

FIELD MANUAL
NO. 6-40
MARINE CORPS WARFIGHTING PUBLICATION
NO. 3-1.6.19

HEADQUARTERS
DEPARTMENT OF THE ARMY
U.S. MARINE CORPS
Washington, DC, 23 April 1996

Tactics, Techniques, and Procedures for
FIELD ARTILLERY
MANUAL CANNON GUNNERY

Table of Contents

	PAGE
PREFACE	xviii
 Chapter 1 	
THE GUNNERY PROBLEM AND THE GUNNERY TEAM	
1-1. Gunnery Problem Solution	1-1
1-2. Field Artillery Gunnery Team	1-1
1-3. Five Requirements for Accurate Predicted Fire	1-3
 Chapter 2 	
FIRING BATTERY AND BATTERY FDC ORGANIZATION	
2-1. Firing Battery Organization	2-1
2-2. Battery or Platoon FDC	2-1
2-3. Definitions	2-2
2-4. Relationship Between Battery or Platoon and Battalion FDC	2-3
2-5. Battalion FDC Personnel	2-3

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

*This publication supersedes TC 6-40, 27 December 1988, and rescinds DA Form 5336-R, September 1984, and DA Form 5337-R, September 1984.

PCN: 143 000003 00

Chapter 3
BALLISTICS

3-1.	Interior Ballistics	3-1
3-2.	Transitional Ballistics	3-12
3-3.	Exterior Ballistics	3-12
3-4.	Dispersion and Probability	3-18
3-5.	Causes of Dispersion	3-18
3-6.	Mean Point of Impact	3-19
3-7.	Probable Error	3-20
3-8.	Dispersion Zones	3-20
3-9.	Range Probable Error	3-21
3-10.	Fork	3-22
3-11.	Deflection Probable Error	3-22
3-12.	Time-To-Burst Probable Error	3-22
3-13.	Height-Of-Burst Probable Error	3-22
3-14.	Range-To-Burst Probable Error	3-22

Chapter 4
MUZZLE VELOCITY MANAGEMENT

4-1.	Muzzle Velocity Terms	4-1
4-2.	Calibration	4-4
4-3.	Estimating Shooting Strength	4-12
4-4.	Updating MVV Data	4-14
4-5.	Other Applications	4-14
4-6.	MVV Logbook	4-15
4-7.	Frequency of Calibration	4-15
4-8.	Transferring MVVs	4-16

Chapter 5
FIRE MISSION MESSAGES

Section I	
Fire Order	5-1
5-1. Overview	5-1
5-2. Target Attack Considerations	5-1
5-3. Fire Order Elements	5-2
5-4. Battery or Platoon Fire Orders	5-4
5-5. Fire Order Standing Operating Procedures	5-7
5-6. Battalion Fire Order	5-9
5-7. Massing of Fires	5-11
Section II	
Message to Observer	5-15
5-8. Description	5-15
5-9. Additional Information	5-16
Section III	
Fire Commands	5-17
5-10. Fire Command Elements	5-17
5-11. Battery or Platoon Fire Commands	5-18
5-12. Examples of Fire Commands	5-23
5-13. Standardizing Elements of the Fire Commands	5-24

Chapter 6
FIRING CHARTS

Section I	
Types of Firing Charts	6-1
6-1. Description	6-1
6-2. Firing Chart Construction	6-1
Section II	
Plotting Equipment and Firing Chart Preparation	6-2
6-3. Pencils	6-2
6-4. Plotting Pins	6-3
6-5. Plotting Scale	6-3

