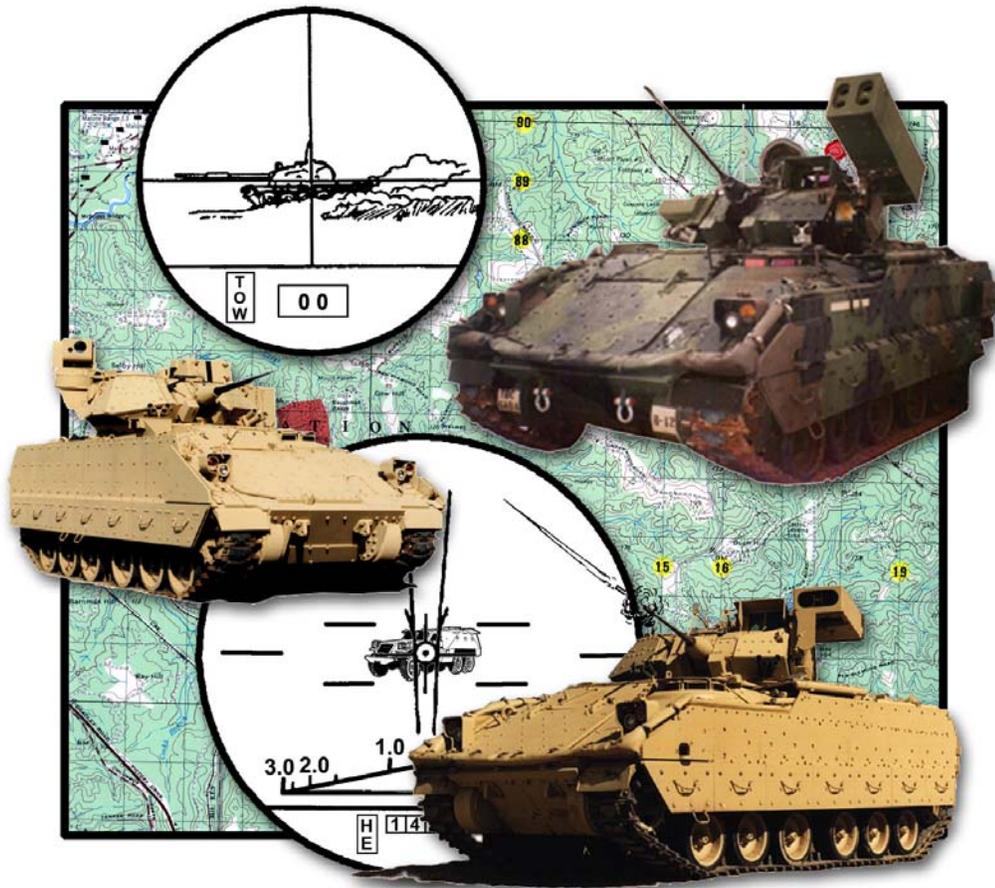


BRADLEY GUNNERY



NOVEMBER 2003

HEADQUARTERS, DEPARTMENT OF THE ARMY

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BRADLEY GUNNERY

CONTENTS

	Page
Gunnery Tables.....	viii
Preface.....	ix
CHAPTER 1. VEHICULAR SYSTEMS	
1-1. Overview of Models	1-1
1-2. M2A2 and M3A2 Models.....	1-1
1-3. M2A2 ODS and ODS-E, and M3A2 ODS	1-1
1-4. M2A3 and M3A3 Models.....	1-3
1-5. M6 Linebacker.....	1-5
1-6. M7 Bradley Fire Support Team.....	1-7
1-7. Bradley Rollover Drill	1-7
CHAPTER 2. WEAPONS AND AMMUNITION	
Section I. Weapon Systems.....	2-1
2-1. M242 25-mm Automatic Gun.....	2-1
2-2. M240C 7.62-mm Coaxial Machine Gun	2-4
2-3. Tube-Launched, Optically Tracked, Wire-Guided Missile.....	2-5
2-4. M231 5.56-mm Firing Port Weapon.....	2-11
2-5. M257 Smoke-Grenade Launcher.....	2-11
2-6. Stinger Missile Subsystem.....	2-12
Section II. Ammunition	2-12
2-7. M242 25-mm Automatic Gun (Standard)	2-13
2-8. M240C 7.62-mm Coaxial Machine Gun	2-19
2-9. Tube-Launched, Optically Tracked, Wire-Guided Missile.....	2-19
2-10. Stinger Missile	2-22
2-11. M231 5.56-mm Firing Port Weapon.....	2-23
2-12. M257 Smoke-Grenade Launcher.....	2-24

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*This publication supersedes FM 23-1, 18 March 1996.

	Page
CHAPTER 3. CREW TRAINING	
Section I. Tasks	3-1
3-1. Skills	3-1
3-2. Preliminary Gunnery.....	3-1
3-3. COFT and BATS	3-2
3-4. Device Gunnery	3-2
3-5. Live-Fire Gunnery.....	3-3
Section II. Leader Skills	3-3
3-6. Coordination and Integration	3-3
3-7. Close Combat.....	3-3
Section III. Development of Training Program	3-4
3-8. Battle Focus	3-4
3-9. Mission-Essential Task List.....	3-4
3-10. Commander's Assessment.....	3-4
Section IV. Training Strategy.....	3-5
3-11. Crew Training	3-5
3-12. Cross Training.....	3-6
3-13. Integrated Training.....	3-6
Section V. Training Plans	3-7
3-14. Bradley Master Gunner	3-7
3-15. Relationships Between Key Leaders and Trainers.....	3-8
3-16. Crew Stability Management.....	3-9
3-17. Long-Range Training Plans	3-10
3-18. Short-Range Training Plans.....	3-11
3-19. Near-Term Training Plans	3-12
Section VI. Collective Training	3-13
3-20. Home-Station Gunnery	3-13
3-21. Gunnery Densities.....	3-13
3-22. Gunnery Levels	3-13
3-23. Gunnery Conditions	3-14
3-24. Training Requirements.....	3-14
CHAPTER 4. TRAINING DEVICES	
4-1. Types.....	4-1
4-2. Appended Equipment.....	4-1
4-3. Simulators	4-8
4-4. Training Aids	4-12
CHAPTER 5. RANGE OPERATIONS	
5-1. Preparation and Operation	5-1
5-2. Reconnaissance	5-4
5-3. Personnel, Equipment, and Layout	5-5
5-4. Establishment of Live-Fire Range	5-14
5-5. Digital Range Setup	5-20

	Page
CHAPTER 6. ENGAGEMENT PROCESS	
Section I. Target Acquisition	6-1
6-1. Search.....	6-2
6-2. Target Detection.....	6-7
6-3. Target Location	6-9
6-4. Range Estimation	6-10
6-5. Range Determination	6-11
6-6. Target Identification.....	6-23
6-7. Acquisition Reports	6-24
Section II. Decision Process	6-25
6-8. Determination of Target Threat Levels.....	6-25
6-9. Selection of Weapon and Ammunition.....	6-25
6-10. Target Confirmation.....	6-26
Section III. Engagement Execution	6-27
6-11. Methods.....	6-27
6-12. Techniques	6-28
6-13. Direct-Fire Adjustment	6-32
6-14. 25-mm-Point Targets	6-33
6-15. Fire-Control Subsystem	6-33
6-16. Kinematic Lead.....	6-34
6-17. Bradley A3 25-mm Point Targets	6-34
6-18. Failure of Eye-Safe Laser Range Finder	6-34
6-19. 25-mm Area-Targets	6-35
6-20. Coax Machine Gun	6-36
6-21. Suppressive Fire.....	6-36
6-22. Coax Point Targets.....	6-36
6-23. Coax Area Targets	6-37
6-24. Bradley A3 Coax	6-38
6-25. Other Uses of Machine-Gun Fire.....	6-39
6-26. Tube-Launched, Optically Tracked, Wire-Guided Missile.....	6-40
6-27. M257 Smoke-Grenade Launcher	6-42
6-28. M231 Firing-Port Weapon (M2 Only)	6-42
6-29. Aerial Targets.....	6-42
6-30. Problem Areas.....	6-49
6-31. Bradley A3 Aided-Target-Tracker Mode.....	6-49
6-32. Termination of Engagement.....	6-50
6-33. Kill Standards.....	6-50
6-34. Armored Vehicles	6-51
6-35. Unarmored Vehicles	6-51
6-36. Infantry Rifle Squads and Antiarmor Systems.....	6-51
Section IV. Fire Commands.....	6-52
6-37. Elements.....	6-52
6-38. Terms	6-52
6-39. Methods.....	6-55

	Page
Section V. Crew Duties in an Engagement.....	6-64
6-40. Defensive Engagements.....	6-64
6-41. Offensive Engagements	6-71
 CHAPTER 7. PRELIMINARY GUNNERY	
Section I. Basic Instruction	7-1
7-1. Hands-On Training	7-2
7-2. Range-Determination Training	7-7
7-3. Direct-Fire-Adjustment Exercises.....	7-8
Section II. TOW Training.....	7-12
7-4. Basic Tasks	7-12
7-5. Operation in Power Mode.....	7-13
7-6. Preparation for Loading	7-13
7-7. Loading Procedures.....	7-14
7-8. Fire and Immediate Action	7-14
7-9. Removal of Misfired Missile	7-15
7-10. Manual Procedure for Raising Launcher	7-15
7-11. Tracking	7-16
7-12. COFT Training.....	7-16
7-13. BATS Training.....	7-16
Section III. Standard Vehicle-Mounted Launcher	7-16
7-14. Raise the Stinger Launcher	7-16
7-15. Lower the Stinger Launcher.....	7-17
7-16. Load Stinger Missiles.....	7-17
7-17. Unload Stinger Missiles.....	7-18
7-18. Operate the Linebacker in the Engage Mode.....	7-19
7-19. Perform Immediate Action for Stinger Misfire.....	7-19
7-20. Remove a Misfired Stinger Missile from the Launcher.....	7-20
Section IV. Bradley Range Card	7-20
7-21. Description.....	7-21
7-22. Preparation	7-23
7-23. Digital Range Card Overlay.....	7-35
7-24. Firing Position.....	7-37
7-25. Task.....	7-38
 CHAPTER 8. CREW GUNNERY	
Section I. Evaluation	8-2
8-1. Engagement Standards	8-2
8-2. Task Standards	8-2
8-3. Critical Subtask Standards	8-12
8-4. Leader Subtask Standards	8-12
8-5. Noncritical Subtask Standards	8-14
8-6. Crew Device-Gunnery Standards	8-15
8-7. Crew Live-Fire Gunnery Standards	8-16

	Page
8-8. Qualification Refires	8-17
8-9. Alibis	8-17
8-10. Crew Scoresheet	8-17
Section II. Evaluators	8-19
8-11. Duties	8-19
8-12. Certification	8-19
8-13. Recertification	8-20
8-14. Sustainment	8-20
Section III. After-Action Reviews	8-20
8-15. Planning	8-20
8-16. Preparing	8-21
8-17. Conducting	8-21
Section IV. Device Gunnery	8-23
8-18. Guidelines	8-23
8-19. Bradley Table I, Crew Defense	8-24
8-20. Bradley Table II, Crew Proficiency Course	8-26
Section V. Live-Fire Gunnery	8-31
8-21. Development of Table	8-31
8-22. Targetry	8-32
8-23. Ammunition	8-33
8-24. Allowable Variations	8-33
8-25. Prerequisites	8-34
8-26. Bradley Table V, Crew Practice 1	8-34
8-27. Bradley Table VI, Crew Practice 2	8-36
8-28. Bradley Table VII, Crew Practice 3	8-36
8-29. Bradley Table VIII, Crew Qualification	8-36
CHAPTER 9. INFANTRY PLATOON	
Section I. Training Program	9-1
9-1. Infantry Squad Training	9-2
9-2. Integrated Training	9-3
9-3. Requirements	9-3
Section II. Fire Distribution and Control	9-4
9-4. Principles	9-4
9-5. Fire-Control Measures	9-5
9-6. Fire Plans	9-9
Section III. Evaluation	9-16
9-7. Evaluation Team	9-16
9-8. Evaluation Guidelines	9-17
9-9. Assessment of Penalties	9-18
9-10. Examples	9-19
Section IV. Section and Platoon Device Gunnery	9-20
9-11. Guidelines	9-21
9-12. Bradley Table III, Infantry Squad and Section Exercise	9-21

	Page
9-13. Bradley Table IV, Infantry Platoon Proficiency Course	9-21
Section V. Platoon Gunnery	9-22
9-14. Development of Exercise	9-22
9-15. Prerequisites	9-25
9-16. Bradley Table XI, Infantry Platoon Practice	9-25
9-17. Bradley Table XII, Infantry Platoon Qualification	9-26
CHAPTER 10. CAVALRY SECTION ADVANCED TABLES	
10-1. Principles of Training	10-1
10-2. Purpose of Gunnery Tables	10-2
10-3. Evaluation Procedures and Standards	10-3
10-4. Scoring Procedures	10-4
10-5. Ratings	10-5
10-6. Targets	10-5
10-7. Bradley Table IX, Scout Section Training	10-6
10-8. Bradley Table X, Scout Section Qualification	10-11
CHAPTER 11. AIR DEFENSE ADVANCED TABLES	
11-1. Development of Exercise	11-1
11-2. Live-Fire Requirements	11-3
11-3. Targetry	11-3
11-4. Ammunition	11-4
11-5. Evaluation Standards	11-4
11-6. Army Universal Task List	11-5
11-7. Evaluation Team	11-6
11-8. Prerequisites	11-6
11-9. Refires for Qualification	11-6
11-10. Bradley Tables IXA And IX, Section Practice	11-6
11-11. Bradley Tables XA and X, Section Qualification	11-7
CHAPTER 12. ENGINEER GUNNERY	
12-1. Engineer Platoon Training Program	12-1
12-2. Development of Exercise	12-2
12-3. Prerequisites	12-5
12-4. Engineer Bradley Tables III and IV, Section and Platoon Device Gunnery	12-5
12-5. Engineer Bradley Table XI, Platoon Practice	12-5
12-6. Engineer Bradley Table XII, Platoon Qualification	12-6
CHAPTER 13. FIRE-SUPPORT TEAM GUNNERY	
Section I. Training Program	13-1
13-1. Crew Training	13-1
13-2. UCOFT Training Strategy	13-3
13-3. Advanced Gunnery	13-3

	Page
Section II. Evaluation	13-3
13-4. Standards.....	13-3
13-5. Team	13-4
Section III. Advanced Gunnery.....	13-6
13-6. Development of Exercise.....	13-6
13-7. Prerequisites for BFIST Table X.....	13-9
13-8. Collective Task List	13-9
13-9. Refires for Qualification	13-10
13-10. BFIST Table IX, Crew Fires-Integration Course.....	13-10
13-11. BFIST Table X, Crew Certification.....	13-10
13-12. Fire Commands.....	13-10
APPENDIX A. BRADLEY GUNNERY SKILLS TEST.....	A-1
APPENDIX B. BORESIGHTING.....	B-1
APPENDIX C. ZEROING.....	C-1
APPENDIX D. PREFIRE CHECKS, MALFUNCTIONS, AND POSTFIRE CHECKS	D-1
APPENDIX E. URBAN OPERATIONS	E-1
APPENDIX F. RIFLE INFANTRY TRAINING.....	F-1
GLOSSARY	Glossary-1
REFERENCES	References-1
INDEX	Index-1

DA Form 7354-R (Revised), Bradley Crew Scoresheet
 DA Form XXX-A-R, Bradley Gunnery Skills Test Scoresheet
 DA Form XXX-B-R, Boresight Telescope Accuracy Test Scoresheet

TABLE	TITLE	PAGE
I	Crew Defense, All *	8-26
II	Crew Proficiency Course--	
	ODS and below	8-27
	ADA Linebacker	8-28
	A3	8-29
	BFIST	8-30
III	Infantry Squad/Section Exercise	9-21
	Engineer Section/Platoon Device Gunnery	12-5
IV	Infantry Platoon Proficiency Course	9-21
	BFIST Proficiency Course	9-21
V	Crew Practice 1, All	8-35
VI	BT VI, Crew Practice 2--	
	ODS and below	8-36
	ADA Linebacker	8-37
	A3	8-38
	BFIST	8-38
VII	Crew Practice 3--	
	ODS and below	8-40
	ADA Linebacker	8-41
	A3	8-42
	BFIST	8-43
VIII	Crew Qualification--	
	ODS and below	8-44
	ADA Linebacker	8-45
	A3	8-46
	BFIST	8-47
IX	Cavalry Section Training	10-6
	Air Defense Section Practice 2	11-6
	BFIST Fires Integration Course	13-8
X	Cavalry Section Qualification	10-11
	Air Defense Section Qualification	11-7
	BFIST Certification	13-8
XI	Infantry Platoon Practice	9-25
	Engineer Platoon Practice	12-5
XII	Infantry Platoon Qualification	9-26
	Engineer Platoon Qualification	12-6
<p>NOTE: Most tables are illustrated only the first time they are discussed; consequently, some page numbers refer only to a text discussion.</p>		

Firing tables in this manual listed in numerical order.

PREFACE

This manual explains Bradley system gunnery doctrine and techniques. Operator's manuals cover everything else. Where procedures conflict, the readers should follow the ones in the technical manuals, because they can obtain priority updates for them.

Except as noted, this text refers not to published editions of ARTEPs, but to those posted in March 2000 (or later) to the Reimer Digital Library (RDL).

Every person who works in any way with BFVs should have access to this manual: commanders, staff, master gunners, and leaders at all levels. With it, they can develop gunnery programs to sustain combat readiness.

The crewmember will find specific information, but training managers and master gunners will find the information they need to develop BFV training. This includes--

- M2 and M3 Bradley gunnery theory, methods, and techniques.
- System features and capabilities.
- Gunnery training and evaluation at all levels.

The first eight chapters apply to all Bradleys. Subsequent chapters provide training strategies and advanced gunnery by MOS.

