops when they are within range of enemy small arms. (Joint Pub 1-02) (Part 1 of a 2-part definition.)

crater analysis — The examination of a shell crater with the purpose of determining the line of flight of the projectile to establish its probable launch point.

crest — (DOD, NATO) A terrain feature of such altitude that it restricts fire or observation in an area beyond, resulting in dead space, or limiting the minimum elevation, or both. (Joint Pub 1-02)

D

damage assessment — (DOD, NATO) **1.** The determination of the effect of attacks on targets. (Joint Pub 1-02) (Part 1 of a 2-part definition.)

deep supporting fire — (DOD, NATO) Fire directed on objectives not in the immediate vicinity of our forces, for neutralizing and destroying enemy reserves and weapons, and interfering with enemy command, supply, communications, and observations. (Joint Pub 1-02)

deliberate occupation — The occupation of a position by a unit that has been fully prepared for occupation by the advance party; for example, howitzer positions have been selected and initial deflections have been provided to the gun guides.

destruction fire — (DOD) Fire delivered for the sole purpose of destroying material objects. (Joint Pub 1-02)

direct fire — (DOD) Gunfire delivered on a target, using the target itself as a point of aim for either the gun or the director. (NATO) Fire directed at a target which is visible to the aimer. (Joint Pub 1-02)

direct support – (DOD) A mission requiring a force to support another specific force and authorizing it to answer directly the supported force's request for assistance. (Joint Pub 1-02)

displacement – **1.** The act of leaving a position before occupying another. **2.** The undesired movement of a sight caused by traversing the tube or by the shock of firing.

displacement report – A report used to report the displacement of a firing battery or element. The DISREP is submitted when the unit can no longer fire from its present position due to displacement.

distant aiming point – An aiming point at least 1,500 meters from the pieces.

distribution of fire – The pattern of bursts in the target area; the sheaf.

dud – (DOD, NATO) Explosive munition which has not been armed as intended or which has failed to explode after being armed. (Joint Pub 1-02)

E

emergency mission – See **hip shoot.**

end of the orienting line – A point on the orienting line marked by any sharply defined permanent or semipermanent object such as a steeple, flagpole, or stake. It should be visible during darkness.

F

field storage location – A controlled, limited-access area in which a unit having custody of nuclear weapons stores them. Its primary purpose is to prevent unauthorized and uncontrolled access to the weapons.

final protective fire – (DOD, NATO) An immediately available prearranged barrier of fire designed to impede enemy movement across defensive lines or areas. (Joint Pub 1-02) Final protective fires consist of final protective lines (FPLs), principal direction of fire (PDF), and barrages. FPLs and PDFs apply to small arms; artillery normally fires barrages.

fire capabilities chart – (DOD, NATO) A chart, usually in the form of an overlay, showing the areas which can be reached by the fire of the bulk of the weapons of a unit. (Joint Pub 1-02)

fire capability report—A report providing the firing status of an artillery battery or element. The report is made when a unit occupies a new firing position and is ready to fire, or when a change occurs in the number of weapons available (e.g., a gun out of action due to enemy action or a mechanical malfunction).

fire control—(DOD, NATO) The control of all operations in connection with the application of fire on a target. (Joint Pub 1-02)

fire control alignment tests—Tests performed to determine if the on-carriage fire control equipment, the gunner's quadrant, and the alignment device are in correct adjustment.

fire direction center—(DOD, NATO) That element of a command post, consisting of gunnery and communication personnel and equipment, by means of which the commander exercises fire direction and/or fire control. The fire direction center receives target intelligence and requests for fire, and translates them into appropriate fire direction. (Joint Pub 1-02)

fire planning—The planning conducted by each supporting arm agency in response to the supported commander's fire support plan.

fire support coordination center—(DOD, NATO) A single location in which are centralized communications facilities and personnel incident to the coordination of all forms of fire support. (Joint Pub 1-02)

fire support coordinator—The officer in charge of the fire support coordination center. He is the direct representative of the commander, landing force for the planning and coordination of all available fire support.

fire support plan—A plan which outlines how the commander wants to use his fire support assets to support an operation. (FMFM 6-18, *Techniques and Procedures for Fire Support Coordination*)

firing position—A specific location occupied or to be occupied by the firing battery.

formations—Weapons emplacement in a position area as selected by the battery commander.

G

general support – (DOD, NATO) That support which is given to the supported force as a whole and not to any particular subdivision thereof. (Joint Pub 1-02)

general support-reinforcing – (DOD) A tactical artillery mission. General support-reinforcing artillery has the mission of supporting the force as a whole and of providing reinforcing fires for another artillery unit. (Joint Pub 1-02)

H

harassing fire – (DOD, NATO) Fire designed to disturb the rest of the enemy troops, to curtail movement and, by threat of losses, to lower morale. (Joint Pub 1-02)

hasty occupation – The occupation of a position that has not been prepared for occupation by the advance party.

hasty survey – Techniques used to quickly establish sufficiently accurate direction and/or position data through simplified procedures and with cannon battery table of equipment.

high angle fire – (DOD, NATO) Fire delivered at angles of elevation greater than the elevation that corresponds to the maximum range of the gun and ammunition concerned; fire, the range of which decreases as the angle of elevation is increased. (Joint Pub 1-02)

high-payoff target – Those high-value targets that must be acquired and successfully attacked for the success of the friendly commander's mission. (FM 6-20-10, *Tactics, Techniques, and Procedures for the Targeting Process*)

high-value target – Those assets that the enemy commander requires for the successful completion of his mission. (FM 6-20-10, *Tactics, Techniques, and Procedures for the Targeting Process*)

hip shoot – Occupying a position from a convoy without prior reconnaissance and firing from this position in response to a call for fire.

howitzer – (DOD) A cannon which combines certain characteristics of guns and mortars. The howitzer delivers projectiles with medium velocities, either by low or high trajectories. (Joint Pub 1-02)

I

illumination fire – (NATO) Fire designed to illuminate an area. (Joint Pub 1-02) Illumination fire is used to observe enemy operations and movements, to adjust observed fire during hours of darkness, and to provide assistance to friendly night operations.

immediate counterfire – The attack of the enemy's indirect fire systems that are inflicting heavy damage on friendly forces.

indirect fire – (DOD) Fire delivered on a target that is not itself used as a point of aim for the weapons or the director. (NATO) Fire delivered at a target which cannot be seen by the aimer. (Joint Pub 1-02)

infiltration – (DOD) 1. The movement through or into an area or territory occupied by either friendly or enemy troops or organizations. The movement is made, either by small groups or by individuals, at extended or irregular intervals. When used in connection with the enemy, it infers that contact is avoided. (Joint Pub 1-02) (Part 1 of a 2-part definition.)

intelligence preparation of the battlefield – A continuous, systematic approach to analyzing the enemy, weather, and terrain in a specific geographical area. Threat capabilities are evaluated and the enemy courses of action with respect to specific battlefield conditions are predicted. (FM 6-20-10, *Tactics, Techniques, and Procedures for the Targeting Process*)

interdiction fire – (NATO) Fire placed on an area or point to prevent the enemy from using the area or point. (Joint Pub 1-02)

K

killing zone – (DOD) An area in which a commander plans to force the enemy to concentrate so as to destroy him with conventional weapons or the tactical employment of nuclear weapons. (Joint Pub 1-02)

L

laid – A weapon is laid when the axis of the tube is accurately aimed in a predetermined direction.