FM 6-40/MCWP 3-1.6.19

	PAGE
6-6. Range-Deflection Protractor	6-5
6-7. Target Grid	6-6
Section III	
Surveyed Firing Chart	6-7
6-8. Selection of Lower Left-Hand Corner and Azimuth of Lay	6-7
6-9. Firing Chart Preparation	6-8
6-10. Four-Step Plotting Method	6-9
6-11. Tick Marks	6-12
6-12. Construction of Azimuth Indexes	6-15
6-13. Construction of Deflection Indexes	6-18
6-14. Plotting Targets	6-23
6-15. Determining and Announcing Chart Data	6-25
6-16. Chart-to-Chart Checks	6-28
Section IV	
Observed Firing Charts	6-28
6-17. Overview	6-29
6-18. Methods of Determining Polar Plot Data	6-30
6-19. Constructing Observed Firing Charts	6-30
6-20. Determination of Direction for Polar Plotting	6-32
6-21. Percussion Plot, VI Unknown	6-34
6-22. Percussion Plot, VI Estimated	6-34
6-23. Time Plot, VI Unknown	6-34
6-24. Time Plot, VI Known (Preferred Technique)	6-36
6-25. Setting Up the Observed Firing Chart	6-39
6-26. Example of Percussion Plot, VI Unknown.	6-40
6-27. Example of Percussion Plot, VI Estimated	6-40
6-28. Example of Time Plot, VI Unknown	6-41
6-29. Example of Time Plot, VI Known, XO's High Burst	6-42
6-30. Locate an Observer	6-43
6-31. Battalion Observed Firing Charts	6-43
6-32. Observed Firing Chart With Incomplete Survey	6-45

	PAGE
Section V	
Using Map Spot Data to Construct Firing Charts	6-45
6-33. Map Spot Survey	6-46
6-34. Constructing a Firing Chart From Map Spot Survey	6-46
6-35. Transferring to a Surveyed Firing Chart	6-46

Chapter 7
Firing Tables

Section I	
Tabular Firing Tables	7-1
7-1. Elements and Purpose	7-2
7-2. Cover Information	7-2
7-3. Table A	7-7
7-4. Table B.	7-8
7-5. Table C	7-8
7-6. Table D	7-10
7-7. Table E	7-12
7-8. Table F	7-12
7-9. Extracting Basic HE Data From Table F	7-16
7-10. Table G	7-17
7-11. Table H	7-19
7-12. Table I	7-19
7-13. Table J	7-22
7-14. Table K	7-22
7-15. Illuminating Projectiles	7-22
7-16. TFT Part 3 and Part 4	7-25
7-17. Appendixes	7-25
Section II	
Graphical Firing Tables	7-25
7-18. Overview	7-25
7-19. Low-Angle GFTs	7-27
7-20. High-Angle GFT	7-29
7-21. Illuminating Projectile GFT	7-30

Chapter 8

SITE

8-1.	Initial Elements of the Trajectory	8-1
8-2.	Site in High-Angle Fire	8-2
8-3.	Determination of Altitudes	8-2
8-4.	Determination of Site Without a Graphical Site Table	8-3
8-5.	Determination of Site Without a GST, Requiring Interpolation	8-4
8-6.	Determination of Vertical Angle	8-6
8-7.	The Graphical Site Table	8-6
8-8.	Average Site	8-9
8-9.	Determination of Angle of Site and Vertical Angle With the GST	8-10
8-10.	Determination of Site With the GST	8-11
8-11.	Sample Problems	8-12
8-12.	High-Angle Site	8-14
8-13.	Determination of High-Angle Site With the TFT	8-14
8-14.	Determination of High-Angle Site With a High-Angle GFT	8-15
8-15.	Determination of 10-Mil Site Factor Without a High-Angle GFT	8-16

Chapter 9

FIRE MISSION PROCESSING

Section I

Duties and the Record of Fire	9-1
9-1. Crew Duties for the FDC	9-2
9-2. Elements of Firing Data	9-3
9-3. Recording Firing Data	9-4

Section II

High Explosives	9-11
9-4. Overview	9-11
9-5. Examples of Completing the Record of Fire for HE Fire Missions	9-14
9-6. Example of Completing the Record of Fire for a Nonstandard Square Weight WP or HE Projectile	9-27