References to division commands and master gunners include enhanced or separate brigade commands and brigade master gunners. Double vertical lines in the margins (as shown for this paragraph) identify information that pertains only to the Bradley A3.

The proponent for this manual is the United States Army Infantry School. Send comments and recommendations to doctrine@benning.army.mil or on DA Form 2028 to Commandant, USAIS, ATTN: ATSH-ATD, Fort Benning, Georgia 31905-5410.

Unless this manual states otherwise, masculine nouns and pronouns may refer to men or to women.

CHAPTER 1

Vehicular Systems

The Bradley fighting vehicle (BFV) contributes to the combined arms effort. It provides the Infantry, Cavalry, Engineers, Air Defense, and Field Artillery with firepower, armor protection, and battlefield agility.

To employ the Bradley effectively, soldiers must know the characteristics and capabilities of its vehicles. As the Army upgrades and improves the BFV, and as Army doctrine changes, soldiers must stay current on the Bradley's capabilities.

1-1. OVERVIEW OF MODELS

The original BFV models are the M2 Infantry fighting vehicle (IFV) and the M3 Cavalry fighting vehicle (CFV), both of which fielded in 1983. Later model numbers represent upgrades or differences in system configurations and capabilities. These include the following. (Table 1-1, page 1-2, shows BFV technical data by model):

- M2 and M3.
- M2A2 and M3A2.
- M2A3 and M3A3.
- M2A2 ODS, M2A2 ODS-E, M3A2 ODS.
- M6 Linebacker.
- M7 BFIST.

1-2. M2A2 AND M3A2 MODELS

The A2 models offered several improvements over its predecessors. These improvements included an increase of 100 HP in the power train, 30-mm armor protection, armored-tile protection capability, and spall liners.

1-3. M2A2 ODS AND ODS-E, AND M3A2 ODS

Lessons learned during Operation Desert Storm inspired the development of two new Bradley models, the M2A2 ODS and M3A2 ODS. The M2A2 ODS-E model is tailored specifically for Engineer use. The ODS upgrades include the following:

a. **Eye-Safe Laser Range Finder.** The eye-safe laser range finder (ELRF) is part of the vehicle's integrated-sight unit (ISU). Using the ELRF, the crew can determine target ranges from 200 to 9,995 meters, accurate within 10 meters. The ELRF induces the weapon systems to superelevate for the determined range.

b. **Tactical Navigation System.** The TACNAV system comprises the precision lightweight GPS receiver (PLGR) and the digital compass system (DCS). It reports the vehicle's position in three dimensions: longitude and latitude, grid location, and elevation. The PLGR works with the DCS to provide the BFV's hull and turret azimuths, location, directions, distance to way points, and steer-to data. This information shows up on both the commander's and driver's compass displays.

CHARACTERISTICS	M2, M2A2	M3, M3A2	M2A2 ODS, ODS-E	M3A2 ODS	M2A3	M3A3	M6	M7
Weight (Combat, Pounds)	50,259 63,982	49,945 64,204	66,401	64,204	66,000	66,000	66,000	66,000
Ground Pressure	7.7	7.7	9.9	9.9	9.93	9.93	10.2	10.2
Fuel Capacity (Gallons)	175	175	175	175	175	175	175	175
Cruising Range (Miles, KM)	300, 483	300, 483	250, 400	250, 441	250, 441	250, 441	250, 441	250, 441
Engine	VTA-903T	VTA-903T	VTA-903T	VTA-903T	VTA-903T	VTA-903T	VTA-903T	VTA-903T
Gross Horsepower (HP)	500	500	600	600	600	600	600	600
Gross HP-to-Weight (Tons)	20.62	20.62	18.9	18.9	18.7	18.7	18.2	18.2
Transmission	500	500	500-3EC	500-3EC	500-3EC	500-3EC	500-3EC	500-3EC
Speed (MPH, KPH) Land	41, 66	41, 66	38, 61	38, 61	38, 61	38, 61	38, 61	38, 61
Speed (MPH, KPH) Water	4.5, 7	4.5, 7	5, 8	5, 8	NA	NA	NA	NA
Slope Climb	60%	60%	60%	60%	60%	60%	60%	60%
Trench Crossing	8'4"	8'4"	8'4"	8'4"	8'4"	8'4"	8'4"	8'4"
Vertical Wall Climb (Inches)	36	36	36	36	36	36	36	36
Personnel Capacity (Crewmembers)	3	3	3	3	3	3	4	4
Personnel Capacity (Passengers)	7, 6	2	7	2	7	2	1	1
Total Personnel Capacity (Passengers + Crewmembers)	10, 9	5	10	5	10	5	5	5
Firing Ports	6, 2	0	2	0	2	0	0	0
TOW Missile Variant	*All	*All	All	All	All	All	NA	NA
TOW Missile Ready	2	2	2	2	2	2	NA	NA
TOW Missile Stowed	5	10	5	10	5	10	NA	NA
25-mm Ammo Ready	300	300	300	300	300	300	300	300
25-mm Ammo Stowed	600	1,200	600	1,200	600	1,200	300	300
M240C 7.62-mm Coax Ready	800	800	800	800	800, 400**	800, 400**	400	800
M240C 7.62-mm Coax Ammo Stowed	1,400	3,600	1,400	3,400	1,400	3,400	2,800	2,800
M60 7.62-mm Ammo Stowed	2,200	3,200	2,200	3,400	2,200	3,400	NA	NA
M231 FPW 5.56-mm Ammo Stowed	4,200	0	2,200	0	2,520	0	NA	NA
M16 5.56-mm Ammo Stowed	2,520	1,680	2,520	1,680	2,520	1,680	1,680	1,680
Stinger Missile Ready	NA	NA	NA	NA	NA	NA	4	NA
Stinger Missile Stowed	NA	NA	NA	NA	NA	NA	6	NA
* Firing the TOW 2, TOW 2A and TOW 2B missiles from the basic TOW launcher is possible; however, the missile will have a reduced probability of hit.			** The Bradley A3 command vehicle will have 400 7.62 rounds in the ready.					

Table 1-1. Comparison of BFV technical data by model.

c. **Missile Countermeasure Device.** With the missile countermeasure device (MCD), Bradley crews can deter first-generation thermal, wire-guided antitank missiles. This greatly increases the survivability of crews.

d. **Improved Vehicle Stowage.**

- (1) Bench seats.
- (2) A tenth-man seat.
- (3) Mounted water ration heater.
- (4) Electric lift for engine-access door.
- (5) Outside stowage for personal gear.
- (6) Three 25-mm ammunition boxes. Each box contains 50 rounds of linked ammunition (a "hot box").

e. **Driver's Vision Enhancer.** The driver's vision enhancer (DVE) is an uncooled, forward-looking, infrared (FLIR) night-vision device. It has a sensor module and a display module. The DVE is a real-time thermal-imaging system. It operates in the 8- to 12-micron spectral range. Detectors convert received infrared radiation into electrical signals. The DVE processes the signals and displays the resulting image onto a flat-panel LCD screen.

f. **Force XXI Battle Command Brigade and Below.** The FBCB2 is a digital battlefield command information system. The FBCB2 and integrated communications, command, and control (IC3) give A2 ODS, and A3 crews situational awareness and real-time C2.

1-4. M2A3 AND M3A3 MODELS

Innovations on the digitized M2A3 and M3A3 BFV improve the BFVs' abilities to shoot, move, and communicate:

a. **Target Acquisition.** Each A3 model has a commander's independent viewer (CIV) and the improved Bradley acquisition subsystem (IBAS).

(1) **Commander's Independent Viewer.** The CIV gives the A3 dual-sight capability. With the CIV, the commander can acquire targets independently from the gunner.

(a) While the gunner "kills" acquired targets, the commander can search for new ones. He then designates the new targets and "hands them over" to the gunner. If for any reason the gunner cannot fire, the commander can do so from his station by selecting IBAS on the remote biocular display (RBD).

(b) The CIV can traverse a full circle (360 degrees) in azimuth and can depress and elevate from -22 to +60 degrees.

(c) The CIV uses second-generation FLIR technology and day-TV video. The video image from the CIV appears on the RBD. This allows the viewer to watch the image with both eyes at the same time. The gunner and squad leader can also watch this video signal.

(2) **Improved Bradley Acquisition Subsystem.** On the A3, the gunner's primary sight is the target-acquisition system (TAS), which is part of the IBAS. Like the CIV, the TAS employs second generation FLIR technology and day-TV video. Like the A2 ODS, the TAS also has direct-view optics (DVO) and the eye-safe laser range finder. The TAS provides limited sight travel without the disturbing turret motion experienced in the earlier BFVs. The TAS periscope's head mirror assembly provides 5 degrees of travel left or right of center and 17 degrees of travel above and below center. This extends the gunner sight's elevation range from -22 to +60 degrees. This "independent" travel

accommodates the aided target tracker (ATT), which allows the gunner to track two different targets within the same field of view (FOV) simultaneously. Using the autopoint function allows the system to slew quickly to the closest tracked box nearest the center of the reticle. As with the CIV, both the commander and the squad leader can see the TAS video image. The TAS can also zoom from 4X to 48X to help identify the threat (digital zoom).

b. **Turret Drive System.** The TDS moves the weapon and stabilizes the A3 weapon systems. The TDS responds to fire-control system and crew inputs from the handstation.

c. **Situational Awareness.** Improvements to the sights and the commander's tactical display (CTD) give the A3 commander a level of situational awareness never before possible. The squad leader's display (SLD), controlled by video selection buttons on the monitor, also gives passengers situational awareness of the battlefield. It gives more information about the battlefield location of each vehicle in the company, team, or task force. It also gives operational graphics, and it lets the leader send and receive orders and mission updates and respond to an expanding area of operations.

d. **Electrical Power Control.** The A3 has segregated electrical power control. This means that many of its components can keep working when others fail. Connection to a data bus provides redundant communications. The A3 has a 400-ampere current-regulated generator. The generator supplies power to six 24-volt hull batteries and one 24-volt emergency-backup turret battery.

e. **Fire Control.** The A3's fire-control system allows the crew to independently search, track, and conduct target hand-off. Like the other BFVs, it also allows the commander to override the gunner and to abort a fired missile.

f. **Integrated Communications, Command, and Control.** The IC3 digital battle command information system provides situational awareness. It also offers real-time command and control information to A3 crews and passengers.

g. **Navigation.** The A3's position-navigation subsystem (POS-NAV) provides the A3 with accurate positioning and navigation data. It works by combining GPS data with data obtained from an inertial navigation unit (INU) and a vehicle motion sensor (VMS). Using the CTD's digital map, the crew can navigate by loading and selecting routes and overlays.

h. **NBC Protection.** The A3's large gas-particulate filter system has additional crew stations and heaters to provide NBC protection to the entire Bradley crew and passengers.

i. **Diagnostics.** The A3 maintains a higher level of combat survivability than earlier models. The A3's built-in-test (BIT) continually monitors the system's turret status. On the commander's tactical display, the BIT shows warnings and cautions about potentially dangerous faults. It recommends degraded modes of operation when needed. Using pre-mission and PMCS checklists simplifies system maintenance.

1-5. M6 LINEBACKER

Air defense-specific modifications to the Bradley give the maneuver force continuous day and night air-defense coverage, slew-to-cue (STC) acquisition, and shoot-on-the-move aerial-engagement capability. These all rely on having as the primary weapon system a standard vehicle mounted launcher (SVML) and on having Stinger missiles. The M242 gun provides extra air defense coverage in missile dead zones and self defense protection against ground targets.

a. **Slew-To-Cue Acquisition.** The M6 Linebacker can receive and display forward area air defense (FAAD) command, control, communications, and intelligence (C3I) cueing information while stationary or on the move. This increases its ability to keep up with the maneuver force and to engage aerial targets before other assets can either observe or attack. STC lets the Linebacker interface with the digital early-warning data from the Enhanced Position-Location Reporting System (EPLRS)-based inter-FAAD network. This allows automatic slewing of the turret in both azimuth and elevation on hooked tracks, and centering of the aerial target in the gunner's FOV. Once the STC processes the slew command and acquires the target, the system continues to track until the gunner engages the aerial target, or until he receives the command to disengage.

b. **Standard Vehicle Mounted Launcher.** Replacing the TOW launcher with the SVML and fire-control system gives the Linebacker both a superelevation and a 360-degree launch capability with four ready-to-fire Stinger missiles. This gives the vehicle an effective shoot-on-the-move capability. At the same time, it enhances crew survivability and provides continuous air-defense coverage for rapid maneuver forces. The armored SVML assembly includes an alignment plate for azimuth boresighting. Crewmembers can load and unload Stinger missiles through both inside and outside access doors. The Stinger elevation drive-select lever allows the gunner to operate the SVML in either manual or power mode.

c. **Modes of Operation.** The SVML has four modes:

(1) **OFF.** In this mode, the SVML is stowed.

(2) **ON.** In this mode, the SVML is stowed. The Stinger system powers up and automatically runs the built-in-test (BIT). The SVML runs the Stinger BIT continuously. If the BIT finds a fault, the fault indicator FLT lights on the system control box (SCB), and the CDT displays a fault message.

(3) **LAUNCHER UP.** In this mode, the SVML is in the deployed position at an angle of 0 degrees. If the launcher deploys within 16 seconds after the gunner pulls the palm grips, the SCB GO light comes on. The BC runs the Stinger BIT continuously.

(4) **ENGAGE.** In this mode, the SVML is in the deployed position and tracks in elevation. Only the gunner's handstation is enabled. Switch functions of the gunner's handstation change to allow the gunner to activate and uncage the Stinger missile before firing. The Stinger vision module (SVM) displays missile-related symbology, launcher azimuth and elevation angles, and cueing information from the FAADS network. The BC continuously runs the Stinger's BIT.

d. **Stinger Vision Module.** The ISU has the SVM, which shows the gunner the Stinger symbology, target data, and turret or launcher position, all of which he must know to fire the missile. Upon missile uncage, the SVM indicates the position of the Stinger missile seeker. This feature is available to the gunner for all primary sighting modes such as FLIR and DVO. The SVM with Stinger missile-tone audio improves aerial targeting and helps the gunner to ensure that the Stinger missile locks onto the correct target rather than onto friendly aerial platforms or clutter. This also conserves missiles and reduces fratricide. The Stinger vision module electronics (SVME) links the SVM to the Bradley crew evaluator (BCE). The SVME is located behind the gunner, above the EPLRS radio. The SVM, SVME, and ISU permit day and night operation of the Stinger system and continuously send status reports to the gunner.

e. **Identify Friend or Foe.** The IFF system provides aerial target identification. Components include the IFF antenna mounted on the right front of the turret, the IFF interconnect box, and the IFF interrogator mounted to the right of the commander. The IFF antenna transmits signals from the IFF interrogator and receives the response signals from the aerial targets. To interrogate aerial targets, the gunner presses forward on either side-thumb switch on his handstation. The IFF announces the results of the interrogation over the intercom system as a series of tones.

f. **Stinger Control Box.** The SCB is the primary operator interface for the Stinger system. This box houses the controls and indicators for performing aerial engagements with the Stinger missiles. It lets the gunner move the SVML electrically into any of the following. (Indicator lights supply GO/Fault BIT results and firing indicators and conditions of the Stinger system):

- Deployed or stowed positions
- Automatic or manual stinger missile tracking
- Indicator lights and lamp test
- Mode switch selection of system operation.

g. **Gunner's Controls.** In the STINGER ENGAGE mode, the gunner's controls can interrogate aerial targets friend or foe; and they can activate, uncage, and fire the Stinger missile. When the gunner's controls are in this mode, the commander's controls are inoperative.

h. **Interface Electronics Assembly.** This assembly receives mode signals from the BCE and SCB, plus operational commands from the gunner's control handstation, which directs the activating, uncaging, and firing of the Stinger missile. The IEA also processes aerial target data from the activated missile, giving the gunner a visual identification when the seeker locks onto the target.

i. **Handheld Terminal Unit.** This is a small computer terminal used to receive, process, and display aerial-targeting information, messages, and data. It is located in front of the commander and mounts on the 7.62-mm gun door. The HTU interfaces with the FAAD PLGR for carrier position and receives aerial target information from the Sentinel radar via EPLRS radios.

j. **Enhanced Position-Location Reporting System.** The EPLRS radio provides digital communication between all EPLRS-equipped divisional Linebacker elements. They use the EPLRS radios to broadcast battle management and air-tracking data to the HTU.

1-6. M7 BRADLEY FIRE SUPPORT TEAM

Integrating FIST mission equipment lets the Bradley complete fire-support missions by day or night. This model adds an inertial navigation system and a new targeting station-control panel. A mission-processor unit automates the fire-request system. Having the 25-mm automatic cannon gives the BFIST unit self-defense and the ability to locate targets on the move. The M7 has the same mobility, survivability, and battlefield signature as the A2 Bradley.

1-7. BRADLEY ROLLOVER DRILL

The Bradley can roll over in rough terrain. This paragraph explains how crews can get out of the vehicle quickly and safely, depending on the situation. The first crewmember to notice the vehicle starting to roll over should say "Rollover" and act IAW Table 1-1.

a. **Equipment Stowage.** Proper stowage of equipment prevents unnecessary injuries. Crewmembers must stow all equipment IAW published TMs and unit SOPs.

b. **Fire-Suppression System.** When a vehicle rolls over while still running, fuel and oil pouring from the engine can start a fire. The internal fire-suppression system trips only when the flame sensors detect a blazing fire. The system dispenses large amounts of CO2 into the crew compartment, which can suffocate the crew. Consequently, during operation, the driver can leave the system set to the manual mode, and exiting crewmembers can activate the system themselves. He generally leaves the system in automatic mode when the vehicle is unmanned. If the crew exits a burning vehicle, they should try to take all weapons and protective gear, if they can do so safely (Figure 1-1).