356-548 O - 93 - 11

laying – The process of orienting a weapon for direction.

list of targets – (DOD) A tabulation of confirmed or suspect targets maintained by any echelon for informational and fire support planning purposes. (Joint Pub 1-02)

lot – (DOD) Specifically, a quantity of material all of which was manufactured under identical conditions and assigned an identifying lot number. (Joint Pub 1-02)

low angle fire – (DOD, NATO) Fire delivered at angles of elevation below the elevation that corresponds to the maximum range of the gun and ammunition concerned. (Joint Pub 1-02)

M

main battle area – (DOD) That portion of the battlefield in which the decisive battle is fought to defeat the enemy. For any particular command, the main battle area extends rearward from the forward edge of the battle area to the rear boundary of the command's subordinate units. (Joint Pub 1-02)

marking fire – (DOD, NATO) Fire placed on a target for the purpose of identification. (Joint Pub 1-02)

maximum rate of fire – The rate of fire that a weapon can continue for a short period without seriously overheating.

mil – A unit of measurement for angles. There are 6,400 mils in a complete circle.

multiple launch rocket system – A highly mobile, rapid-fire, free-flight rocket delivery means designed to complement cannon artillery in all fire support roles.

N

neutralization fire – (DOD) Fire which is delivered to render the target ineffective or unusable. (Joint Pub 1-02)

O

obscuration fire – Fire delivered to suppress the enemy by obscuring his view of the battlefield. (FMFM 6-18, *Techniques and Procedures for Fire Support Coordination*)

observed fire – (DOD, NATO) Fire for which the point of impact or burst can be seen by an observer. The fire can be controlled and adjusted on the basis of observation. (Joint Pub 1-02)

open column – A convoy in which vehicles move at intervals of 100 meters.

open sheaf – (DOD) The lateral distribution of the fire of two or more pieces so that adjoining points of impact or points of burst are separated by the maximum effective width of burst of the type shell being used. (Joint Pub 1-02)

operational control – (DOD) Transferable command authority which may be exercised by commanders at any echelon at or below the level of combatant command. Operational control is inherent in Combatant Command (command authority) and 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 authoritative direction necessary to accomplish the mission. Operational control includes authoritative direction over all aspects of military operations and joint training necessary to accomplish missions assigned to the command. Operational control should be exercised through the commanders of subordinate organizations; normally this authority is exercised through the Service component commanders. Operational control normally provides full authority to organize commands and forces and to employ those forces as the commander in operational control considers necessary to accomplish assigned missions. Operational control does not, in and of itself, include authoritative direction for logistics or matters of administration, discipline, internal organization, or unit training. Also called **OPCON**. (Joint Pub 1-02) (NATO) The authority delegated to a commander to direct forces assigned so that the commander may accomplish specific missions or tasks which are usually limited by function, time, or location; to deploy units concerned, and to retain or assign tactical control of those units. (Extract from Joint Pub 1-02)

organic – (DOD) Assigned to and forming an essential part of a military organization. (Extract from Joint Pub 1-02)

organization for combat – A process which places an artillery unit within an organization (i.e., establishes a command relationship) and assigns the unit a tactical mission.

orienting angle – A horizontal clockwise angle from the line of fire to the orienting line.

orienting line — A line of known direction in the battery area that serves as a basis for laying the battery for direction. The azimuth of the orienting line is the direction from the orienting station to a designated end of the orienting line.

P

parallel sheaf — (DOD) In artillery and naval gunfire support, a sheaf in which the planes (lines) of fire of all pieces are parallel. (Joint Pub 1-02)

point target — (DOD) **1.** A target of such small dimension that it requires the accurate placement of ordnance in order to neutralize or destroy it. (Joint Pub 1-02) (Part 1 of a 2-part definition.)

position area — An area that is occupied, or to be occupied, by an artillery unit with its elements disposed to provide artillery support. Position areas do not constitute a rigid restrictive area for the artillery unit. They should be considered only as guides to be followed as closely as the mission, terrain, and tactical situation permit.

prearranged fire — (DOD, NATO) Fire that is formally planned and executed against targets or target areas of known location. Such fire is usually planned well in advance and is executed at a predetermined time or during a predetermined period of time. (Joint Pub 1-02)

precision fire — Fire used for registration and for attack and destruction of point targets.

preparation fire — (DOD, NATO) Fire delivered on a target preparatory to an assault. (Joint Pub 1-02) Preparation fires are an intense volume of fire delivered in accordance with a time schedule. Preparation fires are intended to disrupt communications, disorganize and soften the hostile defense, and assist the friendly forces in gaining fire superiority.

primary position — The position from which a battery intends to perform its assigned mission.

priority of fire — Guidance to a fire support planner to organize and employ fire support means in accordance with the relative importance of the maneuver unit's missions. (FMFRP 0-14)

priority target — A target which when requested for attack takes priority over all other requests. Priority targets are designated by the maneuver

battalion commander, who also provides specific guidance as to when the targets will become priority, munitions to use, accuracy, and desired effects. When not engaged in fire missions, firing units will lay on priority targets, with firing data and ammunition prepared and staged for responsiveness.

R

radar fire – (DOD, NATO) Gunfire aimed at a target which is tracked by radar. (Joint Pub 1-02)

radar report – A report used by the artillery to control and coordinate the use of the radars of the counterbattery radar platoon. The report is used by the counterbattery radar platoon and the controlling artillery unit.

rally point – A feature identifiable on the ground and on a map used for assembly and recovery of vehicles and personnel following an enemy attack.

rate of fire – (DOD, NATO) The number of rounds fired per weapon per minute. (Joint Pub 1-02)

rear area – (DOD, NATO) For any particular command, the area extending forward from its rear boundary to the rear of the area of responsibility of the next lower level of command. This area is provided primarily for the performance of combat service support functions. (Joint Pub 1-02)

reconnaissance by fire – (DOD, NATO) A method of reconnaissance in which fire is placed on a suspected enemy position to cause the enemy to disclose his presence by movement or return of fire. (Joint Pub 1-02)

reconnaissance, selection, and occupation of position – A procedure used by artillery units to assist the rapid and orderly movement of the artillery unit from a position area, assembly area, or a march column into a position from which it can deliver the fire support required to accomplish its mission.

reinforcing – (DOD, NATO) In artillery usage, tactical mission in which one artillery unit augments the fire of another artillery unit. (Joint Pub 1-02)

release point — A feature identifiable on the ground and on a map at which convoy control ceases as the last vehicle of a convoy crosses the point at a specified time.