	PAGE
Section III	
High-Angle Fire	9-29
9-8. High-Angle GFT	9-30
9-8. Duties of Personnel in High-Angle Fire	9-32
9-9. Example of Completing the ROF for an HE High-Angle Adjust-Fire Mission	9-33
Section IV	
Illumination	9-37
9-10. Overview	9-37
9-11. Illuminating Projectile GFT	9-38
9-12. Illumination Firing Data	9-39
9-13. Determination of Illumination Firing Data With the GFT	9-40
9-14. Determination of Illumination Firing Data With the TFT	9-40
9-15. Processing a One-Gun Illumination Fire Mission	9-41
9-16. Two-Gun Illumination Range Spread	9-44
9-17. Two-Gun Illumination Lateral Spread	9-46
9-18. Four-Gun Illumination--Range and Lateral Spread	9-48
9-19. Coordinated Illumination	9-48
9-20. High-Angle Illumination	9-53

Chapter 10
Registrations

Section I	
Reasons for Registrations	10-1
10-1. Accurate Firing Unit Location	10-1
10-2. Accurate Weapon and Ammunition Information	10-1
10-3. Accurate Meteorological Information	10-2
10-4. Accurate Computational Procedures	10-2
10-5. When to Conduct Registrations	10-2
10-6. Types of Registrations	10-3
10-7. Assurance Tables	10-5
10-8. Registration Corrections and GFT Settings	10-5

	PAGE
Section II	
Precision Registrations	10-6
10-9. Objective	10-6
10-10. Initiation of a Precision Registration	10-6
10-11. Conduct of the impact phase of a precision registration	10-7
10-12. Conduct of the Time Phase of a Precision Registration	10-8
10-13. Second Lot Registrations	10-9
10-14. Initiation of the Second Lot Registration	10-9
10-15. Example of a Completed Precision Registration	10-10
10-16. Abbreviated Precision Registration	10-14
Section III	
High-Burst/Mean Point of Impact Registrations	10-16
10-17. Description	10-16
10-18. Selecting an Orienting Point	10-16
10-19. Orienting the Observers	10-18
10-20. Determining Firing Data	10-19
10-21. Firing the HB or MPI Registration	10-19
10-22. Determine the Mean Burst Location	10-21
10-23. Example of an HB/MPI Registration	10-22
10-24. Determination of the MBL	10-25
10-25. Determine Chart Data and Registration Corrections	10-32
10-26. Effect of Complementary Angle of Site on Adjusted Fuze Setting	10-32
Section IV	
Process an AN/TPQ-36 or AN/TPQ-37 Radar Registration	10-34
10-27. Characteristics	10-34
10-28. Conduct of a Radar Registration	10-35
10-29. Selection of an Orienting Point	10-35
10-30. Orienting the Radar	10-37
10-31. Determine Firing Data to the Orienting Point	10-37
10-32. Firing the HB or MPI Registration	10-37
10-33. Determination of the Mean Burst Location	10-38

	PAGE
10-34. Determination of Chart Data and Registration Corrections	10-38
10-35. DPICM Registrations (M483A1/M509E1)	10-38
Section V	
High-Angle Registration	10-42
10-36. High-Angle GFT	10-42
10-37. Procedures for High-Angle Impact Registration	10-42
10-38. Computation of the Adjusted Elevation	10-42
10-39. DPICM High-Angle Registration	10-45
Section VI	
Offset Registrations or Registrations to the Rear	10-45
10-40. Offset Registration	10-45
10-41. Registrations to the Rear	10-46
Section VII	
Determination and Application of Registration Corrections	10-47
10-42. Computation of Total Range Correction	10-47
10-43. Computation of Total Fuze Correction	10-48
10-44. Computation of Total Deflection Correction	10-49
10-45. Determination of Total Registration Corrections	10-49
10-46. Low-Angle GFT Settings	10-50
10-47. Determination of a GFT Setting When the Registering Piece is not the Base Piece	10-51
10-48. Construction of a GFT Setting	10-52
10-49. Construction of a Two-Plot or Multiplot GFT Setting	10-53
10-50. Update of a GFT Setting When Transferring From a Map Spot or Observed Firing Chart	10-53
10-51. Registration Transfer Limits	10-54
10-52. High-Angle GFT Settings	10-56
10-53. High-Angle Transfer Limits	10-56
10-54. Transfer of GFT Settings	10-57
10-55. Example of Transferring a GFT Setting	10-59