BC	Gunner	Driver	Squad Member
<i>BFV Is Rolling Over</i>			
Drops inside turret and braces for impact.	Braces for impact by holding the bottom of seat.	Braces for impact by placing hands on walls of driver compartment.	Braces for impact by placing hands on inside of troop compartment; maintains control of weapon.
<i>BFV Has Rolled Over</i>			
Begins crew checks to ensure no fires have started, and to account for personnel.	Ensures weapon system is on electrical and manual SAFE.	Pulls fuel shutoff and turns off accessories. If needed, sets off internal (CO2) fire-suppression system in engine compartment.	Checks for injuries and reports to the BC.
Checks for injured personnel. Reports rollover.	Helps the BC evacuate the vehicle.	Exits vehicle through hatch, if unobstructed; or, if driver hatch is blocked, exits through the crew compartment.	Exits vehicle through clear hatch.
NOTE: Sometimes the crew should remain in the vehicle and wait for recovery.			

Figure 1-1. Rollover procedures.

CHAPTER 2

Weapons and Ammunition

To employ the Bradley effectively, soldiers must know not only its vehicular systems, but also its weapon systems, ammunitions, and their capabilities.

Section I. WEAPON SYSTEMS

The BFV's five weapon systems include the 25-mm automatic gun, the 7.62-mm coaxial machine gun, the tube-launched, optically tracked, wire-guided (TOW or Stinger) missile-launcher system, the 5.56-mm firing port weapons (infantry vehicle only), and two smoke-grenade launchers (Appendix A).

2-1. M242 25-MM AUTOMATIC GUN

The Bradley's main armament is the M242 25-mm, fully automatic, externally powered gun (Figure 2-1, page 2-2). It can destroy lightly armored vehicles and aerial targets such as helicopters and slow-flying aircraft. It can also suppress enemy positions such as troops in the open, dug-in positions, and built-up areas. (Vehicle TMs 9-2350-284-10-2, 9-2350-284-20-2-1, and 9-2350-294-10-2-1 provide more operator information.)

a. **Dual-Feed System.** A dual-feed system uses sprockets and extractor grooves to control rounds (Figure 2-2, page 2-2). A system of clutches allows either sprocket to engage and feed either an AP or HE cartridge. One ammunition box holds 70 rounds, and the other holds 230 rounds. Each box can hold either AP- or HE-type ammunition. A single 1.5-horsepower DC motor externally powers the 25-mm. The enhanced gun uses a 1.0-horsepower DC motor. For all 25-mm guns, unit maintenance replaces inoperable 1.5-horsepower DC motors with the newer 1.0-horsepower DC motors. The gunner can choose from three rates of fire:

(1) **Single Shot.** The commander or gunner can shoot about as fast as he can squeeze the trigger.

(2) **Low Rate.** The commander or gunner can shoot 100 rounds a minute, plus or minus 25 rounds.

(3) **High Rate.** The commander or gunner can shoot 200 rounds a minute, plus or minus 25 rounds.

DANGER

PREFIRE CHECK -- 25-MM GUN

BEFORE FIRING THE 25-MM GUN, THE GUNNER MUST CHECK THE GUN COVER FOR SERVICEABILITY, ZIP IT UP, AND ENSURE THE TURRET VENTILATION SYSTEM IS OPERATIONAL TO PREVENT POISONOUS GAS FROM LEAKING INTO THE TURRET. FIRING ROUNDS CAUSES THE GUNPOWDER TO PRODUCE THIS GAS.

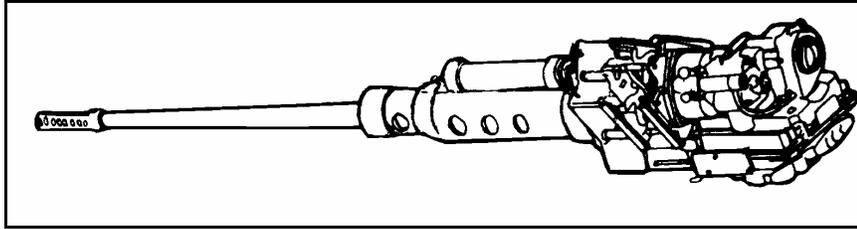


Figure 2-1. M242 25-mm automatic gun.

b. **Cycles of Function.** The 25-mm automatic gun has eight cycles of function that relate to the bolt position indicator (Figure 2-3, page 2-4). The BPI shows the crew where the bolt is located the whole time the gun moves through its eight cycles of function:

(1) **Sear or Charge Cycle.** The 25-mm bolt is forward of its rearmost position. The sear engages the master link. As a safety measure, the firing pin remains uncocked. The bolt position arrow points to SEAR.

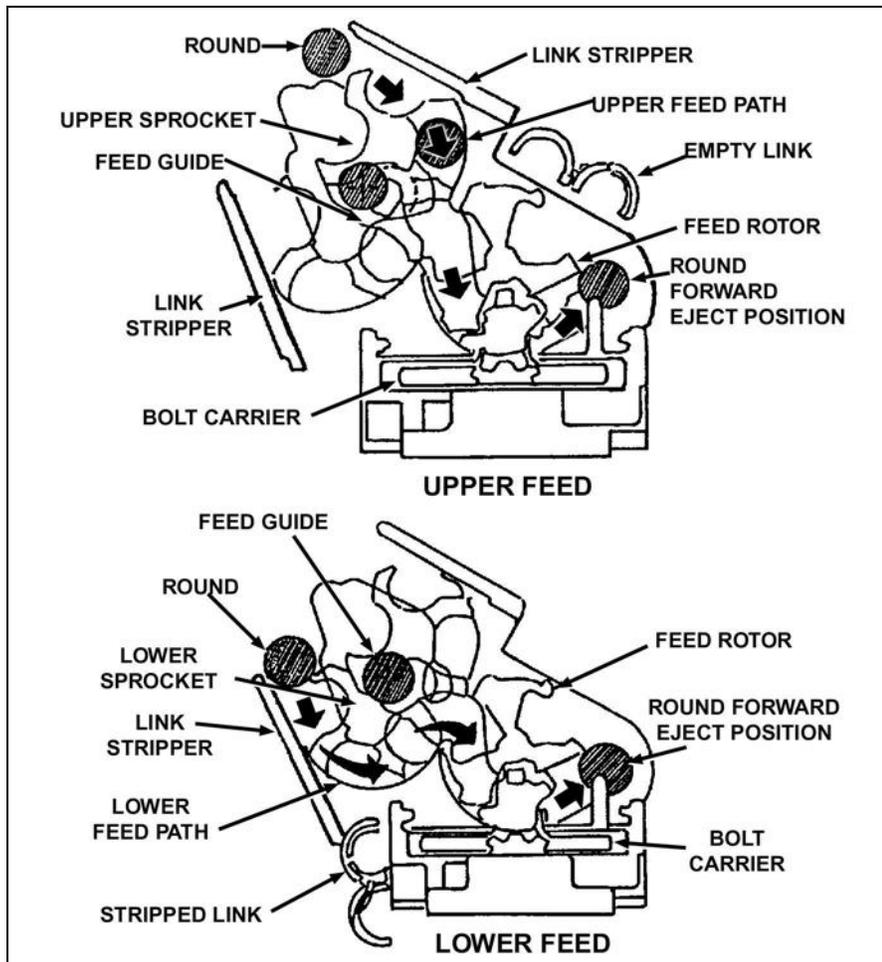


Figure 2-2. Dual-feed system.

(2) **Feed Cycle.** Linked ammunition enters the 25-mm gun feeder. The feed sprockets strip the rounds from the links and move the round into the round positioner one at a time. The round positioner pushes the round into the ready position. During the feed cycle, the bolt moves about 25-mm to the rear of the sear position. The feeder rotor rotates one-third of a turn, allowing the round positioner to place a round into the rotor. The position arrow points to FEED or to DON'T REMOVE FEEDER. Absolute hang-fire protection activates in this position.

(3) **Chamber or Ram Cycle.** The rotor stops moving counterclockwise once the round is positioned on the bolt face. The bolt, bolt carrier, and round move forward until the round seats fully in the chamber. The position arrow points to RAM.

(4) **Lock Cycle.** The bolt is in the full forward position and the bolt carrier is still moving forward. The cam pin moving in its channel causes the bolt to rotate counterclockwise. This allows the lugs on the bolt to engage in the recesses of the breech, making a solid lock. Before the round fires, the position arrow points at the red zone.

(5) **Fire Cycle.** The final rotation of the bolt pushes the firing pin tang off the firing pin pawl in the track assembly. This causes the firing pin spring to push the firing pin forward. In its full forward position, the firing pin's tip protrudes 2 millimeters through the bolt face. The indicator arrow points to FIRE. Although the gun requires no gas to operate, it does use 12 mm of recoil to deactivate mechanical interlock. If the breech fails to recoil, the gun stops cycling with the bolt still locked in the breech. The position arrow points to MISFIRE.

(6) **Unlock Cycle.** Once past the MISFIRE position, the master link and slider start to the rear. The slider pulls the bolt carrier with it. The cam pin rotates the bolt clockwise, causing it to unlock from the recesses in the breech. As the bolt unlocks, the arrow points to EXTRACT.

(7) **Extract Cycle.** As the bolt moves to the rear, the fixed T-slot extractors remove the cartridge case from the chamber. The case remains positioned on the face of the bolt. The bolt continues to the rear until it locks in the sear position. As this happens, the position arrow moves from EXTRACT to SEAR.

(8) **Eject Cycle.** The expended case remains in the bolt face until the gunner pulls the trigger to fire another round. When that happens, the bolt moves to the FEED position. The rotor rotates one-third of a turn, feeding a round onto the bolt face and sweeping the expended case into the feeder ejection chute. As the bolt moves forward to chamber the round, the eject arm on the bolt carrier pushes the expended case from the receiver cartridge eject port.

c. **Enhanced 25-mm Gun.** The A3's enhanced 25-mm gun has three major components: a chrome-lined barrel, an enhanced feeder, and an enhanced receiver. The gun also has quick-detachable link covers, a larger breach assembly, longer recoil, and a triple-spring drive clutch. It also has a built-in test (BIT) for the feed-select solenoid and gun-drive motor. The feed-select solenoid and the gun-drive motor each contains a jumper wire that enables the on-vehicle BIT. (TM 9-1005-200-23&P provides more information about the enhanced gun.)

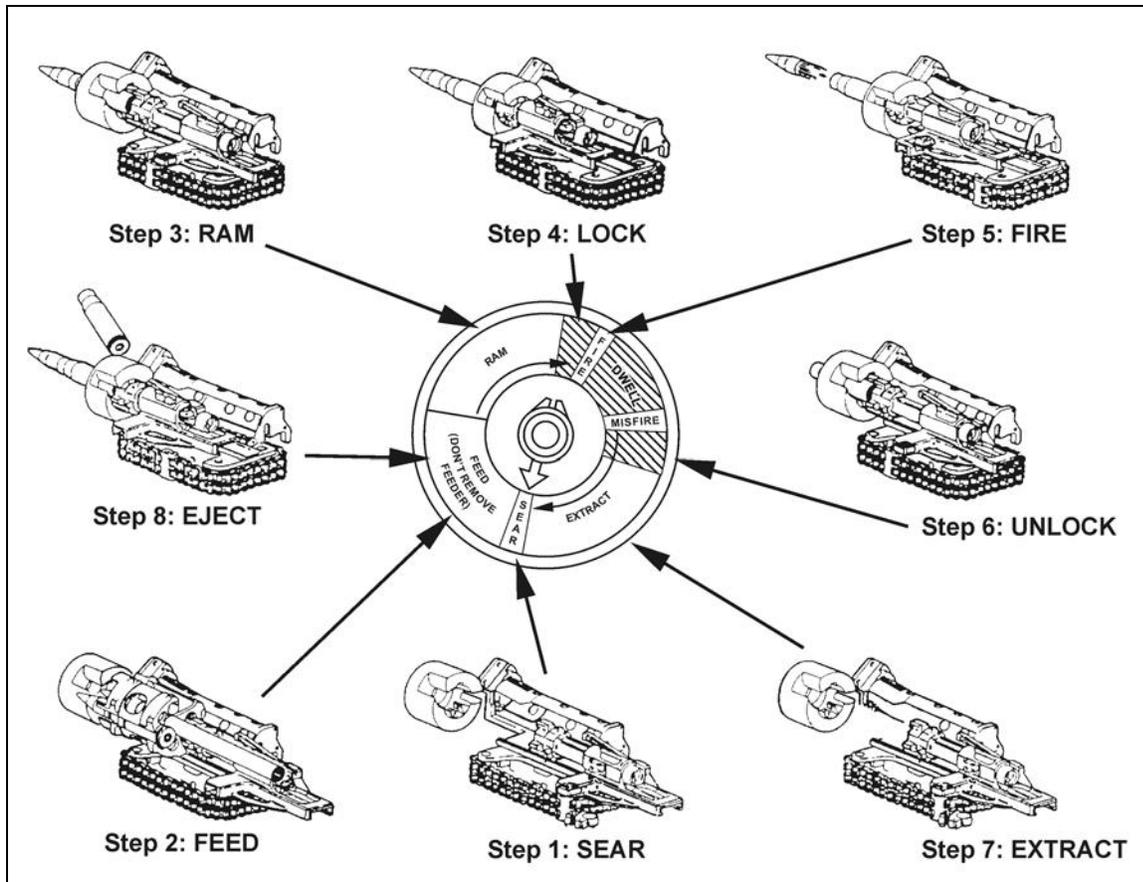


Figure 2-3. The M242 25-mm gun's eight cycles of function.

2-2. M240C 7.62-MM COAXIAL MACHINE GUN

The BFV crew uses the M240C 7.62-mm coaxial machine gun to engage enemy personnel, infantry crew-served weapons, antitank guided missile teams, and unarmored vehicles (Figure 2-4). The coax machine gun is a belt-fed, gas-operated, fully automatic weapon with a maximum effective range of 900 meters (tracer burnout). The coax machine gun mounts on the right side of the turret, in front of the Bradley commander's (BC's) position. The BC can reach the coax machine gun easily through access doors. The coax machine gun has three rates of fire: cyclic, sustained, and rapid.

a. **Cyclic Rate.** At this rate, the gun fires 650 to 950 rounds a minute; the gunner must change the barrel every minute.

b. **Sustained Rate.** At this rate, the gun fires 100 rounds a minute, with 4 to 5 seconds between each burst. The gunner must change the barrel every 10 minutes (TM 9-2350-284-10-2).

c. **Rapid Rate.** At this rate, the gun fires 200 rounds a minute, with 2 to 3 seconds between each burst. The gunner, must change the barrel every 2 minutes.

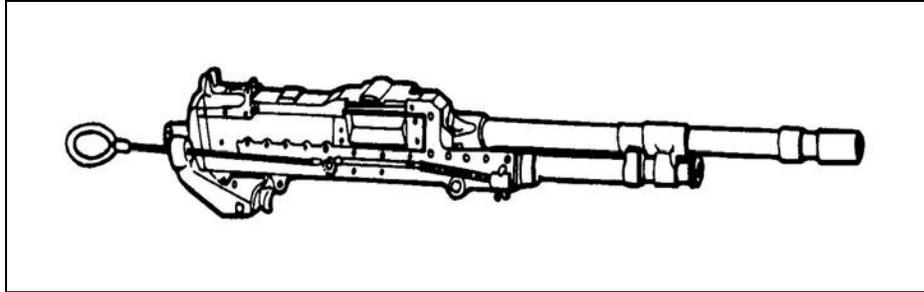


Figure 2-4. M240C 7.62-mm coaxial machine gun.

DANGER

SEALS ON THE ACCESS DOORS

BEFORE FIRING THE COAX, INSPECT THE SEALS ON THE ACCESS DOORS. CHECK FOR SERVICEABILITY AND ENSURE ACCESS DOORS ARE CLOSED TO KEEP POISONOUS GAS FROM LEAKING INTO THE TURRET.

2-3. TUBE-LAUNCHED, OPTICALLY TRACKED, WIRE-GUIDED MISSILE

The TOW is a command-guided surface-attack weapon that can destroy tanks, other armored vehicles, and helicopters. It can also destroy fortified bunkers, gun emplacements, and other protected positions. The TOW system destroys armored vehicles at ranges from 65 to 3,750 meters, depending on the type of missile used. While in a defilade position, the BC or gunner locates, engages, and destroys enemy targets using the TOW. The BFV crew can reload the TOW launcher without exposure to hostile fire.

a. When the firer pulls the trigger, the TOW or TOW 2 subsystem starts a 1.5-second self-balancing routine, which activates the gyro and stabilizes the missile. To avoid accidentally aborting the missile, the crew must remember this delay when firing the TOW. At launch, the electronic command guidance electronics or digital guidance system (CGE or DCGE) or the missile control subsystem (MCS) sends a signal that triggers the missile launch motor to ignite. This ignition propels the missile out of the launcher, and then the flight motor takes over. When the missile enters the firer's line of sight, the ISU or IBAS receives infrared energy from the missile. Components in the ISU or IBAS then signal the CGE, DCGE, or MCS to position the missile with respect to the ISU or IBAS line of sight. This exchange continues until the missile impact(s) or aborts (Table 2-1, page 2-7).

DANGER
1.5-SECOND DELAY

**WHEN FIRING THE TOW, REMEMBER THE
1.5-SECOND DELAY, DURING WHICH THE GYRO
STABILIZES THE MISSILE.**

b. The last step in the firing sequence occurs when the TOW or TOW 2 subsystem automatically cuts the wire 23 seconds after launch. The subsystem also cuts the wire when--

- The BC or gunner presses the TOW ABORT switch.
- The BC or gunner selects another missile on the TOW control box.
- The missile reaches the wire's maximum range.
- The BC or gunner resets the weapons control box.
- The BC or gunner deselects the TOW weapon system.
- The BC or gunner changes magnification (except A3).

c. When firing a TOW, the BC or gunner must lay the crosshairs on the center mass of the target, fire the missile, and keep the crosshairs on the target during the flight of the missile. This keeps the firer from losing control of the missile. (TM 9-2350-252-10-2, TM 9-2350-284-10-2, TM 9-2350-284-10-2-1, and TM 9-2350-294-10-2-1 provide specific procedures.)

d. Before firing any TOW 2-type missiles, the firer ensures that both ISU or IBAS ballistic doors are open. (TM 9-2350-252-10-2, TM 9-2350-284-10-2, TM 9-2350-284-10-2-1, and TM 9-2350-294-10-2-1 provide more information.)

e. Before the BC or gunner fire the TOW, the vehicle must be level or on a slope of less than 10 degrees. The wings and control surfaces extend as soon as the missile clears the launcher. To avoid damaging these surfaces, the end of the launcher needs at least 36 inches clearance.

f. Between 500 and 900 meters downrange, the missile could fly below the gunner's line of sight. Therefore, the firer must allow at least 30 inches of clearance between the line of sight and any obstruction. This reduces the chance of the missile hitting the ground on its way to the target.

g. Some conditions limit the TOW's firing and engagement capabilities and effectiveness.