S

screening fire — Fire delivered to mask friendly maneuver elements and to conceal the nature of their operations. (FMFM 2-7, *Fire Support in Marine Air-Ground Task Force Operations*)

security area — The forward of the three echelons of a defensive sector. It is the area forward of the forward edge of the battle area out to the forward positions initially assigned to the security forces. The ground combat element commander may extend the lateral boundaries of subordinate units forward of the forward edge of the battle area, giving them responsibility for the security area within sector to the forward limit of their boundaries, or he may assign a security force to operate across the entire ground combat element frontage. (FMFRP 0-14)

self-propelled weapon — A weapon that has its cannon permanently installed on a full tracked vehicle which provides its own automotive power.

semi-fixed ammunition — (DOD, NATO) Ammunition in which the cartridge case is not permanently attached to the projectile. (Joint Pub 1-02)

separate-loading ammunition — (DOD, NATO) Ammunition in which the projectile and charge are loaded into a gun separately. (Joint Pub 1-02)

sheaf — (DOD) In artillery and naval gunfire support, planned planes (lines) of fire that produce a desired pattern of bursts with rounds fired by two or more weapons. (Joint Pub 1-02)

shelling report — (DOD, NATO) Any report of enemy shelling containing information on caliber, direction, time, density, and area shelled. (Joint Pub 1-02)

special ammunition supply point — A mobile supply point where special ammunition is stored and issued to delivery units.

start point — (NATO) A well defined point on a route at which a movement of vehicles begins to be under the control of the commander of this movement. (extract from Joint Pub 1-02) The first vehicle of a convoy crosses the start point at a specified time.

supplementary position – A position selected for accomplishment of a specific mission other than primary.

supporting fire – (DOD, NATO) Fire delivered by supporting units to assist or protect a unit in combat. (Joint Pub 1-02)

suppression of enemy air defenses – (DOD, NATO) That activity which neutralizes, destroys or temporarily degrades enemy air defenses in a specific area by physical attack and/or electronic warfare. (Joint Pub 1-02)

suppressive fire – (DOD) Fires on or about a weapons system to degrade its performance below the level needed to fulfill its mission objectives, during the conduct of the fire mission. (Joint Pub 1-02)

survey control point – (DOD) A survey station used to coordinate survey control. (Joint Pub 1-02)

survey information center – (DOD) A place where survey data are collected, correlated, and made available to subordinate units. (Joint Pub 1-02)

survivability move – A displacement for the purpose of increasing the artillery unit's chance of survival.

suspected target – A possible target that requires further correlation or additional information before it is considered a target.

sustained rate of fire – (DOD, NATO) Actual rate of fire that a weapon can continue to deliver for an indefinite length of time without seriously overheating. (Joint Pub 1-02)

sweeping fire – A method of fire which involves lateral distribution to cover wide targets generally perpendicular to the battery.

T

tactical area of responsibility – (DOD) A defined area of land for which responsibility is specifically assigned to the commander of the area as a measure for control of assigned forces and coordination of support. (Joint Pub 1-02)

tactical fire direction – The control of one or more units in the selection of targets to attack, designation of the unit or units to fire, selection of the method of attack, and selection of the most suitable ammunition for the mission.

tactical march – The movement of a unit or an element under actual or simulated combat conditions.

tactical mission – Defines the fire support responsibility of an artillery unit, normally a battalion, to a supported unit or to another artillery unit. (extract from FMFM 2-7, *Fire Support in Marine Air-Ground Task Force Operations*)

tactics – (DOD) **1.** The employment of units in combat. **2.** The ordered arrangement and maneuver of units in relation to each other and/or to the enemy in order to utilize their full potentialities. (Joint Pub 1-02)

target – (DOD, NATO) **1.** A geographical area, complex, or installation planned for capture or destruction by military forces. **3.** An area designated and numbered for future firing. (Joint Pub 1-02) (Parts 1 and 3 of a 4-part definition.)

target acquisition – (DOD, NATO) The detection, identification, and location of a target in sufficient detail to permit the effective employment of weapons. (Joint Pub 1-02)

target analysis – (DOD, NATO) An examination of potential targets to determine military importance, priority of attack, and weapons required to obtain a desired level of damage or casualties. (Joint Pub 1-02)

target category – Those categories used to facilitate the processing of target data, particularly the maintenance of counterfire target files.

target of opportunity – (DOD) **1.** 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. (Joint Pub 1-02) (Part 1 of a 2-part definition.)

target prediction – Predicting a target's existence and location by analyzing available combat information and intelligence.

target selection standards – Criteria established by the G-2/S-2 of the supported unit to determine if data is a target or a suspected target. The standards are based on the enemy's demonstrated use of deception and the susceptibility of our collective systems to such deception. The artillery S-2 makes recommendations on the establishment.

target value analysis – A method for providing a systematic determination of which targets out of the entire target array should be attacked for the greatest tactical benefit. (FMFM 6-18, *Techniques and Procedures for Fire Support Coordination*)

technical fire direction – The conversion of requests for fire to appropriate firing data and fire commands.

terrain march – An off-road movement.

time on target – (NATO) **1.** Time at which aircraft are scheduled to attack or photograph a target. **2.** In other than air operations, the time of the first weapons effect on the target or target groups. (Joint Pub 1-02) (Parts 1 and 2 of a 3-part definition.)

towed weapon – A weapon which must be moved by an external prime mover, such as a truck or a tractor. The weapon is detached from the prime mover for firing.

trig list – (DOD) A list published by certain Army units which includes essential information of accurately located survey points. (Joint Pub 1-02)

U

unobserved fire – (DOD, NATO) Fire for which the points of impact or burst are not observed. (Joint Pub 1-02)

Z

zone and sweep fire – A method of fire which combines zone fire and sweeping fire, and is valuable in attacking large, regular-shaped targets.

zone fire – (DOD) Artillery or mortar fires that are delivered in a constant direction at several quadrant elevations. (Joint Pub 1-02)

zone of fire – (DOD) An area within which a designated ground unit or fire support ship delivers, or is prepared to deliver, fire support. Fire may or may not be observed. (Joint Pub 1-02)

(reverse blank)