Chapter 11
Meteorological Techniques

Section I		
Principles	11-1
11-1.	Purpose and Use of Met Techniques	11-1
11-2.	Position Constants	11-4
11-3.	Met Messages	11-5
11-4.	Ballistic Met Message	11-6
11-5.	Computer Met Message	11-10
11-6.	Met Message Checking Procedures	11-12
11-7.	Met Message Space and Time Validity	11-14
Section II		
Concurrent Met Technique	11-15
11-8.	DA Form 4200	11-16
11-9.	Solution of a Concurrent Met	11-17
Section III		
Subsequent Met Technique	11-39
11-10.	Overview	11-39
11-11.	Solution of a Subsequent Met	11-39
Section IV		
Subsequent Met Applications	11-49
11-12.	Eight-Direction Met	11-49
11-13.	Solution of an Eight-Direction Met Technique.	11-51
11-14.	Met to a Target	11-60
11-15.	Solution of a Met-to-Target Technique	11-60
11-16.	Computing a GFT Setting for an Unregistered Charge	11-68
11-17.	Met to Met Check Gauge Point	11-70
11-18.	Met + VE	11-70

Chapter 12

**TERRAIN GUN POSITION CORRECTIONS
AND SPECIAL CORRECTIONS**

Section I	
Types of Corrections	12-2
12-1. Overview	12-2
12-2. Piece Displacement	12-2
12-3. Sheafs	12-3
Section II	
The M17/M10 Plotting Board	12-6
12-4. Description	12-6
12-5. Plotting Piece Locations for Weapons Equipped With the M100-Series Sight	12-7
12-6. Plotting Piece Locations for Weapons Equipped With the M12-Series Sight	12-10
12-7. Determination of Base Piece Grid Coordinates.	12-13
Section III	
Terrain Gun Position Corrections	12-14
12-8. Transfer Limits and Sectors of Fire	12-14
12-9. Fire Order and Fire Commands	12-15
12-10. Determination of Terrain Gun Position Corrections	12-16
12-11. Hasty Terrain Gun Position Corrections	12-19
12-12. Determination of Hasty TGPCs	12-20
Section IV	
Special Corrections	12-30
12-13. Definitions and Use	12-30
12-14. Computation of Special Corrections	12-30
Section IV	
Use of Plotting Board for Fire Mission Processing	12-34
12-15. M17 Plotting Board	12-34
12-16. Determination of Subsequent Corrections for a Laser Adjust-Fire Mission	12-36
12-17. Examples of TGPCs.	12-37
12-18. Examples of Special Corrections	12-39

Chapter 13
SPECIAL MUNITIONS

Section I	
Copperhead	13-1
13-1. Description	13-1
13-2. Computations for Shell Copperhead	13-4
13-3. Copperhead SOP	13-5
13-4. Message to Observer	13-6
13-5. Fire Order	13-6
13-6. Computation of Firing Data	13-6
13-7. Angle T and Target Cloud Height Checks	13-7
13-8. Trajectories	13-8
13-9. Switch Setting	13-9
13-10. Computing Site	13-10
13-11. Computing Deflection Correction	13-10
13-12. Limits of the Base Piece Solution	13-10
13-13. Target Attack Contingencies	13-10
Section II	
Rocket-Assisted Projectile	13-18
13-15. Description	13-18
13-16. Manual Computations	13-18
13-17. Registration and Determining a GFT Setting	13-19
Section III	
Smoke Projectiles	13-23
13-18. Description	13-23
13-19. Quick Smoke	13-24
13-20. Quick Smoke Technique	13-26
13-21. Smoke Munitions Expenditure Tables and Equations	13-33
13-22. M825 Smoke Procedures	13-35
13-23. M825 Examples	13-36