(1) ***Firing Over Water.*** The BC should consider the following when employing the TOW over water:

(a) Firing across bodies of water wider than 1,100 meters can reduce the range of the TOW. Signals traveling through the command-link wires short out when a large amount of the wire falls in the water. At ranges less than 1,100 meters, submersion of the wire does not affect missile range.

EVENTS:	TIME (SECONDS)		RANGE (METERS)		VELOCITY (FPS)	
	TOW TOW2 TOW2A	TOW2B	TOW TOW2 TOW2A	TOW2B	TOW TOW2 TOW2A	TOW2B
Trigger pull:	-1.58 sec	-1.58 sec	—	—	—	—
Initiation of launch sequence:	-1.48 sec	-1.48 sec	—	—	—	—
Activation of thermal beacon:	-0.88 sec	-0.88 sec	—	—	—	—
Enabling of fire signal on launcher and firing of launch motor squibs:	-0.01 sec	-0.01 sec	—	—	—	—
Missile clearance of launch tube:	0.04 sec	0.04 sec	—	—	—	—
Completion of launch motor burn:	0.04 sec	0.04 sec	1.12 M	1.12 M	181 FPS	173 FPS
Ignition of flight motor:	0.16 sec	0.16 sec	7.7 M	7.4 M	—	—
Burnout of flight motor:	1.50 to 1.60 sec	1.50 to 1.60 sec	239 to 280 M	289 to 319 M	1,025 to 1,060 FPS	991 to 1,005 FPS
Interception of 3,000-meter target:	14.35 sec	15.44 sec	3,000 M	3,000 M	488 to 493 FPS	459 FPS
Interception of 3,750-meter target:	20.10 sec	21.40 sec	3,750 M	3,750 M	387 to 396 FPS	367 FPS

Table 2-1. TOW missile launch and in-flight sequence.

(b) A TOW position should sit as high above and as far back from the water as the tactical situation will allow. As soon as the BFV occupies the position, the BC should analyze the sector to determine if water will affect the employment of the TOW. (Chapter 7, Section II discusses this in more detail.)

(2) *Firing Over Electrical Wires.* Contact between the command-link wires and a live high-voltage power line can kill or injure personnel, cause a loss of control of the missile, and it can damage launcher electronics.

DANGER
FIRING OVER WIRES

WHEN FIRING OVER ELECTRICAL WIRES, TAKE CARE TO AVOID LETTING THE COMMAND-LINK WIRES TOUCH A LIVE HIGH-VOLTAGE POWER LINE. FAILURE TO OBSERVE THIS PRECAUTION CAN CAUSE INJURY OR DEATH, CAUSE THE FIRER TO LOSE CONTROL OF THE MISSILE, AND DAMAGE LAUNCHER ELECTRONICS.

(3) *Firing in Windy Conditions.* Gusty, flanking, or quartering winds can move the missile around during flight. As long as the crosshairs remain on the center mass of the target, the weapon system will compensate for wind effects.

(4) *Firing Through Smoke.* For the firer to maintain a proper sight picture, he must be able to see the target. Smoke can obscure the line of sight and hide the target. TOW missiles have a xenon beacon for tracking. In addition to the xenon beacon, TOW 2, TOW 2A, and TOW 2B missiles also have a thermal beacon. This thermal beacon allows the gunner to track through most smoke obscuration. When a target disappears into a smoke cloud, the firer should hold a smooth tracking rate so that the missile will still be on target.

(5) *Firing Through Area Fires.* The firer follows the same visibility and target-tracking instructions that apply to firing through smoke. He should also avoid firing through or over fire if he thinks that the fire could touch the wires before missile impact. A fire can burn through the command-link wire, causing the firer to lose control of the missile.

h. Soldiers need to take the following precautions:

(1) *Backblast.* The TOW weapon system has a backblast area that extends 75 meters to the rear of the vehicle in a 90-degree cone (Figure 2-5). This area comprises both a 50-meter danger zone and a 25-meter caution zone. The Bradley moves so that no personnel, unarmored vehicles, or obstructions (such as walls, embankments, or large trees) remain in the backblast area for its missile.

(a) *Danger Zone.* Flying debris can cause serious injury or damage equipment. Keep all personnel and equipment out of the backblast area.

DANGER
BACKBLAST

KEEP ALL PERSONNEL CLEAR OF BACKBLAST AREA. FLYING DEBRIS PRODUCED BY FIRING A TOW MISSILE COULD INJURE OR KILL ANYONE REMAINING IN THE BACKBLAST AREA.

CAUTION

Remove all equipment and debris from the backblast area. Flying debris produced by firing a TOW missile could badly damage any equipment remaining in the backblast area.

(b) *Caution Zone.* In all training situations, keep all personnel and equipment clear of the caution zone.

(2) *Firing.* Do not fire a damaged encased missile such as one with large dents or cracks in the launch container. However, if the missile only has minor bending of the end rings, this is not serious, and you can fire the missile without danger. Ensure the litmus in the humidity indicator is blue. Pink indicates possible degradation in missile condition. If this happens in a training environment, return the missile to the supply point. If it happens during combat, you can fire the missiles.

WARNING**DAMAGED MISSILE CASE**

NEVER fire a damaged encased missile. This includes, for example, missiles with large dents or cracks in the launch containers. However, if slightly bent end rings are the only problem, then you can fire the missile without danger.

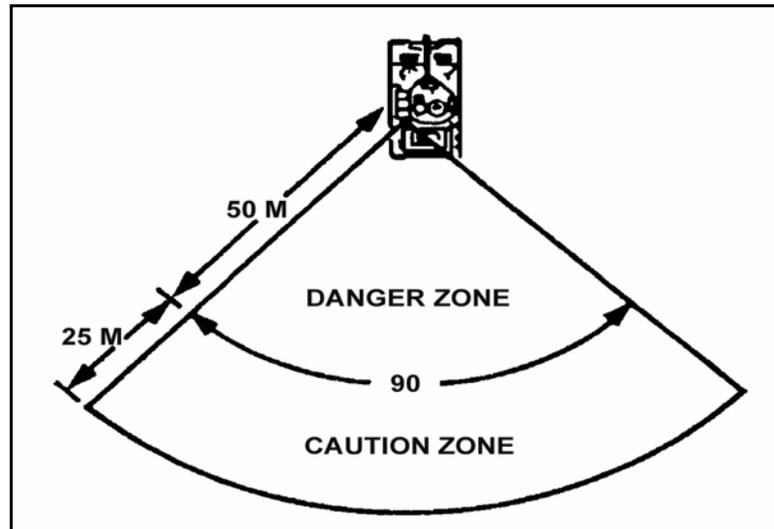


Figure 2-5. TOW backblast area.

WARNING
MISSILE AFFECTED BY MOISTURE

Ensure the litmus in the humidity indicator is blue. Pink litmus might indicate a degraded missile.

- **Training -- Return missile to supply point.**
- **Combat -- Use the missile.**

(3) *Handling Precautions.* The electrolyte in the emergency battery assembly is highly corrosive. If the battery sustains damage, electrolytes might leak out, and these can cause serious injury, especially to the eyes.

WARNING
CORROSIVE BATTERY CONTENTS

The electrolytes in the emergency battery are highly corrosive. If the battery sustains damage, electrolytes might leak out, and these can cause serious injury, especially to the eyes.

(a) Report all duds or defective missiles to an explosive ordnance-disposal (EOD) team.

(b) In training, you must wait 30 minutes before removing a misfired missile from the launcher. (TM 9-2350-252-10-2, TM 9-2350-284-10-2, TM 9-2350-284-10-2-1, and TM 9-2350-294-10-2-1 provide more information.)

DANGER
DUDS, DEFECTIVE MISSILES

DO NOT MOVE OR HANDLE DUDS OR DEFECTIVE MISSILES, EXCEPT WHEN YOU REMOVE A MISFIRE FROM THE LAUNCHER AND PLACE IT A SAFE DISTANCE (200 METERS) FROM THE VEHICLE.

(c) The command-link wires are strong. Move carefully through areas where missiles were fired.

(d) Do not move or handle duds or defective missiles except to remove a misfire from the launcher and place it a safe distance (200 meters) from the vehicle.

2-4. M231 5.56-MM FIRING PORT WEAPON

The infantry rifle squad uses the M231 5.56-mm FPW to engage enemy personnel, crew-served weapons, and ATGM teams, and to suppress suspected close-in enemy positions (Figure 2-6). The FPW has a maximum effective range of 300 meters (tracer burnout). The basic BFV M2 has six firing port mounts, two on each side and two in the ramp. The BFV M2A2, M2A2 ODS, and A3 have two firing port mounts in the ramp (none on the sides). When not using the FPWs, the crew stores them in their assigned storage racks located inside the vehicle.

DANGER

AMMUNITION

AVOID USING M193, M855 BALL, OR M856 AMMUNITION IN THE FPW--THESE WORK ONLY IN THE M249 SAW OR IN THE M16A2.

FIRING PORT WEAPON

BEFORE USING THE FPW, MAKE SURE THAT THE EXHAUST FANS WORK AND THAT THE EXHAUST HOSE IS IN GOOD WORKING CONDITION. THEY MUST BE ABLE TO REMOVE POISONOUS GASSES FROM THE TROOP COMPARTMENT.

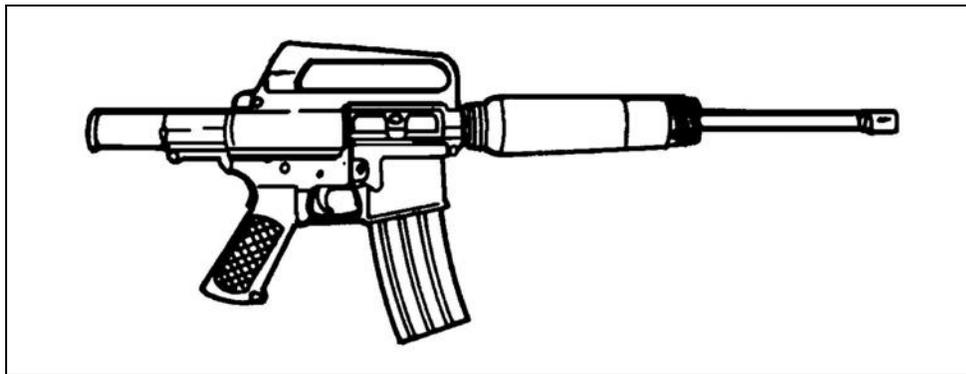


Figure 2-6. M231 5.56-mm firing port weapon.

2-5. M257 SMOKE-GRENADE LAUNCHER

The BFV has two, four-tube, electrically fired grenade launchers, one on each side of the 25-mm gun (Figure 2-7, page 2-12). Therefore, each can fire four grenades. On activation, the grenades create enough smoke to screen the Bradley in three seconds. Using one switch inside the turret, the BC or gunner fires the launchers. The launchers cannot fire independently. Both launchers--all eight grenades--fire at once.

DANGER SMOKE GRENADES

ELECTRICAL TROUBLE CAN CAUSE SMOKE GRENADES TO KILL OR INJURE SOLDIERS. BEFORE LOADING ANY SMOKE GRENADES, ENSURE THAT THE TURRET POWER AND GRENADE LAUNCHER SWITCHES ARE SET TO OFF.

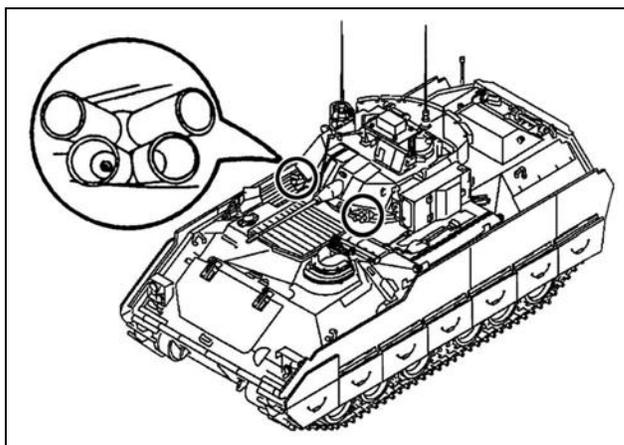


Figure 2-7. M257 smoke-grenade launchers.

2-6. STINGER MISSILE SUBSYSTEM

The M6 Linebacker can engage low-altitude, high-speed, fixed-wing aircraft; rotary-wing aircraft; cruise missiles (CMs); and unmanned aerial vehicles (UAV) with its Stinger missile standard vehicle-mounted launcher (SVML). The SVML rests in an armored box, which is mounted on the left side of the turret on a retractable platform. This box houses any mix of up to four Stinger missiles and provides a stable platform for controlled missile launching. If the SVML is disabled, the crew can convert to a Stinger Man-Portable, Air-Defense System (MANPADS) team. The Stinger system provides round-the-clock, day or night, all-weather air defense during offensive and defensive operations. Coupled with the FAAD C2 and C3I elements of short-range air defense (SHORAD), the Linebacker has an automatic or manual slew-to-cue, target-acquisition capability, during both stationary and moving operations.

Section II. AMMUNITION

Each of the BFV's organic weapon systems uses ammunition designed to support the missions of that BFV model. As mission requirements and threat capabilities change, these munitions will counter the threat. For more realistic training, the 25-mm's training ammunition replicates service ammunition.

2-7. M242 25-MM AUTOMATIC GUN (STANDARD)

The five basic rounds used with the 25-mm gun include the M791, M792, M793, M910, and M919. Table 2-2 compares the five types of 25-mm ammunition.

ROUND	M791 APDS-T	M792 HEI-T	M793 TP-T	M910 TPDS-T	M919 APFSDS-T
Muzzle velocity (meters per second):	1,345 MPS	1,100 MPS	1,100 MPS	1,525 MPS	1,385 MPS
Time of flight (seconds):					
1,000 meters	0.8 sec	1.2 sec	1.2 sec	0.7 sec	0.8 sec
1,500 meters	1.2 sec	2.2 sec	2.2 sec	1.2 sec	1.2 sec
2,000 meters	1.7 sec	3.6 sec	3.5 sec	1.8 sec	1.6 sec
2,500 meters	2.2 sec	5.3 sec	5.2 sec	2.5 sec	2.1 sec
Cartridge weight (grams):	458 gm	501 gm	501 gm	420 gm	454 gm
Projectile weight (grams):	134 gm	185 gm	182 gm	95 gm	96 gm
Tracer burn time (seconds):	> 1.7 sec	> 3.5 sec	> 3.5 sec	> 1.8 sec	> 1.8 sec
Bursting radius, arming distance:	NA	5 M 10 to 200 M	NA	NA	NA
Max effective range (meters):	2,000 M	3,000 M	1,600 M	2,000 M	2,500 M
Tracer burn range (meters):	> 2,000 M	> 2,000 M	> 2,000 M	> 2,000 M	2,500 M
<p>">" means "more than." Also, the M793 TP-T round loses its effectiveness after 1,600 meters.</p>					

Table 2-2. Comparison of ammunition for 25-mm gun.

a. **M791 Armor-Piercing Discarding Sabot with Tracer.** The APDS-T (Figure 2-8, page 2-14) penetrates lightly armored vehicles, self-propelled artillery, and aerial targets such as helicopters and slow-moving, fixed-wing aircraft.

DANGER DISCARDING SABOTS

BEFORE FIRING ANY DISCARDING SABOT AMMUNITION, CONSIDER THE SAFETY OF SOLDIERS ON THE GROUND. THE DISCARDING SABOT CAN CAUSE DEATH OR INJURY.

THE DISCARDING SABOT LEAVES THE BARREL AT A 30-DEGREE ANGLE ON BOTH SIDES OF THE GUN-TARGET LINE FOR 100 METERS.

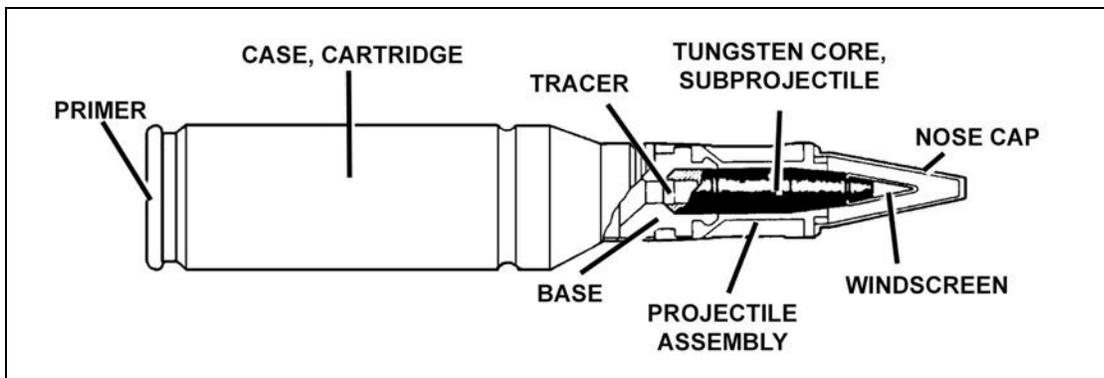


Figure 2-8. M791 APDS-T.

(1) The APDS-T is a fixed-type, percussion, primed round. It consists of a sabot-encapsulated projectile body crimped to a steel cartridge case. The projectile body consists of a solid tungsten alloy penetrator, pressed-on aluminum windscreen, pressed-in tracer pellets, molded discarding-type nylon sabot, staked aluminum base, and welded or pressed-on nylon nose-cap. The projectile sabot and nose-cap are black with white markings.