Appendix I

References

1. Joint Publication

Joint Pub 1-02	DOD Dictionary of Military and Associated Terms

2. Fleet Marine Force Manuals

FMFM 1-5	MPF Operations (under development)
FMFM 1-7/NWP 22-2	Supporting Arms in Amphibious Operations
FMFM 2-7	Fire Support in MAGTF Operations
FMFM 2-7-1	Fire Support Coordination by the MAGTF Command Element
FMFM 3-1	Command and Staff Action
FMFM 3-21	MAGTF Intelligence Operations
FMFM 3-30	Communications
FMFM 3-41	Position-Location Reporting System Employment Planning
FMFM 4-61/ FM 55-12/AFM 76-6/ OPNAVINST 4630-27A	Movement of Units in Air Force Aircraft
FMFRP 5-31/ FM 55-450-1	Multi-Service Helicopter External Air Transport Procedures (HEAT)
FMFM 5-40	Offensive Air Support
FMFM 5-41	Close Air Support and Close-In Fire Support
FMFM 6	Ground Combat Operations (under development)
FMFM 6-1	The Marine Division/Regiment (under development)
FMFM 6-2	The Marine Infantry Battalion/Rifle Company (under development)
FMFM 6-3	Marine Rifle Platoon/Squad (under development)
FMFM 6-7	Scouting and Patrolling for Infantry Units
FMFM 6-8	Supporting Arms Observer, Spotter, and Controller
FMFM 6-11	Mechanized Operations
FMFM 6-15	Machineguns and Machinegun Gunnery
FMFM 6-18	Techniques and Procedures for Fire Support Coordination
FMFM 6-30	Light Armored Infantry Operations

FMFM 7-1F/ FM 3-10-1/NWP 18-1/ AFM 355-4	(SRD) Chemical Weapons Employment
FMFM 7-5-1	MAGTF Riverine Operations
FMFM 7-12	Electronic Warfare
FMFM 7-13	Military Deception
FMFM 7-15	Military Operations in Urban Terrain
FMFM 7-21	Tactical Fundamentals for Cold Weather Warfighting
FMFM 7-26/FM 90-13	River-Crossing Operations
FMFM 7-26-1	Supplement to FMFM 7-26/FM 90-13, River-Crossing Operations
FMFM 7-27/FM 90-3	Desert Operations
FMFM 7-27-1	Supplement to FMFM 7-27/FM 90-3, Desert Operations
FMFM 7-28/FM 90-5	Jungle Operations
FMFM 7-28-1	Supplement to FMFM 7-28/FM 90-5, Jungle Operations
FMFM 7-29/FM 90-6	Mountain Operations
FMFM 7-29-2	Marine Corps Supplement on Mountain Operations (Supplement to FMFM 7-29-1/FM 90-6 and TC 90-6-1/FMFM 7-29-1)
FMFM 7-32	Raids (coordinating draft)
FMFM 11	MAGTF Nuclear, Chemical, and Defensive Biological Operations
FMFM 11-2	NBC Defense Chemical Warfare, Smoke, and Flame Operations
FMFM 11-3	(S) Employment of Chemical Agents w/change 1 (U)
FMFM 11-3B	(C) Chemical Target Analysis (U)
FMFM 11-4	Nuclear Weapons Employment Doctrine and Procedures w/change 1
FMFM 11-4A	(S-RD) Nuclear Weapons Employment Effects Data (U)
FMFM 11-4B	Nuclear Weapons Employment Effects Data
FMFM 11-8	NBC Contamination Avoidance
FMFM 11-9	NBC Protection
FMFM 11-10	NBC Decontamination
FMFM 13-1	Combat Engineer Operations
FMFM 13-2	Engineers in the Combat Service Support Element

3. Fleet Marine Force Reference Publications

FMFRP 0-14	Marine Corps Supplement to the DOD Dictionary of Military and Associated Terms
FMFRP 5-54	Small Arms Defense Against Air Attack w/change 1
FMFRP 6-17	Combat Service Support for Artillery Units
FMFRP 12-3	Artillery in the Desert

4. Marine Corps Order

MCO 3501.6A	Marine Corps Combat Readiness Evaluation System (Short Title: [MCCRES]); Volume V, Artillery Units

5. U.S. Army Field Manuals

FM 5-20	Camouflage
FM 5-103	Survivability
FM 6-2	Field Artillery Survey
FM 6-15	Field Artillery Meteorology
FM 6-20	Fire Support in Combined Arms Operations
FM 6-20-1	Tactics, Techniques, and Procedures for Field Artillery Cannon Battalion
FM 6-20-10	Tactics, Techniques, and Procedures for the Targeting Process
FM 6-20-30	Tactics, Techniques, and Procedures for Fire Support for Corps and Division Operations
FM 6-20-40	Tactics, Techniques, and Procedures for Fire Support for Brigade Operations (Heavy)
FM 6-20-50	Tactics, Techniques, and Procedures for Fire Support for Brigade Operations (Light)
FM 6-50	The Field Artillery Cannon Battery
FM 6-75	105 Howitzer, M101 Series, Towed
FM 6-121	Field Artillery Target Acquisition
FM 6-141-2	(C) Field Artillery Target Analysis and Weapons Employment: Nonnuclear (U)
FM 21-60	Visual Signals
FM 55-9	Unit Air Movement Planning
FM 55-15	Transportation Reference Data
FM 55-30	Army Motor Transport Units and Operations w/change 001
FM 90-2 (HTF)	Tactical Deception (How to Fight)
FM 90-4	Air Assault Operations
FM 100-50	Operations for Nuclear-Capable Units
FM 101-10-1/1	Staff Officers Field Manual—Organizational, Technical, and Logistical Data, Volume I

6. Training Circulars

TC 6-20-5	Field Artillery Delivered Scatterable Mines
TC 6-40	Field Artillery Manual Cannon Gunnery
TC 6-40A	Field Artillery Automated Cannon Gunnery
TC 6-60	Multiple Launch Rocket System (MLRS) Operations

7. Field Circulars

FC 6-40-2	Battery Computer System BCS Job Aids
FC 6-40-31	Backup Computer System Job Aids—Cannon Application
FC 6-50-20	Battery Executive Officer's/Platoon Leaders's Handbook: Cannon Artillery

8. Joint Munitions Effectiveness Manuals

FM 101-60-2	(C) Joint Munitions Effectiveness Manual/Surface-to-Surface: Effectiveness Data for Howitzer, 105-mm M101A1 (U)
FM 101-60-3	(C) Joint Munitions Effectiveness Manual Surface-to-Surface: Effectiveness Data for Howitzer, 155-mm, M109 (U)
FM 101-61-3	(C) Joint Munitions Effectiveness Manual Surface-to-Surface (JMEM/SS) Weapon/Ammunition Application: Ammunition Reliability (U)
FM 101-62-1	(C) Joint Munitions Effectiveness Manual/Surface-to-Surface: Safe Distances for Fragmentary Munitions (U)
FM 101-62-3	(C) Joint Munitions Effectiveness Manual/Surface-to-Surface: Manual of Fragmentation Data (U)