	PAGE
Section IV	
Dual-Purpose Improved Conventional Munitions	13-40
13-24. Overview	13-40
13-25. Determining DPICM Firing Data	13-40
Section V	
Family of Scatterable Mines	13-46
13-26. Types of Scatterable Mines	13-46
13-27. FASCAM Tactical Considerations and Fire Order Process	13-48
13-28. Technical Fire Direction Procedures	13-58
13-29. ADAM	13-61
13-30. RAAMS	13-61
13-31. DA Form 5032-R	13-61
13-32. Planned Minefields	13-62
13-33. Target of Opportunity Minefields and Minefields Established in Conjunction With Other Munitions	13-62
13-34. Safety Zone Determination	13-66
13-35. Safety Zone Tables	13-67
13-36. Safety Zone Templates	13-68
13-37. FASCAM Employment Steps	13-69
13-38. Base Bum DPICM (M864)	13-74
13-39. M864 Firing Data Computations	13-74
13-40. Met to a Target	13-75
13-41. M864 Registrations	13-76

Chapter 14

EMERGENCY FDC PROCEDURES

14-1. Methods of Determining Initial Data	14-1
14-2. Methods of Determining Subsequent Data	14-2
14-3. Emergency Firing Chart	14-2
14-4. M10 or M17 Plotting Board	14-9
14-5. Black Magic	14-10
14-6. Emergency Firing Chart Example	14-12
14-7. Black Magic Example	14-14

Chapter 15

SAFETY

Section I

Responsibilities and Duties 15-1

 15-1. Responsibilities 15-1

 15-2. Duties of Safety Personnel 15-2

 15-3. Safety Aids 15-4

Section II

Manual Computation of Low-Angle Safety Data 15-7

 15-4. Safety Card 15-7

 15-5. Basic Safety Diagram 15-8

 15-6. Computation of Low-Angle Safety Data for Shell HE,
Standard Square Weight (No GFT Setting Available) 15-9

 15-7. Safety T 15-10

 15-8. Computation of Low-Angle Safety Data for Nonstandard
Square Weight (Shell HE, WP, or HC) (No GFT Setting Available) 15-11

 15-9. Updating Safety Data After Registration 15-12

 15-10. Low-Angle Illumination 15-13

 15-11. Computation of Safety Data for Illumination,
GFT Method, Low Angle (No GFT Setting Available) 15-14

 15-12. Computation of Safety Data for Illumination, TFT Method, Low Angle 15-15

 15-13. Determination of Maximum Effective Illumination Area 15-17

 15-14. Low-Angle Safety Data for Shell 155 mm M483A1 DPICM,
M825 Smoke, M692/M731 ADAM, M718/M741 RAAM, and
M449 APICM (TFT Method, No GFT Setting Available) 15-17

 15-15. Safety Procedures for M712 Copperhead 15-20

 15-16. Safety Procedures for M549A1 RAP 15-21

 15-17. Safety Procedures for M864 Base Burn DPICM 15-21

Section III

Manual Computation of High-Angle Safety Data 15-21

 15-18. Safety Data for High-Angle Fire 15-21

 15-19. Construction of Basic Safety Diagram 15-22

 15-20. Computation of Safety Data for HA (No GFT Setting Available) 15-23

 15-21. Computation of Safety Data for HA Fire (GFT Setting Available) 15-24

	PAGE
15-22. Computation of Safety Data for HA Illumination (TFT Method)	15-24
15-23. Safety Computations Matrixes	15-25
Section IV	
Minimum Quadrant Elevation	15-26
15-24. Elements of Computation	15-26
15-25. Measuring Angle of Site to Crest	15-28
15-26. Measuring Piece-To-Crest Range	15-28
15-27. Computation for Fuzes Other Than Armed VT	15-28
15-28. Computations for Armed VT Fuze (Low-Angle Fire)	15-30
15-29. Using Minimum Quadrant Elevation	15-32
15-30. Intervening Crest	15-32

Appendix A

BATTERY OR PLATOON FIRE DIRECTION CENTER SOP

A-1. Operational Concepts	A-1
A-2. Duties and Responsibilities Within the FDC	A-1
A-3. Fire Direction Center Operations Checklist	A-4
A-4. Fire Direction Center Journal (Logbook)	A-9
A-5. Fire Direction Center Equipment and Configurations	A-10