(2) Gasses produced by the burning propellant send the projectile from the gun at 1,345 meters per second (plus or minus 20 meters per second) and ignite the tracer. Setback, centrifugal, and aerodynamic forces cause both the sabot and nose-cap to discard as soon as the round leaves the barrel. The tungsten alloy penetrator (core) is spin-stabilized and penetrates the target solely by kinetic energy.

(3) The maximum effective range is 2,000 meters due to tracer burnout. Although its tracer burns out at 2,000 meters, an APDS-T round is accurate out to 2,200 meters. As the range increases, the APDS-T penetration decreases, especially when target vehicles have appliqué armor (an added layer of armor).

b. **M792 High-Explosive Incendiary with Tracer.** The HEI-T (Figure 2-9) can destroy unarmored vehicles and helicopters and suppress antitank guided missile (ATGM) positions and enemy squads beyond coax range (900 meters) and out to a maximum effective range of 3,000 meters.

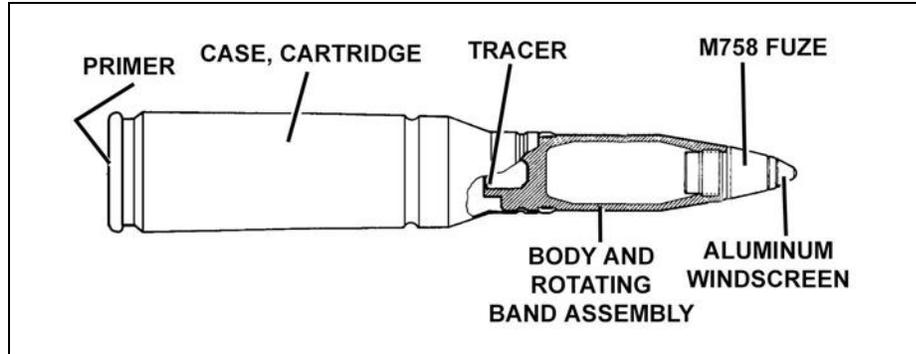


Figure 2-9. M792 HEI-T.

(1) The HEI-T cartridge is a fixed-type, percussion-primed round. The one-piece projectile body contains HEI and is crimped onto a steel cartridge case. The hollowed steel projectile houses an M758 mechanical fuze, 32 grams of an HEI mix, and a pressed-in tracer. The projectile is yellow with a red band, black markings, and a gold tip. On some rounds, the projectile's yellow color is slightly orange near the red band.

(2) Gasses produced by the burning propellant send the projectile out of the gun at 1,100 meters per second (plus or minus 20 meters per second). On impact, the M758 mechanical fuze (Figure 2-10, page 2-16) ignites and the HEI filler detonates. This projects steel fragments from the body, rotating band assembly, and incendiary filler over a 5-meter radius.

(3) The maximum effective range for HEI-T rounds is 3,000 meters, at which range, a mechanical fuze (the M758) detonates the round. Accuracy decreases beyond 1,600 meters, and the tracer burns out at 2,000 meters. However, the round's 5-meter bursting radius and rate of fire let the firer engage either point or area targets out to the maximum effective range.

(4) The M792 HEI-T projectile can detonate in any of three ways: direct impact, grazing impact, and self-destruct (Figure 2-11, page 2-17). The piston and body assemblies are forced to aft position by the projectile's acceleration in the gun tube (1). The air is forced from the rear cavity into the newly created forward cavity (2). Air flows through the porous restrictor (3). The spin locks the rotor (4) and causes the seal to fix against the wall (5). This forces the ball outward and locks the body assembly in the rear position (6).

(a) *Direct Impact.* Striking the target crushes the projectile's probe cap. This pushes the probe rearward, which thrusts the firing pin into the detonator, which detonates the HEI mixture.

(b) *Grazing Impact.* Due to spin decay (loss of forward velocity), the projectile strikes the target with insufficient force. Spin decay triggers the setback spring to overcome centrifugal force, pushes the body assembly forward, and thrusts the detonator into the firing pin.

(c) *Self-Destruct.* If it does not hit a target, the projectile self-destructs at 3,000 meters. However, head and tail winds, depending on their severity, can reduce the distance at which the round self-destructs.

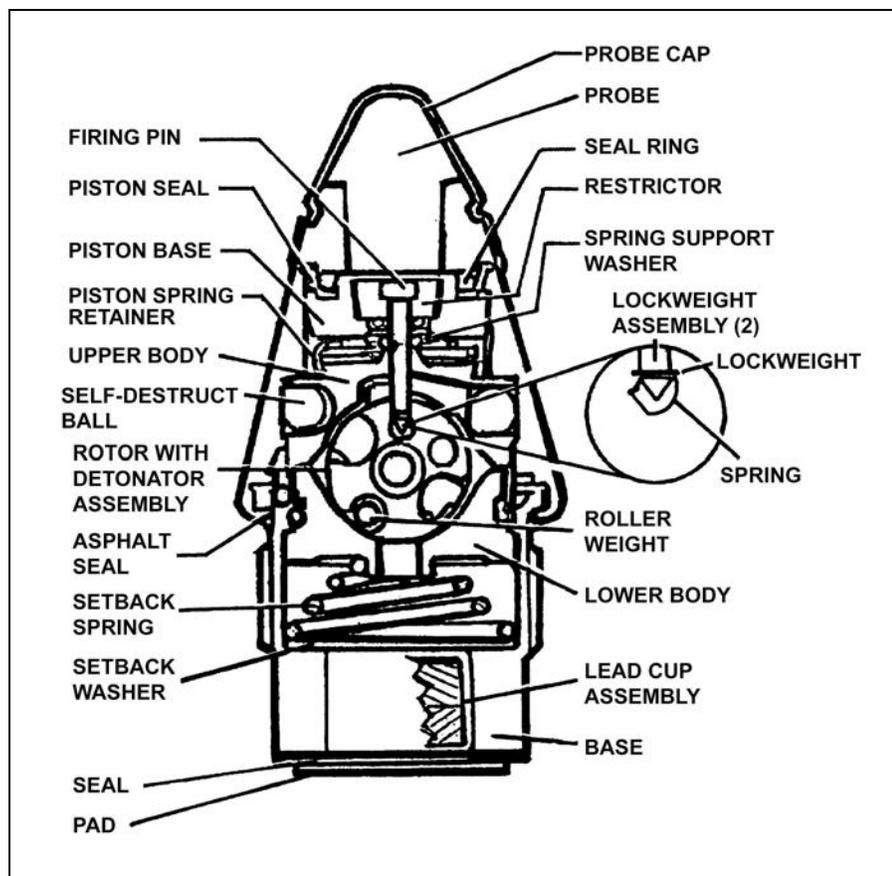


Figure 2-10. M758 HEI-T fuze.

c. **M793 Target Practice with Tracer.** The TP-T cartridge (Figure 2-12) is a fixed-type, percussion-primed training round that matches the HEI-T round ballistically. The projectile consists of a hollow steel body with blue with white markings. The TP-T's maximum effective range is 1,600 meters, and the tracer is visible out to 2,000 meters. However, accuracy is greatly reduced beyond 1,600 meters.

d. **M910 Target Practice Discarding Sabot with Tracer.** The target-practice, discarding sabot with tracer (TPDS-T) replicates the flight pattern of the M791 APDS-T round. The TPDS-T (Figure 2-13, page 2-18) allows units to practice sabot engagements on limited-distance ranges. The maximum range of the TPDS-T is 6,404 meters.

(1) The TPDS-T cartridge is a fixed type, percussion-primed round. It consists of a sabot-projectile assembly crimped to a steel cartridge case. The projectile assembly includes a disposable aluminum pusher base. It also includes a subprojectile encapsulated with a discarding nylon sabot and polyethylene protective cap. The subprojectile has a steel core with either an aluminum or a steel windscreen and with pressed-in tracer pellets. The projectile is blue with white markings.

(2) The TPDS-T cartridge trajectory ballistically matches the APDS-T plus or minus 1 mil to a range of 2,000 meters.

(3) The tracer burns out at 2,000 meters.

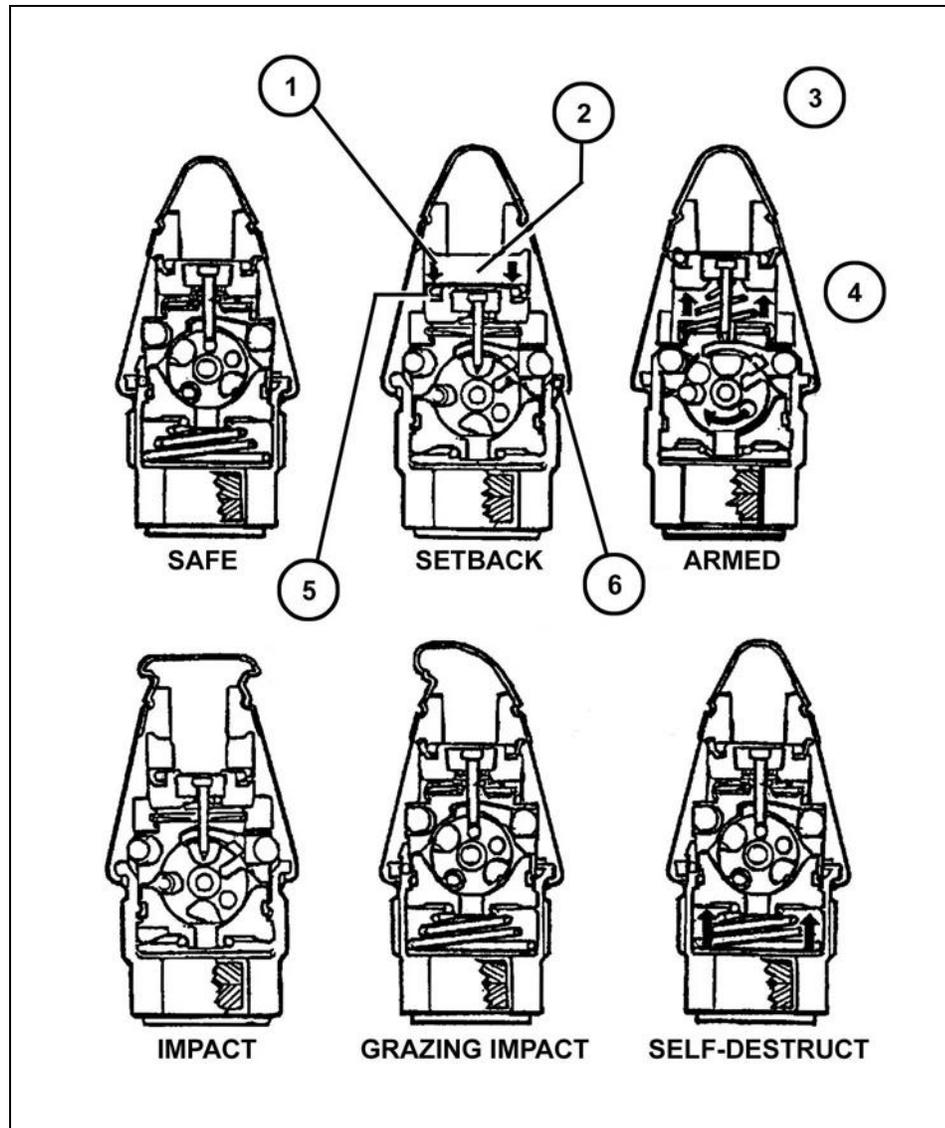


Figure 2-11. M758 operational sequence.

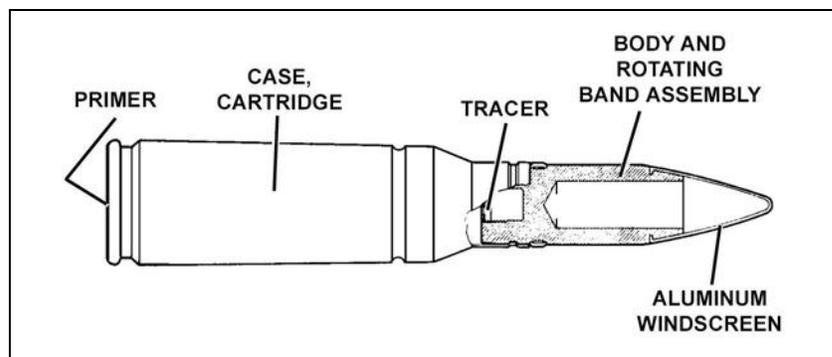


Figure 2-12. M793 TP-T.

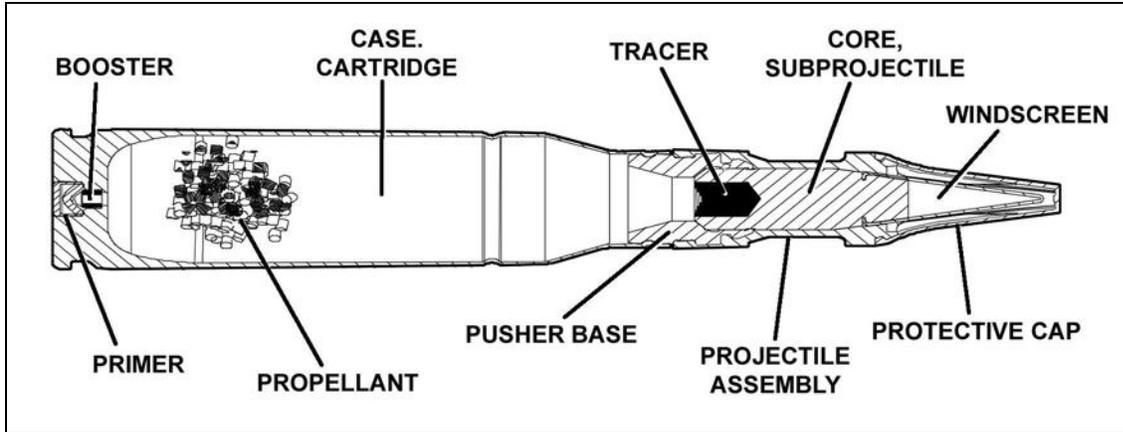


Figure 2-13. M910 TPDS-T.

e. **M919 Armor-Piercing, Fin-Stabilized Discarding Sabot With Tracer.** The armor-piercing, fin-stabilized discarding sabot with tracer (APFSDS-T) round (Figure 2-14) penetrates lightly armored vehicles, self-propelled artillery, and aerial targets, which includes helicopters and slow-moving fixed-wing aircraft.

DANGER

M919 APFSDS-T AMMUNITION

**ONLY USE M919 APFSDS-T AMMUNITION
IN COMBAT.**

**IF THE M919 SUSTAINS DAMAGE, FOLLOW
HANDLING AND REPORTING PROCEDURES IN
DA MESSAGE RUEADWD3453, DTG-17051Z
MAY 2001, AND IN THE VEHICULAR TECHNICAL
MANUALS.**

**TRADOC DU AWARENESS TRAINING, TIER I
(TSP TA-031-DUAT-001, TVT 3-120 PROVIDES
ADDITIONAL TRAINING AND HANDLING
PROCEDURES).**

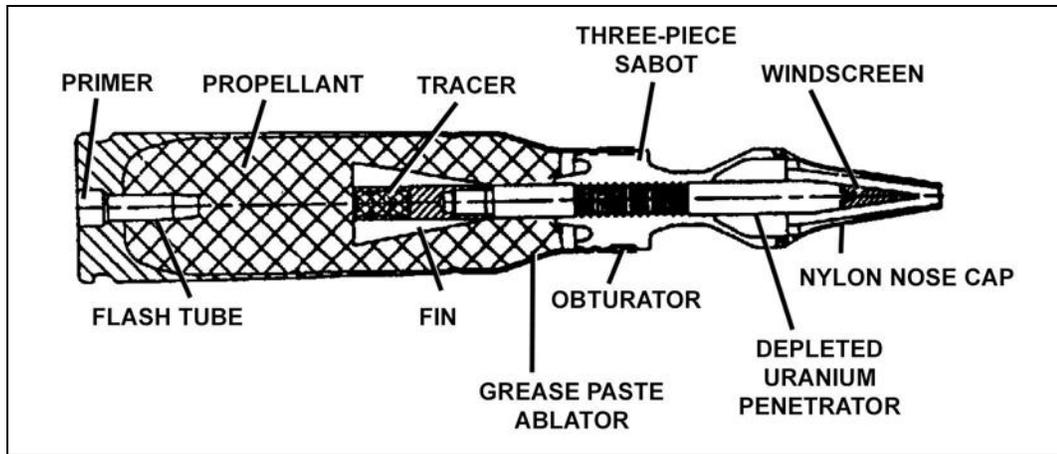


Figure 2-14. M919 APFSDS-T.

(1) The APFSDS-T is a fixed-type, percussion primed round that consists of a sabot-encapsulated projectile crimped into a steel cartridge case. The projectile is made of slate gray, corrosion-protected, depleted uranium. It has a screw-on steel fin with pressed-in tracer pellets; a three-piece, segmented aluminum sabot and a snap-on plastic protective cap. The projectile sabot and protective nose-cap are black, and the slip-band nylon obturator is white. The round has a green rubber sealant between the sabot segments, the sabot and penetrator, and the sabot and the plastic cap.

(2) This kinetic-energy round is the same as the APDS-T (M791), but with a velocity of 1,385 meters per second (plus or minus 20). The APFSDS-T round also has greater effective range, penetration capabilities, and tracer burn time than the APDS-T.

2-8. M240C 7.62-MM COAXIAL MACHINE GUN

The preferred ammunition mix for the coax is four ball and one tracer (A131). Other types of 7.62-mm ammunition are available. However, the four-and-one mix allows the BC and gunner to use the tracer-on-target (TOT) method of adjusting fire to achieve target kill or suppression. (TM 9-1005-313-10 provides more operator information.)