9. Technical Manuals and Publications (Selected)

TM 08625A-10/1-1	Operator's Manual, Meteorological Data System AN/TMQ-31 and Radiosonde Set ML-659V/TMQ-4A
TM 5-6675-308-12	Operator's and Organization Maintenance Manual for Position and Azimuth Determining System, AN/USQ-70
TM 9-1015-203-12	Operator and Organizational Maintenance Manual for Howitzer, Light, Towed, 105-mm, M101A1 (NSN 1015-00-322-9753)

TM 9-1025-211-10	Operator's Manual (Crew) for Howitzer, Medium, Towed: 155-mm, M198 (NSN 1025-01-026-6648)
TM 9-1290-359-12	Radar Chronograph
TM 9-1300-200	Ammunition, General
TM 9-1300-206	Ammunition and Explosive Standards
TM 9-1300-251-20	Artillery Ammunition for Guns, Howitzers, Mortars, Recoilless Rifles and 40mm Grenade Launchers
TM 9-2350-304-10	Operator's Manual Howitzer, Heavy Self-Propelled, 8-Inch, M110A2
TM 9-2350-311-10	Operator's Manual for Howitzer, Medium, Self-Propelled, 155mm, M109A2 and M109A3
TM 11-5840-354-10-1	Operator's Manual for Radar Set, AN/TPQ-36
TM 11-7440-283-12-2	Operator's and Organizational Maintenance Manual for Data Display Groups, Gun Direction, OD-144(V)GYK-29(V) and OD-144(V)3/GYK-29(V)
TM 43-0001-28	Artillery Ammunition Data Sheets for Artillery Ammunition: Guns, Howitzers, Mortars, Recoilless Rifles, Grenade Launchers and Artillery Fuzes
TM 43-0001-28-2	Artillery Ammunition Cartridge/Projectile-Fuze and Propellant Charges Combination Charts
TM 55-2200-0001-12	Application of Blocking, Bracing, and Tiedown Materials for Rail Transportation
TDN 2100	Operator and Organizational Maintenance Manual for M90
TEC 041-061-6041-F	Intro to M110/M110A1 Howitzer and M107 Gun

10. Standardization Agreements/Quadripartite Standardization Agreements

STANAG/QSTAG 2031/515	Proforma for Artillery Fire Plan
STANAG/QSTAG 2103/187	Reporting Nuclear Detonations, Radioactive Fallout, and Biological and Chemical Attacks, and Predicting Associated Hazards
STANAG/QSTAG 2104/189	Friendly Nuclear Strike Warning to Armed Forces Operation on Land
QSTAG 2111	Target Analysis-Nuclear Weapons
STANAG 2376	The Minimum Information Required by Field Formations to Enable Nations to Interchange 155mm Artillery Ammunition for Use in War (AArtyP-2)

STANAG/QSTAG 2373/269	Survey Accuracy Requirements for Surface-to-Surface Artillery
QSTAG 2865	Recording of Data for Artillery Survey Control Points
QSTAG 2867	Radio-Telephone Procedures for the Conduct of Artillery Fire
STANAG/QSTAG 2887/217	Tactical Tasks and Responsibilities for Control of Artillery
STANAG 2934	Artillery Procedures—AArtyP-1
STANAG 2963	Coordination of Field Artillery Delivered Scatterable Mines

11. Suggested Readings for Artillery Professionalism

The following publications contain historical readings about artillery tactics in battle:

Col George Bruchmuller, *Artillery in the Attack in Position Warfare*

Shelford Bidwell, *Artillery Tactics 1939-1945*

J.B.A. Bailey, *Field Artillery and Firepower*

Shelford Bidwell and Dominick Graham, *Fire Power—British Army Weapons and Theories of War 1904-1945*

Col Robert H. Scales, USA, *Firepower in Limited War*

Col George Bruchmuller, *German Artillery in the Breakthrough*

Shelford Bidwell, *Gunners at War*

Col Francis Fox Parry, USMC (Ret), *Three-War Marine*

E.G. Longacre, *The Man Behind the Guns*

Index

	Paragraph	Page
A		
Adjust fire	4004c(3)(c)	4-6
Advance party	1005b(2), 9105b, 9106a, 9107a	1-11, 9-11, 9-13, 9-15
Aiming circle	9107b(2)	9-19
Air guard	9210e(4)	9-36
Air observer	7103d	7-2
Alternate battalion FDC	8005d	8-17
Alternate division command post	8004f	8-13
Alternate regimental FDC	1003b, 8004e	1-6, 8-13
Ambush	9212d	9-40
Ammunition:		
Burning	App. A	A-15
Care and handling	App. A	A-13
Dump	9107b(5)(a)	9-19
Lot management	4003c	4-3
Propellant	4003b, App. A	4-2, A-12
Selection	4004e	4-7
Shell/fuze combinations	4003a, App. A	4-2, A-6
Types	App. A	A-1
Amphibious operations	13008	13-11
Area fire	4004f(3)(a)	4-9
Artillery:		
Allocation	2001	2-1
Ammunition	4003	4-2
Characteristics	4001, App. A	4-1, A-1
Combat tasks	10002	10-4
Estimate of supportability	App. B	B-1
Execution matrix	App. G	G-1
Fire plan	App. C	C-1
Liaison officer	1004b(3), 3005c(2), 8003e	1-9, 3-5, 8-10
Officer (FMF, MAGTF)	3002, 5002a	3-1, 5-3
Radio nets	6004b, 6004c, 6005, 6006	6-4, 6-6, 6-7, 6-8

	Paragraph	Page
Artillery—Continued		
Staff	3005	3-2
Tactical missions	1003b, 2003, Fig. 2-1	1-6, 2-3, 2-4
Weapons types	4002, App. A	4-1, A-1
Assault fire	4004d(2)	4-7
Assistant executive officer	3006d, 9107a(5), 9108b(2)	3-7, 9-16, 9-22
Assistant fire support coordinator	3005c(6)	3-6
Attack	11006	11-6
Attack guidance	7302h(1)	7-28
Attack guidance matrix	Fig. 7-5	7-29
B		
Backup computer system	1005b(2)	1-11
Barrage fire	4004f(1)(a)	4-8
Battalion:		
Commander	3004, 8004c(1), 8009a(3)(a), 9104a(1), 9104c	3-2, 8-12, 8-21, 9-4, 9-6
Fire planning	8002c(3)	8-6
Functions and employment	1004b	1-9
Headquarters echelons	9104f	9-9
Movement	8005b	8-17
Organization	1004a	1-8
Battery computer system	1005b(2)	1-11
Battery operations center	1005b(2), 8006a(2), 9105b(1), 9107b(4)	1-11, 8-18, 9-12, 9-19
Boundaries	2004e	2-7
Breakout of encircled forces	12005	12-10
Built-up/urban area operations	13010	13-13
C		
Clearance to fire procedures	8003e	8-10
Cold weather operations	13002	13-2
Combat operations center	1003a(2), 1003b, 9109b, 9109d, 9109f	1-5, 1-6, 9-25, 9-26, 9-27