Appendix B

FIRE DIRECTION CENTER SECTION EVALUATION GUIDE

B-1. Scope	B-1
B-2. Conduct of the Evaluation	B-1
B-3. Evaluation Format	B-2
B-4. Scoring	B-2
B-5. Qualification	B-2
B-6. Phase I: Test and Answer Key	B-6
B-7. Phase II: Section Performance Test	B-12
B-8. Phase III: Critique Instructions	B-28

Appendix C

TARGET ANALYSIS AND MUNITION EFFECTS AND TERMINAL BALLISTICS

C-1. Target Analysis C-1

C-2. Determining the Precedence of Attack C-1

C-3. Determining Most Suitable Weapon and Ammunition C-6

C-4. Determining the Method of Attack C-7

C-5. Predicting Weapons and Munitions Effects C-8

A-6. Joint Munitions Effectiveness Manuals C-9

C-7. Graphical Munitions Effects Tables (GMETs) C-10

C-8. Quick Reference Tables C-13

C-9. Examples C-17

C-10. Terminal Ballistics C-20

C-11. Munitions Effects C-20

C-12. New Experimental Projectiles C-22

Appendix D

PLANNING RANGES

Appendix E

REPLOTTING PROCEDURES

E-1. Reasons for Replot E-1

E-2. Replot With PD and VT Fuzes E-2

E-3. Time Refinement E-5

E-4. Replot With Time Fuze E-6

E-5. Attack of Large Targets E-7

Appendix F

AUTOMATED FDC

F-1. Personnel F-1

F-2. Fire Order F-1

F-3. Fire Commands F-2

F-4. Establish a Manual Backup for Automated Operations F-2

F-5. Convert a Mission in Progress From Automated to Manual Processing F-3

F-6. Range K and Fuze K F-4

Appendix G

DETERMINING DATA

G-1.	Basic HE Data (155AM2HEM107 GFT)	G-1
G-2.	Determine Firing Data From an HA GFT (GFT Setting Applied)	G-2
G-3.	DPICM Data (155AM2HEM107 GFT)	G-3
G-4.	M825 Smoke Data (155AM2HEM 107/M825 GFT)	G-3
G-5.	ADAM and RAAMS Data (155AN1M483A1 GFT)	G-4
G-6.	Construct a GFT Setting From an HE Registration on an Illuminating GFT	G-5
G-7.	Determine Firing Data From an Illuminating GFT (GFT Setting Applied)	G-5
G-8.	Examples	G-5

Appendix H

SPECIAL SITUATIONS

H-1.	Final Protective Fires	H-1
H-2.	Computational Procedures	H-1
H-3.	Laser Adjust Missions	H-2
H-4.	Laser Adjust-Fire Mission	H-5
H-5.	Radar Adjust-Fire Missions	H-5
H-6.	Destruction Mission	H-8
H-7.	Sweep and Zone	H-9
H-8.	Zone-To-Zone Transformation	H-13
H-9.	Aerial Observers	H-17
H-10.	Ranging Rounds	H-18
H-11.	Time of Flight, Shot, and Splash	H-20
H-12.	Untrained Observers	H-20
H-13.	Example Problems	H-21

Appendix I

SMOKE TABLES

Appendix J

EXTRACT FROM AN-2 TABULAR FIRING TABLE

GLOSSARY	Glossary-1
REFERENCES	References-1
INDEX	Index-1

FOREWARD

This publication may be used by the US Army and US Marine Corps forces during training, exercises, and contingency operations.

General, USA
Commanding
Training and Doctrine Command

Lieutenant General, USMC
Commanding General
Marine Corps Combat Development Command

PREFACE

This field manual (FM) explains all aspects of the cannon gunnery problem and presents a practical application of the science of ballistics. It includes step-by-step instructions for manually solving the gunnery problem and applies to units organized under tables of organization and equipment (TOE) of the L series. The material concerns nonnuclear solutions to the gunnery problem. Automated procedures are covered in ST 6-40-2, ST 6-40-31, and ST 6-50-60.