2-9. TUBE-LAUNCHED, OPTICALLY TRACKED, WIRE-GUIDED MISSILE

The developments and improvements to the TOW missile family follow the developments and improvements of tank armor. The five missiles that followed the basic TOW have each improved upon the previous model. Table 2-3, page 2-20, compares models. Areas of improvement include penetration, maximum range, usefulness during adverse firing conditions, resistance to jamming, and attack profiles.

a. **Identification.** Each TOW round has black markings and a two-inch yellow band near the top, plus another two-inch band near the bottom. On live rounds, the bottom band is brown; on training (inert) rounds, it is blue.

b. **Characteristics.** TOW models still in use include the following (Figure 2-15, page 2-21). Although the basic Bradley TOW system can fire the TOW 2 and newer

model TOW missiles in addition to the basic TOW missiles, doing so will reduce the probability of a hit:

(1) **Basic TOW (BGM-71A)**. The basic TOW has a 5-inch, high-explosive, shaped-charge warhead and a maximum effective range of 3,000 meters.

(2) **Basic TOW (BGM-71A1)**. This is the basic TOW also, except with an improved maximum effective range of 3,750 meters.

(3) **Improved TOW (BGM-71C)**. The ITOW's improved 5-inch warhead, with extensible probe, allows for detonation at a greater standoff distance from the target. It also gives the warhead greater penetration capability. The ITOW's maximum effective range is 3,750 meters.

MISSILES	TOW (BGM-71A,A1)	ITOW (BGM-71C)	TOW 2 (BGM-71D)	TWO 2A (BGM-71E)	TOW 2B (BGM-71F)
Weight:					
Out of tube	40.7 lb.	41.9 lb.	47.2 lb.	49.9 lb.	49.8 lb.
In tube	54.8 lb.	56.0 lb.	61.3 lb.	64.0 lb.	63.9 lb.
Length (out of tube):	45.8 in.	45.6 in.	46.2 in.	46.1 in.	46.2 in.
Tube Diameter:	8.6 in.	8.6 in.	8.6 in.	8.6 in.	8.6 in.
Maximum ranges:	3,000 and 3,750 meters	3,750 meters	3,750 meters	3,750 meters	3,750 meters
Warhead Size:	5-inch HE	5-inch HE improved	6-inch HE	6-inch HE	Two 5-inch explosively formed penetrators
Arming distances:					
Minimum	30 meters	30 meters	30 meters	30 meters	110 meters
Best	NA	NA	NA	NA	150 meters
Maximum	65 meters	65 meters	65 meters	65 meters	200 meters
Reliability: 95.4 percent					
Operating Temperature: - 25 ° to + 125 ° F					
Vehicle Compatibility: All					

Table 2-3. Characteristics of the TOW missile.

c. **TOW 2 (BGM-71D)**. The TOW 2 has a 6-inch full-caliber warhead with an extensible probe (Figure 2-16, page 2-22). This missile has a xenon beacon like the basic and ITOW missiles, but it also has a thermal beacon. The thermal beacon improves missile performance through battlefield smoke and obscurants, and against missile countermeasure devices (jammers). The thermal beacon links tracking to the electro-optical FLIR, which is part of the TOW 2 subsystem. The TOW 2's flight motor is also more powerful than the one in previous models. The TOW 2's maximum effective range is 3,750 meters.

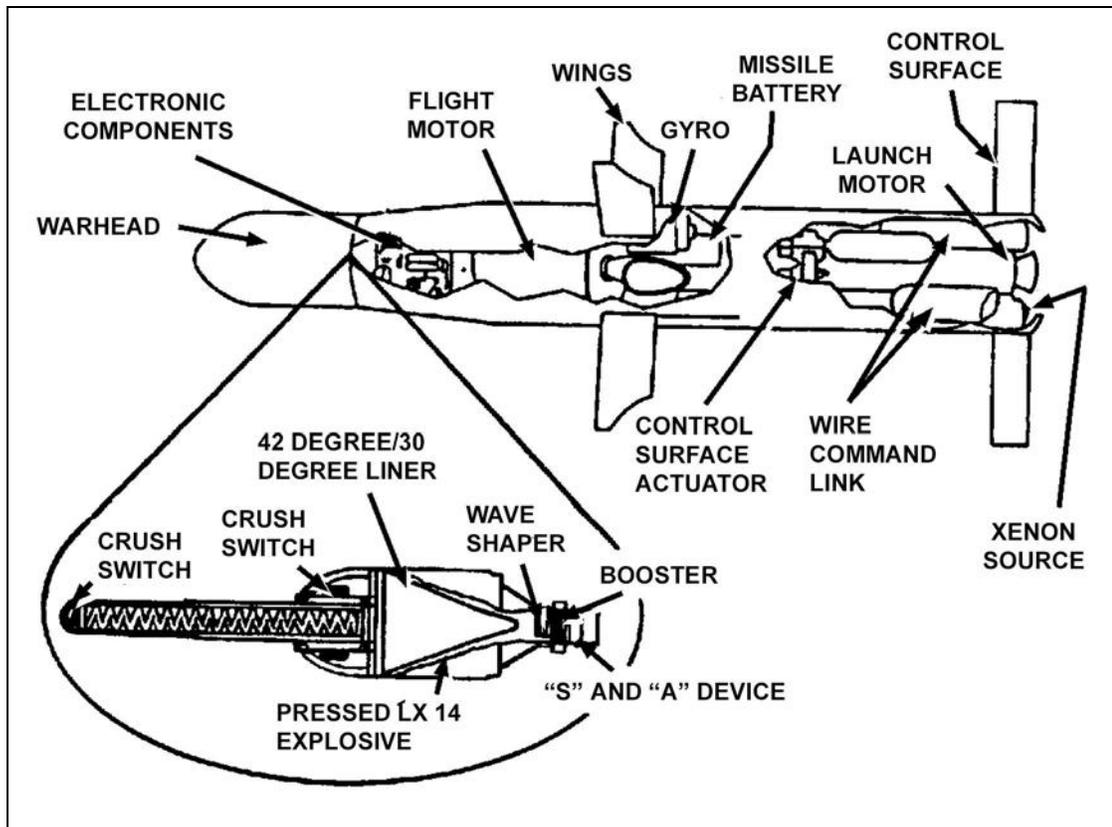


Figure 2-15. Basic and improved TOW missiles.

d. **TOW 2A (BGM-71E)**. The TOW 2A has the same characteristics as the TOW 2, except with the addition of a precursor charge on the extensible probe. The precursor charge discharges reactive armor before the main charge impacts (Figure 2-16, page 2-22).

e. **TOW 2B (BGM-71F)**. The TOW 2B is a top-attack missile (Figure 2-17, page 2-22). The missile flies about 2.25 meters above the gunner's line of sight, but the gunner aims center mass of the target. The missile detects the target by magnetic signature and optical (laser) profile. The missile's sensors cannot distinguish friendly from enemy, or destroyed from not destroyed. To prevent premature detonation of the TOW 2B warheads, crews must ensure that their line of sight is clear of friendly and destroyed vehicles. The TOW 2B has two 5-inch warheads that, when detonated, explosively form two high-density tantalum penetrators.

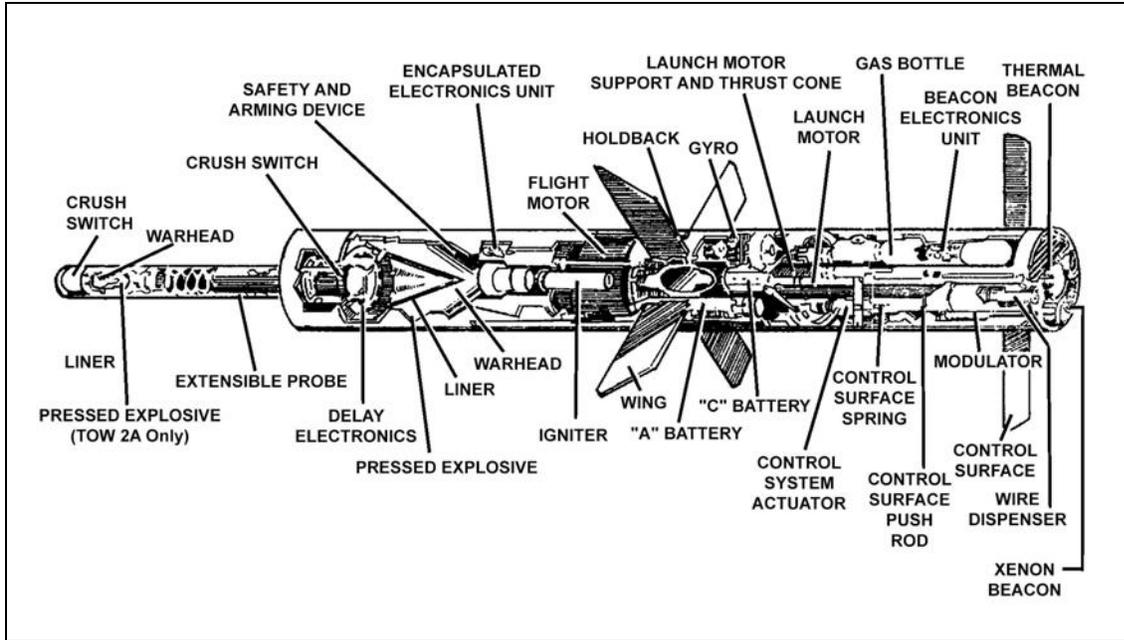


Figure 2-16. TOW 2 and TOW 2A missiles.

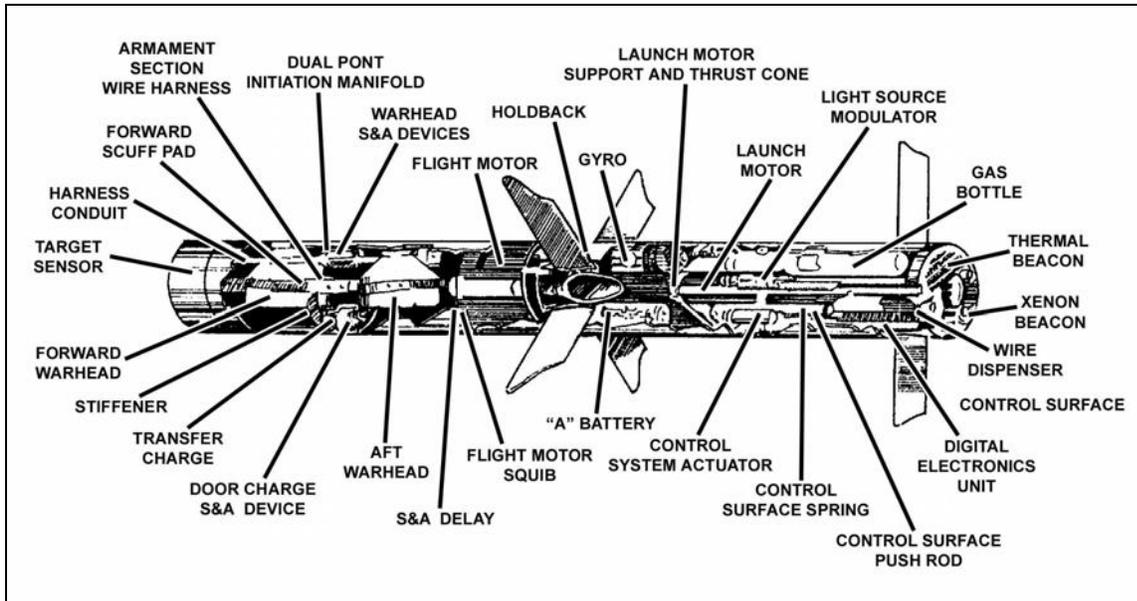


Figure 2-17. TOW 2B missile.

2-10. STINGER MISSILE

The Stinger missile is a fire-and-forget missile whose basic version is a passive infrared homing missile. The more advanced version, the Stinger RMP, is a dual-mode homing missile that uses data from infrared (IR) and ultraviolet (UV) detectors. The Stinger missile round consists of a guidance section, warhead, flight motor, and launch motor. The guidance section contains the seeker head, guidance assembly electronics, control electronics, and control surfaces. The warhead is a small HE charge. The missile uses IR or UV homing to track its target. The launch motor ejects the missile from the launch

tube. The missile coasts a short distance, then the flight motor propels it in flight. The launch motor expands and separates from the flight motor before the missile leaves the launch tube. The expended motor drops at a safe distance outside the launch tube. Also, at separation, a lanyard attached to the launch motor pulls the shorting plug from the flight-motor's ignition circuit. After the missile coasts a safe distance, the flight motor ignites. The missile self-destructs if it has not hit a target after 17 seconds of flight time (Figure 2-18 and Table 2-4).

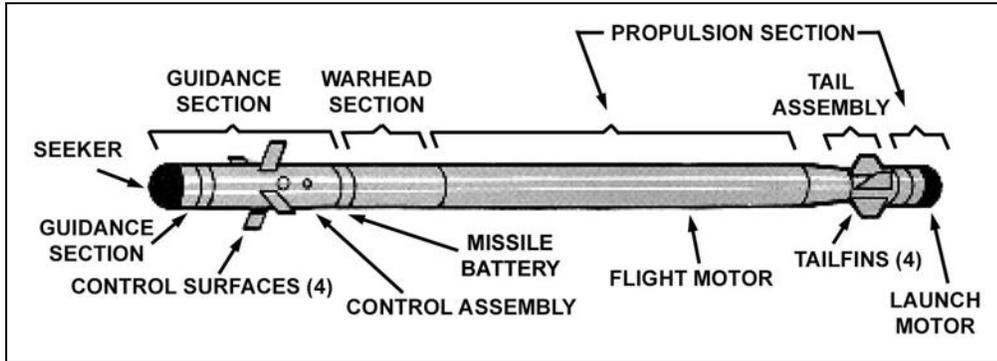


Figure 2-18. Stinger missile round.

Speed:	Supersonic	
Weight:	28.1 pounds. (without gripstock)	
Length:	60 inches	
Diameter:	2.75 inches	
Maximum Effective Range:	4,000+ meters	
Backblast Clearance:	Personnel	50 meters
	Equipment	5 meters

Table 2-4. Characteristics of the Stinger missile.

2-11. M231 5.56-MM FIRING PORT WEAPON

The ammunition for the FPW is the M196 tracer. Its rapid rate of fire allows squad members to use the TOT method of adjusting fire to suppress the target. When training, the squad uses the M200 blank round and the M22 blank firing device. (TM 9-1005-309-10 provides more operator information.) M193, M855 ball, and M856 ammunition are incompatible with the FPW. They work in the M249 SAW and the M16A2 rifle.

2-12. M257 SMOKE-GRENADE LAUNCHER

The M257 smoke-grenade launcher fires the L8A1 or L8A3 red phosphorus smoke grenade and the M76 infrared screening grenade.

a. **L8A1 or L8A3 Red Phosphorus Smoke Grenade.** The red phosphorus smoke grenades contain a mixture of red phosphorus and butyl rubber (Figure 2-19). The smoke bursts in the direction the turret is pointed. The bursting radius is a 105-degree fan, 10 meters high and 20 to 50 meters to the front. The smoke cloud lasts from one to three minutes, depending on wind speed and weather conditions. (TM 9-2350-252-10-2, TM 9-2350-284-10-2, TM 9-2350-284-10-2-1, and TM 9-2350-294-10-2-1 provide more operator information.)

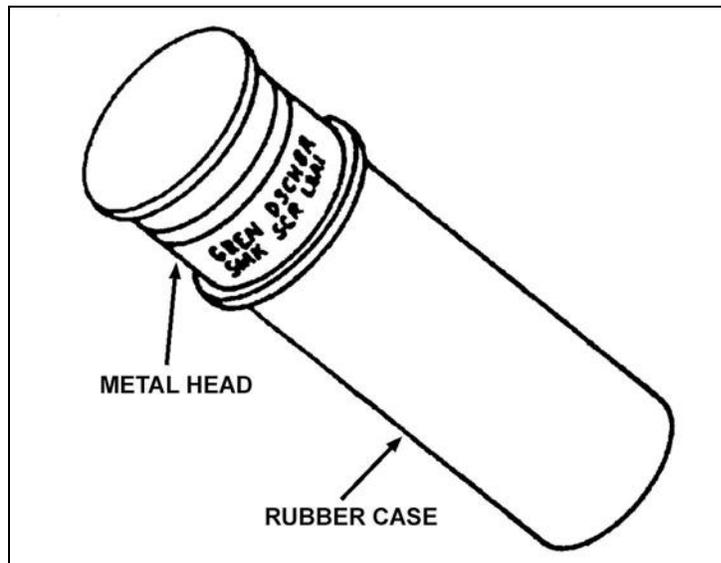


Figure 2-19. L8A1 or L8A3 red phosphorus smoke grenade.

b. **M76 Infrared Screening Grenade.** The M76 infrared screening grenade measures 9.5 inches long by 2.5 inches in diameter. It weighs about 4.5 pounds (Figure 2-20). The launched grenade travels about 30 meters from the vehicle and explodes at a height of 2.5 meters. The grenade uses a central burster to disseminate 3 pounds of brass powder explosively. The smoke cloud obscures the long-wave IR viewer for about 30 to 60 seconds, depending on wind speed and other weather conditions.

CAUTION

When used, the M76 smoke grenade obscures the BFV's day and thermal visibility as long as the smoke cloud lasts.

DANGER SMOKE GRENADES

BEFORE LOADING SMOKE GRENADES, MAKE SURE THAT BOTH THE TURRET POWER AND THE SMOKE GRENADE LAUNCHER SWITCHES ARE OFF.

WHILE LOADING, THE LOADER MUST KEEP ALL PARTS OF HIS BODY AWAY FROM THE FRONT OF THE SMOKE GRENADE LAUNCHERS.

DURING LOADING, ALL PERSONNEL REMAIN WELL AWAY FROM THE FIRING LINES.

AFTER ANY MISFIRE, MOVE THE VEHICLE AT LEAST 125 METERS AWAY FROM ANY OTHER VEHICLES, BUILDINGS, PERSONNEL, OR EQUIPMENT.