	Paragraph	Page
Combat service support	1003c, 3005b(4), 8002b(7), 9104d(1)(e), 9107b(5)(f), 11005c(6), 11006c(7), 11007c(5), 11008c(5)	1-6, 3-4, 8-4, 9-8, 9-20, 11-6, 11-10, 11-11, 11-13
Command and control system	1001c	1-3
Command post:		
Alternate battalion	8005d	8-17
Alternate division	8004f	8-13
Alternate regimental	1003b, 8004e	1-6, 8-13
Regimental	1003a(2)	1-6
Command relationships	2002	2-1
Commander:		
Artillery battalion	3004, 8004c(1), 8009a(3)(a), 9104a(1), 9104c	3-2, 8-12, 8-21, 9-4, 9-6
Artillery regiment	1003a(2), 1003b, 3003, 8004a, 8004c(2), 8009a(3)(a)	1-5, 1-6, 3-1, 8-12, 8-12, 8-21
Firing battery	9105, 9106, 9107a(1)	9-10, 9-13, 9-15
Headquarters battery	9109	9-25
Ground combat element	1003b, 2001	1-6, 2-1
Groupment	2002c	2-3
Role	5002b	5-4
Supporting	2007	2-10
Common grid	8009a(2)	8-21
Communications:		
Battalion	1004a	1-8
Equipment	6003	6-2
Means	6002, 8002b(6)	6-1, 8-4
MLRS	App. D	D-3
Nets	6004b, 6004c, 6005, 6006	6-4, 6-6, 6-7, 6-8
Regimental	1003a	1-4
Concentrated fire	4004f(1)(b)	4-8
Control, centralized	2004e, 4004b	2-9, 4-4
Convoy operations	9208	9-31
Coordinated fire line	8003e	8-10

	Paragraph	Page
Counterbattery radar:		
Capabilities	7204b	7-10
Employment	7103c, 7204d	7-2, 7-11
Movement and positioning	7204e, 9103c, 9104d(2)(c)	7-12, 9-3, 9-9
Platoon commander	3005c(5)	3-6
Platoon organization	7204	7-9
Survey	8009a(9)	3-27
Counterfire	4007a, 7301, 7301b, 7302, 7302h(2)	4-16, 7-15, 7-16, 7-18, 7-30
Counterfire reference grid	7302a(8)	7-20
Counterintelligence	7303	7-30
Countermechanized fire	4007c	4-16
Counterpreparation fire	4007b	4-16
Covering force	11005b, 12003c(1)(d)	11-3, 12-5
Crater analysis	7301a(1)	7-15

D

Deception	7303b	7-31
Decontamination	1003c(4), 9210e(7)	1-7, 9-37
Defense:		
Diagram	9301d(2), Fig. 9-11	9-46, 9-48
Keys	9301	9-41
Organizing	9301d(1)	9-45
Reaction force	9301c(6)	9-51
Defensive operations:		
Mobile	12001a(2)	12-2
Position	12001a(1)	12-1
Sector	12001b	12-2
Desert operations	13004	13-6
Direct fire	4004d(3)	4-7
Direct support:		
Calls for fire	Fig. 2-1	2-4
Fire planning	8002c(2)	8-6
Inherent responsibilities	Fig. 2-1	2-4
Mission	2003a	2-3
Movement and positioning	8004c(1), 9204a	8-12, 9-29
Dispersion	4006b	4-13

	Paragraph	Page
Displacement:		
Considerations	9202	9-28
Control measures	9209	9-33
Emergency	9206	9-30
Execution	9204	9-29
Hasty	9205	9-30
Immediate actions	9212	9-38
March discipline	9211	9-37
Methods	9109e, 9203	9-26, 9-29
Movement brief	9104b	9-5
Preparation for movement	9210	9-35
Signals	9211e	9-37
Survivability moves	9201, 9207	9-28, 9-31
Tactical march	9208	9-31
Division:		
Artillery officer	1003a(2), 3003a	1-5, 3-1

E

Echelon, movement by	9109f	9-27
Echelons of headquarters	1003a(2), 9103b, 9109f	1-5, 9-3, 9-27
Effects of fires	4006	4-12
Elements of predicted fire	4004c	4-4
Emergency:		
Displacement	9206	9-30
Occupation of position	9108d	9-24
Engineer:		
Equipment platoon	1003c(4)	1-7
Operations	1003c(4)	1-7
Estimate of supportability	5002, App. B	5-3, B-1
Estimates, staff	5002	5-3
Execution matrix	App. G	G-1
Executive officer	3005a	3-2
Executive staff	3005b	3-3
Exploitation	11007	11-10

F

Field artillery chief	3005c(9)	3-6
Final protective fires	2004c, 4007e	2-7, 4-17

	Paragraph	Page
Final protective line	9301d	9-44
Fire:		
Assault	4004d(2)	4-7
Barrage	4004f(1)(a)	4-8
Close supporting	4007	4-16
Concentrated fire	4004f(1)(b)	4-8
Countermechanized	4007c	4-16
Counterpreparation	4007b	4-16
Covering	4007d	4-17
Deep supporting	4007	4-16
Destruction	4006c(1)	4-14
Direct	4004d(3)	4-7
Final protective	2004c, 4007e	2-7, 4-17
Harassing	4006c(3)	4-15
High angle	4004d(1)(b)	4-7
Illumination	4006c(5)	4-15
Indirect	4004d(1)	4-6
Interdiction	4006c(4)	4-15
Low angle	4004d(1)(a)	4-6
Marking	4007f	4-17
Massing	8008	8-19
Neutralization	4006c(2)	4-15
Observed	4005a	4-11
Order	8007	8-19
Precision	4004f(3)(b)	4-9
Preparation	4007g	4-17
Radar	4005b	4-11
Reconnaissance by	4007h	4-17
Screening	4006c(6)	4-15
SEAD	4007i	4-17
Suppression	4006c(7)	4-15
Unobserved	4005c	4-11
Fire base	13012	13-16
Fire capabilities overlay	Fig. 8-2	8-8
Fire direction:		
Battalion	8005a	8-14
Battery	8006a	8-17
Centralized	8005a(1)	8-15
Objectives	8003a	8-7