This publication is a guide for field artillery (FA) officers (commanders and fire direction officers [FDOs]), FA noncommissioned officers (NCOs), and enlisted personnel in the military occupational specialty (MOS) of cannon gunnery (MOS 13E; United States Marine Corps [USMC] MOS 0844/48).

This publication implements the following North Atlantic Treaty Organization (NATO) Standardization Agreements (STANAGs)/Quadrupartite Standardization Agreements (QSTAGs):

STANAG	QSTAG	TITE
2934 (Chap 10) (Ed 1)	182 (Ed 2)	Artillery Procedures, Battlefield Illumination
2934 (Chap 6) (Ed 1)	255 (Ed 3)	Artillery Procedures, Call for Fire Procedures
2934 (Chap 7) (Ed 1)	221 (Ed 2)	Artillery Procedures, Target Numbering System (Nonnuclear)
2934 (Chap 5) (Ed 1)	246 (Ed 3)	Artillery Procedures, Radio Telephone Procedures for the Conduct of Artillery Fire
2934 (Chap 3) (Ed 1)	217 (Ed 2)	Artillery Procedures, Tactical Tasks and Responsibilities for Control of Artillery
2963 (Ed 1)	802 (Ed 1)	Coordination of Field Artillery Delivered Scatterable Mines
4119 (Ed 1)	220 (Ed 2)	Adoption of a Standard (Cannon) Artillery Firing Table Format
none	224 (Ed 2)	Manual Fire Direction Equipment, Target Classification, and Methods of Engagement for Post-1970
4425 (Ed 1)	none	Procedure to Determine the Degree of Interchangeability of NATO Indirect Fire Ammunition-APO-29

The proponent of this publication is Headquarters (I-IQ), US Army Training and Doctrine Command (TRADOC). Send comments and recommendations on DA Form 2028 (Recommended Changes to Publications and Blank Forms) directly to Commandant, US Army Field Artillery School (USAFAS), ATTN: ATSF-GD, Fort Sill, OK 73503-5600.

Unless this publication states otherwise, masculine nouns and pronouns do not refer exclusively to men.

Chapter 1

THE GUNNERY PROBLEM AND THE GUNNERY TEAM

The mission of the Field Artillery is to destroy, neutralize, or suppress the enemy by cannon, rocket, and missile fires and to help integrate all fire support assets into combined arms operations. Field artillery weapons are normally employed in masked or defilade positions to conceal them from the enemy. Placing the firing platoon in defilade precludes direct fire on most targets. Consequently, indirect fire must be used when FA weapons fire on targets that are not visible from the weapons. The gunnery problem is an indirect fire problem. Solving the problem requires weapon and ammunition settings that, when applied to the weapon and ammunition, will cause the projectile to achieve the desired effects on the target.

1-1. Gunnery Problem Solution

a. The steps in solving the gunnery problem areas follows:

- (1) Know the location of the firing unit, and determine the location of the target.
- (2) Determine chart (map) data (deflection, range from the weapons to the target, and altitude of the target).
- (3) Determine vertical interval (VI) and site (si).
- (4) Compensate for nonstandard conditions that would affect firing data (meteorological [met] procedures).
- (5) Convert chart data to firing data (shell, charge, fuze, fuze setting, deflection, and quadrant elevation).
- (6) Apply the firing data to the weapon and ammunition.

b. The solution to the problem provides weapon and ammunition settings that will cause the projectile to function on or at a predetermined height above the target. This is necessary so the desired effects will be achieved.

1-2. Field Artillery Gunnery Team

The coordinated efforts of the field artillery gunnery team are required to accomplish the solution of the gunnery problem outlined in paragraph 1-2. The elements of the team must be linked by an adequate communications system.

<p>NOTE: The terms <i>battery</i> and <i>platoon</i> used throughout this manual are synonymous, unless otherwise stated.</p>
--