AFTER REMOVING MISFIRED GRENADES, TAKE THEM AWAY TO A WELL-MARKED SPOT AT LEAST 200 METERS FROM ANY VEHICLE, BUILDING, PERSONNEL, OR EQUIPMENT (TM 9-2350-252-10-2, TM 9-2350-284-10-2, and TM 9-2350-294-10-2-1).

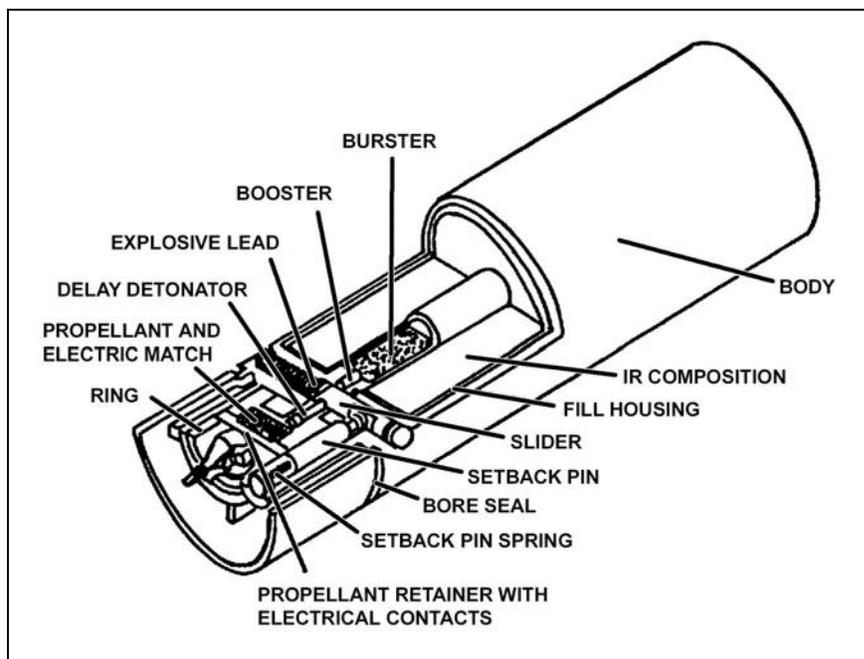


Figure 2-20. M76 infrared screening grenade.

CHAPTER 3

Crew Training

This chapter discusses how to prepare Bradley crews to qualify on Bradley Table VIII (BT VIII). This preparation includes crew and leader tasks, program development, training strategy and plans, and collective training.

It also outlines the requirements crews must achieve in gunnery before advanced gunnery training.

Section I. TASKS

Crew tasks are trained and evaluated first in preliminary gunnery, then in a simulator (COFT or BATS), appended equipment (the Multiple Integrated Laser-Engagement System [MILES] or the Precision Gunnery System [PGS]), then in live-fire training. Crew gunnery culminates with BT VIII, *Crew Qualification*.

3-1. SKILLS

Crews must achieve proficiency in the following skills. The first seven apply to all variants of the BFV. The rest apply to specific training requirements, based on variations in the vehicles' capabilities and systems:

- Engaging moving targets from a moving Bradley.
- Engaging multiple targets using the auxiliary sight.
- Engaging targets using manual controls.
- Engaging multiple targets from the commander's position.
- Engaging multiple targets requiring different ammunition types.
- Engaging targets in an NBC environment.
- Engaging targets at night.
- Engaging targets under digital conditions (ODS and A3 only).
- Engaging aerial targets using the SVML (ADA crews only).
- Engaging targets using hunter-killer techniques (A3 only).
- Conducting a fire mission task (FMT, applies to BFIST only).

3-2. PRELIMINARY GUNNERY

Preliminary gunnery (Chapter 7) develops individual crewmember skills needed to operate the vehicle and turret weapon systems. A crew whose members are all proficient with all vehicle tasks is normally going to function better as a crew.

a. The BC is trained and evaluated on controlling the vehicle and crew, and on laying the weapons systems on targets while issuing fire commands.

- b. The BC and gunner are trained and evaluated on--
- (1) Performing preventive maintenance checks and services on the turret.
 - (2) Manipulating the turret.
 - (3) Operating the turret weapons system controls.
 - (4) Disassembling and assembling the turret weapons.
 - (5) Uploading, downloading, and clearing the turret weapons.
 - (6) Performing immediate action on the turret weapons.
 - (7) Boresighting the weapons systems (Appendix B).

- c. The driver is trained and evaluated on--
 - (1) Performing all preventive maintenance checks and services on the hull.
 - (2) Performing offensive and defensive driving techniques.
- d. The crew receives classroom instruction on gunnery techniques, gunnery training, and section and platoon training.

3-3. COFT AND BATS

Using either the Conduct of Fire Trainer (COFT) or the Bradley Advanced Training System (BATS) simulates an environment in which the BC and gunner can gain proficiency with crew-coordination skills. Neither trainer has a driver's station; however, drivers should participate anyway, to develop the coordination needed to synchronize vehicle movement to and from defensive positions. Training can also include other driver tasks, such as counting of ammunition and announcing of vehicle and TOW launcher status (up and down).

- a. The BC is trained and evaluated on--
 - (1) Acquiring and designating targets.
 - (2) Initiating fire commands.
 - (3) Conducting target handoff procedures.
 - (4) Performing engagement techniques from the BC position.
- b. The gunner is trained and evaluated on--
 - (1) Reacting to fire commands.
 - (2) Performing engagement techniques.

3-4. DEVICE GUNNERY

Device gunnery (Chapter 8) provides device-based training for collective crew tasks on vehicles. These tables are conducted in local training areas or ranges using the Multiple Integrated Laser-Engagement System (MILES) or the Precision Gunnery System (PGS). Thru-sight video enhances this training.

- a. Device gunnery includes BT I and BT II, Crew Defense and Bradley Crew Proficiency Course (BCPC).
- b. The BC is trained and evaluated on--
 - (1) Controlling the crew, vehicle, and weapons systems.
 - (2) Laying the weapons systems on targets.
- c. The gunner is trained and evaluated on--
 - (1) Boresighting training devices (MILES or PGS).
 - (2) Focusing, aligning, and calibrating through-sight video.
 - (3) Engaging targets with training devices (MILES and PGS).
- d. The driver is trained and evaluated on—
 - (1) Performing berm drills.
 - (2) Applying proper driving techniques.

- e. The crew is trained and evaluated on—
 - (1) Installing and removing training devices (MILES or PGS, and thru-sight video [TSV]).
 - (2) Operating as a crew in a gunnery range environment.

3-5. LIVE-FIRE GUNNERY

Crew gunnery (Chapter 8) introduces the crew to live-fire gunnery.

- a. Live-fire gunnery includes--
 - (1) BT V, Crew Practice 1.
 - (2) BT VI, Crew Practice 2.
 - (3) BT VII, Crew Practice 3.
 - (4) BT VIII, Crew Qualification.
- b. The BC and gunner--
 - (1) Zero the weapon systems (Appendix C).
 - (2) Upload, download, and clear the weapons using live ammunition.
 - (3) Engage targets with full-caliber ammunition.
 - (4) Conduct prefire and postfire checks (Appendix D).
- c. The driver executes offensive and defensive driving techniques.

Section II. LEADER SKILLS

Training events must require subordinate leaders to use their initiative and act independently to prepare them for the decentralized operations that characterize the mechanized battlefield. Bradley leaders must be the most capable soldiers in the unit. These key leaders must be tactically and technically proficient, because their leadership determines the unit's success or failure in battle.

3-6. COORDINATION AND INTEGRATION

A critical leader task is the ability to coordinate and integrate the crew(s), sections, or platoons to maximize their combat potential. The leader must be resourceful, tenacious, and decisive, and he must lead from the front. Each leader must be innovative and flexible in employing his unit. He must have the mental agility to transition quickly, and he must have the instinct to act on the situation and the commander's intent.

3-7. CLOSE COMBAT

Above all else, the Bradley leader must have the skills and attributes essential to the crew's, section's, or platoon's survival and success in close combat. Platoon leaders, commanders, and NCOs are the primary trainers and training managers. To meet their training responsibilities, commanders must—

- a. Base training on wartime mission requirements.
- b. Identify applicable Army standards and set unit goals.
- c. Assess current levels of proficiency.
- d. Provide the required resources.
- e. Develop and execute training plans that produce proficient soldiers, leaders, and units.
- f. Develop a tough, thorough, and well-balanced training program for crews and squads.

Section III. DEVELOPMENT OF TRAINING PROGRAM

The Bradley crew's strength comes from the skill, courage, and discipline of the individual soldiers. Teamwork and cohesion enhance individual capabilities. To succeed in close combat, the Bradley crew must have this cohesion. The crew-training program focuses on developing tough, combat-ready platoons. Bradley crew members must have the skill and the will--not just to *participate* in the close fight, but to *dominate* it.

3-8. BATTLE FOCUS

Battle focus is a concept for deriving peacetime training requirements from wartime missions. Battle focus guides the planning, execution, and assessment of each unit's training program. This is to ensure that its members train as they fight. The battle-focus process is about the same for AC and RC units (both MTOE and TDA). FM 7-0 and FM 7-1 explain how to *plan*, *resource*, and *execute* training events. *This* manual provides the tactics, techniques, procedures, and standards to *evaluate* Bradley platoon and section training. A complete training program emphasizes physical fitness, rifle marksmanship, and precision gunnery skills. Frequent night training, especially with live fire, helps platoons hone their skills.

3-9. MISSION-ESSENTIAL TASK LIST

A unit's training program must support the METL. Therefore, time, resources, and command emphasis must all focus on training tasks that support the METL. Commanders and platoon leaders use these collective tasks. Platoon sergeants and squad leaders should use the appropriate MTP to identify the individual tasks that support the collective tasks. To develop the METL, the commander must know and understand the war plans and external directives handed down from higher.

a. **War Plans.** The most critical parts of METL development are the unit's wartime operations and contingency plans. The missions and related information in these plans provide the keys to determining essential training tasks. From each war plan, the commander selects each mission that his unit is expected to execute in combat.

b. **External Directives.** Additional training tasks relevant to the unit's wartime mission derive from external directives. Such directives could include--

- Mobilization plans.
- Installation wartime transition and development plans.
- Force-integration plans.

c. **Task List.** Once he lists all possible tasks, the commander identifies those that are most critical to success on the battlefield. This refined list becomes the METL.

3-10. COMMANDER'S ASSESSMENT

Before developing a training program, the commander must determine his unit's proficiency on each METL task.

a. **Training.** The commander assesses training with input from the XO, S3, subordinate leaders, and master gunners (FM 7-0 and FM 7-1). He can use individual and crew training to determine the unit's proficiency.

(1) **Individual Training.** Common task test results show basic individual training proficiency. The Bradley Gunnery Skills Test (BGST) evaluates specific Bradley-related individual proficiency. Preliminary weapons training and qualification scores indicate proficiency levels with the various weapons organic to the squads and platoon. Reviewing Army physical readiness test scores also reveals individual physical readiness.

(2) **Crew Training.** Crew training proficiency can be measured by reviewing the COFT or BATS unit summaries along with either performance analyses or session summaries. Crew device gunnery results and evaluation sheets from the last gunnery period provide additional field-oriented data, which also help the commander to determine proficiency.

b. **Evaluation.** The commander uses specific standards to measure the demonstrated abilities of individuals and crews. Accurate evaluations are necessary to identify where to place training emphasis. Leaders must make on-the-spot corrections and demand aggressive action to correct training deficiencies. UCOFT or BATS results are also good indicators of crew proficiency.

(1) **Informal Evaluation.** Unit leaders evaluate performance informally during training.

(2) **Formal Evaluation.** The commander schedules a dedicated evaluator on either the long-range or short-range training plan.

(3) **Internal Evaluation.** The evaluated unit plans, resources, and conducts its own evaluations.

(4) **External Evaluation.** Higher headquarters or another unit plans, resources, and conducts a unit evaluation.

Section IV. TRAINING STRATEGY

The commander develops his training strategy after assessing the strengths and weaknesses of his unit. During his assessment, he considers, and his strategy must reflect, any personnel turbulence (changes). His strategy must focus on his METL, sustain his unit's strengths, and correct its weaknesses. He will find that some tasks apply to all soldiers, some apply only to the BFV crew, and others apply only to the soldiers in the squad. This requires an integrated training strategy. Gunnery progresses logically to support crew training, leading the section or platoon up to a collective, tactical, live-fire evaluation during section or platoon qualification.

3-11. CREW TRAINING

The Bradley commander, in coordination with the platoon leader and master gunner, is the principal trainer for crew duties (Chapter 6), crew coordination, and gunnery skills to form an efficient crew. His primary references include this manual and the appropriate field manuals.

a. Preliminary gunnery training focuses on the technical aspects of BFV gunnery theory, turret operations, and elementary gunnery techniques. The trainers use classroom instruction and hands-on training to provide each crewmember with knowledge of the capabilities, limitations, and characteristics of the vehicle. Crews learn fundamentals of turret manipulation; gun lay; and tracking and adjusting fires for the 25-mm gun, 7.62-mm coaxial machine gun, Stinger, and TOW weapons. The unit also conducts

specific TOW or Stinger system training. This includes classroom training, UCOFT or BATS, and hands-on tasks. The record BGST (Appendix A) tests technical proficiency.

b. Device gunnery training allows crews to practice and refine their collective skills on their vehicles using low-cost training devices. At this point, individual crew duties and actions are integrated and crews perform as a team. The crew conducts a defense exercise that allows the driver to practice "berm drills," while the crew engages single, multiple, stationary, and moving targets. The crews' abilities are evaluated during BT II, Bradley Crew Proficiency Course (BCPC).

c. Crew gunnery training solidifies crew collective gunnery techniques using live ammunition. Crews must meet increasingly difficult standards during variable and challenging conditions similar to combat. The outcome is a crew highly skilled in destroying likely enemy threats on the battlefield.

3-12. CROSS TRAINING

The commander, platoon leaders, first sergeant, and platoon sergeants manage training to ensure every soldier is trained in individual and collective tasks for both crew and Infantry squad skills. The unit-training program must focus on developing tough, combat-ready platoons with a balanced, simultaneous, integrated Infantry squad and crew plan.

a. All soldiers require individual weapon training, physical training, common task training, Bradley skills training, and maintenance training.

(1) A diagnostic BGST--

(a) Evaluates individual task proficiency.

(b) Identifies soldiers proficient enough to serve as gunners.

(c) Cross-trains soldiers when last-minute crew changes are required.

(2) The common task test (CTT) evaluates individual task proficiency.

(3) The Army Physical Fitness Test (APFT) is completed by all soldiers.

(4) Individual weapons qualification is completed by all soldiers.

b. During preliminary and device gunnery training, cross training occurs often to counter inevitable peacetime or combat personnel losses. Cross training incorporates both the crew and squad, sustaining basic crew skills and providing additional training for the squad in case it must perform as a BFV crew. Cross training improves coordination between the crew and the squad fight. DA Pam 350-38 requires that alternate crews train regularly in the UCOFT or BATS, conduct crew device gunnery, and take the BGST. Additionally, the platoon leader's backup crew is resourced to fire crew gunnery.

3-13. INTEGRATED TRAINING

The platoon sergeant, squad leaders, and BCs, in coordination with the platoon leader, are the principal trainers for the collective skills of integrated vehicle teams, sections, and platoon. Primary references include this manual and appropriate mission training plans (MTPs) and Army Training and Evaluation Programs (ARTEPs). One of the most critical parts of the Bradley training program is integrated drill: crews and squad. Trainers must emphasize that crew and battle drills comprise the techniques and procedures for immediate action. Trainers must ensure that each member involved in a drill knows exactly what his individual task is, when to accomplish it, and what to do if he cannot perform the task. Before conducting tactical section or platoon missions, the crew rehearses and trains the drills to standard.

a. **Crew Drills.** Crew drills instill instinctive reactions to situations on the vehicle. With crew drills, the vehicle team must coordinate and synchronize their actions. Team members must perform as loaders. The loader must react to BC and gunner commands, and inspect and load 25-mm ammunition and TOW rounds. The squad must react instinctively and without hesitation when mounting and dismounting the vehicle, while the driver reacts to the BC's command to raise and lower the ramp.

b. **Crew Battle Drills.** Crew battle drills instill instinctive reactions to situations the mounted section and platoon could face in combat. Crew elements must immediately react to contact or ambush or immediately initiate an attack.

Section V. TRAINING PLANS

Once the commander has developed his METL and thoroughly assessed training proficiency, he begins the detailed process of developing a training plan. When planning the gunnery aspect of the training plan, he will find the master gunner to be his most valuable asset.

3-14. BRADLEY MASTER GUNNER

The primary mission of the master gunner is to train gunnery. The master gunner helps commanders at all echelons plan, develop, execute, and evaluate all Bradley-related training (individual, crew, and collective).

- a. The commander directs his specific responsibilities. The master gunner—
 - (1) Assists the validation or certification of newly assigned soldiers.
 - Sets up or conducts initial skills training for new BCs or gunners.
 - Assists in training new BC and gunner crews.
 - Trains and certifies Bradley crew evaluators.
 - (2) Assists all elements in the unit concerning gunnery training.
 - (3) Forecasts all ammunition for training.
 - (4) Manages gunnery records, BGST records, and crew rosters.
 - (5) Coordinates and controls training device use.
 - (6) If SIO (senior instructor/operator) qualified, he certifies and recertifies other I/Os to conduct COFT and BATS training.
 - (7) Plans and manages COFT and BATS training.
 - (8) Trains crews on MILES and PGS gunnery (installation, boresighting and troubleshooting procedures, point of aim, and maintenance).
 - (9) Executes gunnery training.
 - (10) Supervises live-fire ranges to ensure all standards are followed.
 - (a) Confirms zero techniques.
 - (b) Coordinates target arrays.
 - (c) Coordinates exposure times for targets.
 - (d) Coordinates maneuver box verification.
 - (e) Coordinates setup of all ranges to ensure they meet the standards in this manual.
 - (11) Sets up and conducts BGST training and evaluates the results.
 - (12) Advises the commander of the tactical capabilities of the Bradley against threat systems (in coordination with the S2).
- b. The master gunner has received formal training to function at battalion level. This includes extensive training in BFV maintenance, range plan preparation and execution, and all phases of gunnery training. Though this chapter previously discussed

the main responsibilities of the master gunner, their scope changes depending on this level of assignment.