	Paragraph	Page
Fire direction—Continued		
Tactical	4004a(1), 8002b(4), 8004b	4-3, 8-3, 8-12
Technical	4004a(2), 8002b(4)	4-3, 8-3
Fire direction center:		
Battalion	1004b(2), 2003a, 8005	1-9, 2-5, 8-14
Battery	1005b(2), 8006, 9107b(3), 9108d(2)	1-11, 8-17, 9-19, 9-24
Forms, records, and charts	8003c	8-8
Functions	4004a, 7302h	4-3, 7-28
Organization	8003b	8-7
Regiment	1003b, 8004, 9109b, 9109d(2)	1-6, 8-11, 9-25, 9-26
Reporting	8003d	8-9
Fire direction officer	1004b(2), 3005c(1), 8005a, 8007, 8008	1-9, 3-5, 8-14, 8-19
Fire order	8007	8-19
Fire planning	Fig. 2-1, 5003, 8002, App. C	2-4, 5-4, 8-1, C-1
Fire support coordination center	1003a(1), 1005b(2), 8003e, 8004b	1-5, 1-11, 8-10, 8-12
Fire support coordination line	8003e(3)	8-11
Fire support coordinator	1003a(2), 3003b, 8003e, 8004a	1-5, 3-2, 8-10, 8-12
Fire support system	1001, 4001	1-3, 4-1
Firing battery:		
Commander	1005b(2), 3006a	1-11, 3-6
Defense	9301	9-41
Executive officer	3006b, 9108d(1)	3-7, 9-24
Fire planning	8002c(5)	8-6
First sergeant	3006e, 9105b(1)	3-8, 9-12
Functions and employment	1005b	1-10
Gunnery sergeant	3006f, 9105b(1), 9107a(2), 9108b(2)	3-8, 9-12, 9-15, 9-22
Local security chief	3006g, 9107a(3)	3-8, 9-16
Movement and positioning	8006b, 9203	8-18, 9-29
Organization	1005a, 3006	1-10, 3-6

	Paragraph	Page
Firing battery—Continued		
Reconnaissance	9105	9-10
Sheafs	4004f(2)	4-8
First sergeant	3006e, 9105b(1), 9109a	3-8, 9-12, 9-25
Forward headquarters echelon	1003a(2)	1-5
Forward observer	1004b(3), 1005b(2), 7103a	1-9, 1-11, 7-2

G

General support:		
Fire planning	8002c(4)	8-6
Inherent responsibilities	Fig. 2-1	2-4
Mission	2003b	2-5
Movement and positioning	8004c(2), 9204c	8-12, 9-30
General support-reinforcing:		
Fire planning	8002c(3)	8-6
Inherent Responsibilities	Fig. 2-1	2-4
Mission	2003d	2-5
Movement and positioning	8004c(2), 9204c	8-12, 9-30
Groupment	2002c(3)	2-2
Guard	11005b, 12003c(1)(c)	11-3, 12-5
Gun guide	9105b(1), 9107a(6), 9108b(2), 9108c(1)	9-12, 9-16, 9-22, 9-23

H

Habitual association	1004b(3)	1-9
Hasty displacement	9205	9-30
Headquarters battery:		
Commander	9109	9-25
First sergeant	3006e, 9109a	3-8, 9-25
Local security chief	9109a	9-25
Movement and positioning	9109b, 9109e	9-25, 9-26
RSOP	9109	9-25
Transfer of control	9109f	9-27
Health service	1003c(5)	1-7
Helicopterborne operations	13009	13-12
High angle fire	4004d(1)(b)	4-7
Hipshoot	9108d	9-24

	Paragraph	Page
I		
Immediate actions	9212	9-38
Indirect fire	4004d(1)(b)	4-6
Inherent errors	4006a	4-13
Intelligence:		
Agencies	7102	7-1
Dissemination	7105	7-4
Documents	7304	7-32
Objectives	7101	7-1
Preparation of the battlefield	App. H	H-1
Processing	7104	7-3
Section	9109d(2)	9-26
Sources	7103	7-2
J		
Jungle operations	13005	13-7
L		
Laying the howitzers, methods of	9108a(1)	9-21
Listening posts	9301c	9-43
Local security chief	9105b(1)	9-12
Low angle fire	4004d(1)(a)	4-6
M		
MAGTF artillery officer	3002	3-1
Main battle area	12001b(2), 12003c(1)(e), 12003c(2)(b)	12-1, 12-5, 12-7
Maintenance	1003c(1)	1-6
March discipline	9212	9-38
Marine expeditionary force	2006b, 8009a(4)(a)	2-9, 8-24
Marine expeditionary unit	2006a, 8009a(4)(b)	2-9, 8-24
Massed fires	8008	8-19
Meteorological officer	3005c(4)	3-5
Meteorological section:		
Employment	1003d, 8009b(2)	1-7, 8-28
Movement and positioning	9103d	9-3

	Paragraph	Page
Meteorology:		
Accuracy of data	8009b(2)(e)	8-29
Mission	8009b	8-28
Operations	1003d	1-7
Plus velocity error	4004c(3)(a)	4-5
Reports	8009b(1)	8-28
Mission:		
Artillery	1002	1-3
Direct support	2003a	2-3
General support	2003b	2-5
General support-reinforcing	2003d	2-5
Inherent responsibilities	Fig. 2-1	2-4
Non-standard	2003e	2-6
On order	2003f	2-4
Reinforcing	2003c	2-5
Mobile defense	12001a(2)	12-2
Mountain operations	13003	13-5
Movement:		
Air	9213	9-40
Briefing	9104b	9-5
Defense	12003c(3)	12-7
Helicopterborne	9213	9-40
March Discipline	9211	9-37
Preparing for	9210	9-35
Rail	9213	9-40
Signals	9211e	9-37
Water	9213	9-40
Movement to Contact	11005	11-2
Multiple Launch Rocket System	8004b, 12003c(1)(a), App. D	8-12, 12-4, D-1

N

Naval Gunfire	1004b(3)	1-9
Nonstandard Tactical Mission	2003e	2-6
Nuclear, Biological, and Chemical:		
Chemical Delivery	App. E	E-4
Decontamination	9210e(7), App. E	9-37, E-3
Defense	App. E	E-1

	Paragraph	Page
O		
Observation	4005, 7201	4-10, 7-6
Observation posts	7103b, 7203	7-2, 7-9
Occupying the position:		
Day	9108a	9-21
Emergency	9108d	9-24
Limited time preparation	9108b	9-22
Night	9108c	9-23
Offensive operations:		
Attack	11006	11-6
Exploitation	11007	11-10
Movement to contact	11005	11-2
Pursuit	11008	11-11
On-order tactical mission	2003f	2-4
Operation order/plan	5004	5-4
Operations:		
24-Hour	8004e, 8006a(4)	8-13, 8-18
Deep	12001b(4), 12003c(1)(a)	12-2, 12-4
Defensive	12001	12-1
Offensive	11002	11-1
Organization for combat:		
Attack	11006c(1)	11-7
Chemical delivery	App. E	E-4
Command relationships	2002	2-1
Exploitation	11006d(1)	11-11
Fundamentals	2005	2-8
MAGTF operations	2006	2-9
MLRS	App. D	D-5
Movement to contact	11005c(1)	11-3
Pursuit	11008c(1)	11-12
Tactical missions	1003b, 2003, Fig. 2-1	1-6, 2-3, 2-4
Organizing the position	9107	9-15
P		
Position:		
Alternate	9106b(2)	9-14
Battalion	9104d(2)(a)	9-8
Defense	12001a(1)	12-1

	Paragraph	Page
Position—Continued		
Firing battery	1005b(2), 9104d(2)(b), 9106	1-11, 9-9, 9-13
Formations	9107b	9-17
Hardening	9301c(5)	9-50
Primary	9106b(1)	9-14
Supplementary	9106b(3)	9-14
Positioning of artillery:		
Attack	11006c(2)	11-7
Battalion	9103a, 9104d(2)	9-2, 9-8
Battery	9104d	9-7
Counterbattery radar	7204e	7-12
Defense	12002c(2)	12-5
Direct support units	Fig. 2-1, 8004c(1)	2-4, 8-12
Exploitation	11007c(2)	11-11
Factors	8002b(5)	8-4
General support-reinforcing units	Fig. 2-1, 8004c(2)	2-4, 8-12
General support units	Fig. 2-1, 8004c(2)	2-4, 8-12
Headquarters battery	9109b	9-25
Movement to contact	11005c(2)	11-4
Pursuit	11008c(2)	11-11
Reinforcing units	Fig. 2-1, 8004c(1)	2-4, 8-12
Precision fire	4004f(3)(b)	4-9
Principle direction of fire	9301d	9-44
Principles of war	10001	10-2
Priority of fires	Fig. 2-1, 2004a	2-4, 2-7
Priority targets	2004b, 8006a(3)	2-7, 8-18
Pursuit	11008	11-11

Q

Quickfire channel	2003d	2-5

R

Raids	13011	13-15
Range card	9301d(3), Fig. 9-12, Fig. 9-13	9-48, 9-49, 9-50
Rear area	12001b(1), 12003c(a)(f)	12-2, 12-5

	Paragraph	Page
Reconnaissance:		
Air	9102b	9-2
Battalion	9103a, 9104	9-2, 9-4
Battery	9105	9-10
By fire	4007h	4-17
Ground	9102c	9-2
Headquarters battery	9109a	9-25
Map	9102a	9-1
Regiment	9103	9-2
Route	9103e	9-3
Reconstitution of battery	9302	9-51
Regiment:		
Fire planning	8002c(1)	8-5
Headquarters battery	8004c(4), 8004f(3)	8-13, 8-14
Headquarters echelons	9103b	9-3
Registration	4004c(3)(b)	4-6
Reinforcing:		
Fire direction	8004e(4)	8-16
Fire planning	8002c(3)	8-6
Inherent responsibilities	Fig. 2-1	2-4
Mission	2003c	2-5
Movement and positioning	8004c(1), 9204b	8-12, 9-29
Reports	8003d, App. F	8-9, F-1
River crossing operations	13007	13-10
Riverine operations	13006	13-9
Route priorities	8004c(3)	8-13
RSOP	9101, 9109, 12003c(3)	9-1, 9-25, 12-7

S

S-1	3005b(1)	3-3
S-2	3005b(2), 7301c(2), 8004a, 9104a(2)	3-3, 7-18, 8-12, 9-4
S-3	3005b(3), 7301c(3), 8004a, 8004c, 9104a(3), 9104c, 9109c, 9109e	3-3, 7-18, 8-12, 8-12, 9-4, 9-6, 9-25, 9-27
S-4	3005b(5), 9104a(4)	3-4, 9-5
S-6	9104c, 9109	9-6, 9-25

	Paragraph	Page
Screen	11005b, 12003c(1)(b)	11-3, 12-4
SEAD fire	4007i	4-17
Sector of fire	9107c, 9103c(3)	9-20, 9-48
Security area	12001b(3), 12003c(1)(f), 12003c(2)(a)	12-2, 12-5, 12-6
Sentinel posts	9301c	9-43
Sheafs	4004f(2)	4-8
Situation map	8003c(1)	8-8
Special staff	3005c	3-5
Supplementary position	9106b(3)	9-14
Supply	1003c(2)	1-5
Survey:		
Battalion	8009a(8)	8-26
Information Center	8009a(3)(d)	8-22
Mission	8009a	8-20
Officer	3005c(3), 9104c	3-5, 9-6
Operations	8009a(3)	8-21
Regimental	1003d, 8009a(7)	1-7, 8-25
Target Area	8009a(11)	8-27

T

Tactical control measures	9209	9-33
Tactical fire direction	4004a(1), 8002b(4), 8004b	4-3, 8-3, 8-12
Tactical marches	9208	9-31
Tactical missions	1003b, 2003, Fig. 2-1	1-6, 2-3, 2-4
Target:		
Area	4005d(2)	4-12
Category	7302a(5)	7-19
Damage assessment	7302f	7-27
High payoff	7302a(4)	7-19
High value	7302a(3)	7-19
Information officer	3005c(7)	3-6
Location	8008b	8-20
Moving	4005d(3)	4-12
Of opportunity	8002b(3)	8-3
Point	4005d(1)	4-12

	Paragraph	Page
Target—Continued		
Priority	8006a(3)	8-18
Processing center	9109d(2)	9-26
Production map	7302d(1)	7-21
Selected standards	7302a(6)	7-19
Suspected	7302a(2)	7-19
Target acquisition	1001a, 4005, 7202, 7302d(3)	1-3, 4-10, 7-6, 7-24
Targeting	7302, Fig. 7-2, 8002b(1), 8004a	7-18, 7-22, 8-2, 8-12
Technical fire direction	4004a(2), 8002b(4)	4-3, 8-3
Terrain gun positioning	9107b(1)(a)	9-17
Track plan	9107b(6)	9-20
Transfer of control	9109f	9-27
Transportation	1003c(3)	1-7

W

Weapon systems	1001b, App. A	1-3, A-1
Withdrawal	12004	12-9

Z

Zone of action	Fig. 2-1	2-4
Zone of fire	Fig. 2-1, 2004d	2-4, 2-7

(reverse blank)

U.S. GOVERNMENT PRINTING OFFICE : 1993 O - 356-548