(1) ***Division or Brigade Master Gunner***. Because effective unit gunnery training programs require a great deal of attention, the master gunner assigned to division or brigade level must--

(a) Work closely with master gunners assigned to lower echelons to ensure uniform standards throughout training programs.

(b) Develop, IAW this manual, the written certification test for Bradley crew evaluators.

(c) Provide any new information on ways to improve Bradley crew training.

(d) Coordinate with range-control personnel at the installation or major training area.

(e) Help develop and upgrade range facilities.

(2) ***Battalion Master Gunner***. When assigned to battalion level, the master gunner must—

(a) Continue to train master gunners assigned to battalion.

(b) Help the battalion commander and command sergeant major select candidates for master gunner school.

(c) Develop new training techniques to improve crew training.

(d) Coordinate with brigade for BFV training assets.

(e) Certify Bradley crew evaluators IAW this manual.

(f) Certify BGST evaluators IAW this manual.

(g) Certify range safety personnel.

(3) ***Company Master Gunner***. When assigned to company level, the master gunner must—

(a) Develop and execute company-level gunnery training plan.

(b) Help service the BFV as required.

(c) Work with unit maintenance on turret problems.

(d) Complete DA Form 2408-4, *Weapon Record Data*.

(e) Coordinate with the battalion S3 and battalion master gunner to secure company gunnery training assets.

(e) Train Bradley crew evaluators IAW this manual.

(4) ***Platoon Master Gunner***. When assigned to platoon level, the master gunner must—

(a) Ensure the platoon BFV weapon system and turret are maintained.

(b) Update the company's master gunner on the platoon's crew training.

(c) Help the company's master gunner with unit gunnery training.

3-15. RELATIONSHIPS BETWEEN KEY LEADERS AND TRAINERS

The goal of BFV gunnery is to prepare Bradley-equipped crews and platoons for war by training to tough, realistic, measurable standards. The key leaders and trainers in this process are the commanders, sergeants major, operations officers, master gunners, and platoon leaders.

a. The battalion commander has the unit execute section or platoon qualification first. His command emphasis on training the whole section or platoon sets the precedent for success. He defines his METL with input from those of his superior and subordinate commanders. When prepared IAW this manual, the battalion METL drives the scenarios

and engagements for section and platoon qualification. The battalion commander assesses training to find out whether the unit is prepared to perform these tasks. He incorporates input from the company commander, the command sergeant major, the Combat Training Center's (CTC's) take-home packages from external evaluations, previous gunnery, and COFT or BATS progress. Based on his assessment, he constructs the unit's long- and short-range training plans.

b. In accordance with the battalion commander's guidance--

(1) **Battalion Operations Officer.** Together the battalion operations officer (S3) and master gunner project the needs of the battalion METL against the unit-training calendar. Multiechelon and sustainment training are the keys to success. The training plan includes basic individual tasks and progresses to task-force training. The master gunner helps the S3 develop the crew and infantry squad-training strategy. He develops scenarios and forecasts ammunition, ranges, and training aids.

(2) **Battalion Master Gunner.** The master gunner focuses on planning crew-training support. He expertly ensures the scenarios comply with this manual and that the range complex supports the scenarios. He is trained to ensure the scenario targets comply with safety requirements. Throughout the process, he uses his expertise to train the Bradley vehicle crew. The master gunner informs the commander and S3 about unit training on the UCOFT or BATS and about the marksmanship results of all individual and crew-served weapons.

c. The company commander and his master gunner relate much like the S3 and his master gunner do.

(1) **Company Commander.** The company commander provides his METL, training assessment, and unit-specific training needs to the battalion commander. He also provides guidance on training priorities to his master gunner.

(2) **Company Master Gunner.** The company master gunner informs the company commander about crew and squad training needs and helps the commander plan. He informally keeps the battalion master gunner informed of company training. Formally, he helps the commander define and request training devices, ammunition, ranges, and resources to support training. He also advises the commander on the maintenance status of turret-specific problems such as worn-out barrels.

d. The platoon leader has several experienced NCOs to help him analyze, plan, and prepare his platoon training.

(1) **Platoon Sergeant.** The most important source of information and aid is the platoon sergeant, who knows firsthand the platoon's strengths, weaknesses, training status, and maintenance status. In preparing platoon training, the platoon leader relies most on the platoon sergeant, who consolidates input from the squad leaders into the platoon and company training strategy. He also closely supervises the platoon master gunner.

(2) **Platoon Master Gunner.** The platoon master gunner provides the same expertise as the company master gunner. He knows training devices, strategies, and this manual. This makes him a valuable asset in preparing platoon training. He provides the necessary expertise when the platoon is tasked to conduct a specific crew or squad training event for the platoon or company.

3-16. CREW STABILITY MANAGEMENT

The greatest problem a commander must contend with in developing a training plan is crew turbulence (personnel changes). This turbulence is inevitable, so the commander

must plan short- or long-term solutions for reducing it and controlling its effects. He must do this before he develops and executes his training plan.

a. **Short-term Solutions.**

(1) Change personnel as a crew rather than a single crewman. For example, if a staff sergeant Bradley commander is promoted to platoon sergeant, then his entire crew moves with him. This causes only one crew change rather than two.

(2) Train an alternate for each position.

b. **Long-Term Solutions.**

(1) Continually cross-train personnel for replacements. Experienced soldiers are easier to train than new soldiers.

(2) Form complete crews from new personnel who come into the unit. Match loss dates (ETS, PCS, and DEROS) within the same crew.

3-17. LONG-RANGE TRAINING PLANS

Long-range planning is resource oriented (FM 7-1). Each commander identifies training needs from his METL task-proficiency assessment. He sets goals and forecasts or allocates resources to reach them. When considering his long-range plan, the commander must answer several questions:

a. What is the current platoon proficiency level (crew and squad)? The answer to this question depends on--

(1) Squad and crew turbulence (changes).

(2) Performance during previous gunnery maneuver exercises and squad and platoon situational training and live-fire exercises (STXs and LFXs).

b. What are the performance goals for the platoons? What proficiency level must crews and infantry squads reach in order to accomplish METL tasks? Some goals include--

(1) Meet or exceed DA Pam 350-38 qualification standards.

(2) Set a percentage of qualified marksmen, sharpshooters, and experts for AT4, Dragon, Javelin, M16, M203, M240B, M249, or other weapon systems that the unit uses.

(3) Set a percentage of qualified, superior, and distinguished ratings for BFV crews.

(4) Obtain an overall rating of trained ("T") on the appropriate advanced gunnery table.

c. What resources must we have, and where is the command emphasis? (DA Pam 350-38 also shows the ammunition authorization for every weapon system in the battalion.)

- Correct tasks that fall short of the standard.
- Sustain proficiency in tasks that meet the standard.

d. What schools and training are needed to certify and train trainers?

- Master gunner's course,
- Bradley crew evaluator's certification, the
- Bradley gunnery skills test-evaluator certification, the
- Instructor/operator courses within the unit, and either the
- Instructor course for the multiple integrated laser-engagement system, or the
- Precision gunnery system training.

3-18. SHORT-RANGE TRAINING PLANS

Resources identified during long-range planning are allocated and prioritized during short-range planning. Command training guidance is published to provide trainers detailed information on the training objective. Active and reserve components' short-range training considerations are different. (FM 7-1 explains this process in detail.)

a. **Considerations.** Gunnery resource considerations are ammunition, fuel and repair parts, range and maneuver area, and training device availability.

b. **Ammunition.** Master gunners must carefully manage ammunition allocations, especially when dealing with 25-mm resources. The battalion master gunner forecasts ammunition needs well before the training event. For many reasons, the ammunition authorization could fall short of the forecasted training requirement. PGS will not train proper boresight, zero, or gun-operation procedures. Once the master gunner knows the yearly ammunition authorization, he allocates ammunition in a specific priority:

(1) **Crew Training.** The crew practices with MILES. However, MILES is unsuitable for moving target engagements, because it does not require the gunner to apply lead to engage a target. MILES is also unsuitable for training BOT and TOT. Consequently, the commander must develop a strategy to train with less ammunition.

- (a) Qualify crew.
- (b) Rehearse crew.
- (c) Conduct qualification refires and additional training.
- (d) Reduce crew practice tasks for stable, prequalified crews.
- (e) Give ammunition to new crews.
- (f) Reduce rounds per engagement on training and practice exercises.
- (g) Increase device-based training.
- (h) Use PGS in crew practice scenarios.
- (i) Increase use of COFT or BATS.

(2) **Squad Training.**

- (a) Conduct weapons qualification.
- (b) Conduct a squad and platoon LFX.
- (c) Dry fire or use MILES on STX lanes.
- (d) Reduce rounds per engagement on squad LFXs (not platoon LFXs).
- (e) Conduct LFX refires and additional training.

(3) **Platoon Training.** Use PGS on platoon practice. PGS will not allow leaders to see tracers from other vehicles for fire control and distribution applications. Dry fire or use a subcaliber (7.62-mm) gun during platoon practice.

- (a) Qualify the platoon.
- (b) Rehearse the platoon.

c. **Fuel and Repair Parts.**

- (1) Train closer to garrison.
- (2) Use a limited number of vehicles to train crews.
- (3) Use HETs to move vehicles to the range.

d. **Range and Maneuver Area.** Include target and range-support personnel.

- (1) Short-range gunnery scheduling considerations include—
 - (a) Vehicle services.
 - (b) Other mandatory training, or events prescribed by higher headquarters.
 - (c) No training events (holidays, leaves, installation support).

- (2) Short-range guidance considerations include—
 - (a) Crew and squad training priorities and expected outcomes.
 - (b) Leader, individual, and collective tasks associated with the training event.
 - (c) Steps required in preparing trainers and evaluators.
 - (d) Integration of crew and squad training on the training calendar.

3-19. NEAR-TERM TRAINING PLANS

Near-term planning is primarily conducted at battalion, company, and platoon levels. Its main purpose is to conduct final coordination and to provide specific guidance to the units.

a. Training meetings should be held at battalion, company, and platoon levels so all key personnel understand detailed information.

- (1) Battalion meetings focus on training management. Leaders--
 - (a) Conduct final coordination of ranges, training areas, and ammunition.
 - (b) Coordinate between units for maintenance, medical, logistical, and personnel requirements.
 - (c) Lock in and publish unit-training schedules.

(2) Company and platoon meetings cover the specifics of executing the training event. Participants--

- (a) Discuss when the training will be conducted, to include movement times to the training area.
- (b) Discuss personnel involved in the training event, and identify who is responsible for conducting the training.
- (c) Discuss in detail the BFV range setup, execution, and key individual responsibilities (Chapter 5).
- (d) Discuss training location, uniforms, and special equipment required to conduct training.
- (e) Discuss specific personnel performance measures to be evaluated.

b. Commanders should require briefbacks to ensure subordinate leaders understand all aspects of the training event.

c. The formal training plan culminates with the training schedule. Commanders, key leaders, and all trainers must continue to plan and coordinate training informally with a series of pre-execution checks. Additionally, trainers, soldiers, and support personnel must thoroughly prepare for training.

(1) Pre-execution checks systematically prepare soldiers, trainers, and resources to ensure that training starts properly. These checks are developed, and responsibility for them assigned, during short-range planning. FM 7-1 includes an example pre-execution checklist. To develop an intensive pre-execution checklist, trainers should integrate range and training area checks and considerations from Chapter 5.

(2) Commanders prepare trainers to conduct performance-oriented training by providing time, guidance, resources, and references. Each trainer rehearses his preparations and reviews the tasks and subtasks that he must conduct. This gives him confidence in his ability to perform the task himself, and to teach soldiers the correct skills.

Section VI. COLLECTIVE TRAINING

Gunnery training must use all available resources to raise and sustain the proficiency level of the METL tasks. Training must be well-structured, realistic, effective, and safe.

3-20. HOME-STATION GUNNERY

Home-station gunnery (HSG) is a continuous and progressive training program that is intensified two to three months before a major gunnery rotation. HSG, which is planned at battalion level and executed at company level—

- Orients the crew to the technical aspects of the turret systems.
- Exposes the crew to the most fundamental gunnery techniques.
- Integrates the crew into an efficient team during device gunnery (before live fire).
- Orients the squad in doctrinal aspects of STX operations.
- Integrates the section and platoon during device gunnery.

3-21. GUNNERY DENSITIES

Major gunnery densities normally focus on--

- Orienting the squad in the fundamental aspects of an LFX.
- Refining crew skills using full-caliber ammunition on full-scale ranges.
- Qualifying crews.
- Integrating the section and platoon in live-fire training and qualification.

3-22. GUNNERY LEVELS

A well-rounded gunnery program has four progressively difficult levels. Crews, squads, sections, and platoons should achieve proficiency at each level before advancing to the next. The four gunnery levels are as follows:

a. **Preliminary.** Preliminary gunnery introduces the crew to the vehicle system and develops individual and crew skills in operating the BFV, turret, and weapon systems. It provides classroom instruction as well as hands-on applications. Hands-on tasks include gun lay, tracking, adjustment of fires, range card, and basic TOW gunnery tasks as well as COFT or BATS exercises. (Chapter 7 discusses elements of preliminary gunnery.)

b. **Device.** Device gunnery trains crews, sections, and platoons using devices. Crews conduct BT I, Crew Defense, which lets the driver practice berm drills using the vehicle while the crew engages single and multiple stationary and moving targets. Evaluators assess the crew's abilities during BT II, Bradley Crew Proficiency Course. Sections also conduct BT III, Infantry Squad or Section Exercise, which allows the infantry squad and vehicle sections to train together. This develops techniques needed to perform squad collective tasks. BT IV, Infantry Platoon Proficiency Course, integrates the entire platoon in a device-based combat scenario. The platoon leaders develop their command and control skills and identify strengths and weaknesses for future training emphasis. (Chapter 8 discusses some elements of device gunnery.)

c. **Crew.** Crew gunnery uses live fire to refine and evaluate crew skills developed during preliminary and device gunnery. Crew gunnery includes three crew practice tables (BT V, BT VI, and BT VII) and the crew qualification table (BT VIII). (Chapter 8 discusses elements of crew gunnery.)

d. **Section and Platoon.** Section and platoon gunnery integrates all the crews into a live-fire tactical scenario. Both sections and platoons refine and verify tactics and techniques developed during previous training. This gunnery consists of section and

platoon practice and qualification tables (BT IX and BT X, Section Practice and Qualification; and BT XI and BT XII, Platoon Practice and Qualification. During qualification, sections and platoons are evaluated on their collective abilities.

3-23. GUNNERY CONDITIONS

Gunnery conditions vary, so crews learn to fight in any battlefield environment. Training in a variety of conditions ensures that crews can perform in adverse weather and degraded-mode gunnery. They must not only use thermal sights at night, but also during daylight operations in smoke, adverse weather conditions, and concealing terrain.

a. **Adverse Weather.** Soldiers must know how adverse weather affects the performance of their systems. They also must know how to mechanically operate the weapons system.

(1) Fog, snow, and heavy rain hinder target acquisition, range determination, and BOT.

(2) Temperature extremes and humidity affect cyclic rates of fire and ballistics.

b. **Degraded-Mode Gunnery.** In degraded mode, BFV crews engage targets with a less than fully operational system or under worse than normal operating conditions.

(1) Battle damage and maintenance problems can deny the use of primary sights and turret control systems. Crews must continue the fight using—

(a) Auxiliary sight. All A3 crews must select "gun power track" when using the auxiliary sight.

(b) Commander's hand station.

(c) Turret, manually operated.

(2) NBC conditions severely influence the crew's ability to—

(a) Operate turret controls and perform crew duties.

(b) Observe through the optics.

(c) Perform during continuous operations.

3-24. TRAINING REQUIREMENTS

A Bradley crew includes the BC, gunner, and driver, unless otherwise specified (Figure 3-1):

a. BCs, gunners, and platoon alternate crewmembers must pass all BGST tasks in the three months (four months for RCs) before live fire.

b. A crew must pass BT II within the three months (four months for RCs) before they can fire full-caliber live rounds.

c. A crew must fire BT VII in the three months (four months for RCs) before they fire BT VIII.

d. BCs and gunners must have completed the TOW gunnery program to standard within the three months (four months for RCs) before they can fire a live TOW missile.

e. Crews who will fire live rounds during infantry platoon, scout team, engineer platoon, BFIST team, or Stinger squad qualification must first qualify on BT VIII in the six months before BT IX, BT X, BT XI, and BT XII.

f. BGST evaluators must pass all BGST tasks within one year and, within the month before they evaluate a particular BGST station themselves, they must achieve a "GO" on that station.

g. All Bradley crew evaluators must certify or recertify IAW the BCE certification program (Chapter 8) in the three months (four months for RC) before any live-fire exercise.

PERSONNEL	REQUIREMENTS
<ul style="list-style-type: none"> • BCs • Gunners • Platoon alternate crewmembers 	Pass all BGST tasks in the 3 months (4 months for RC) before live fire.
<ul style="list-style-type: none"> • Crews 	Passed Table BT II in the 3 months (4 months for RC) before full-caliber live fire. Fired BT VII in the 3 months (4 months for RC) before BT VIII.
<ul style="list-style-type: none"> • BCs and gunners 	Completed the TOW gunnery program to standard in the 3 months (4 months for RC) before TOW missile live fire.
<ul style="list-style-type: none"> • Crew firing live rounds during qualification for-- <ul style="list-style-type: none"> -- Infantry platoon -- Scout team -- Engineer platoon -- BFIST team -- Stinger squad 	Qualified on BT VIII in the 6 months before BT X, BT XI, and BT XII.
<ul style="list-style-type: none"> • BGST evaluators 	Pass all BGST within 1 year. In the month before they evaluate a particular BGST station themselves, achieved a "GO" on that same station.
<ul style="list-style-type: none"> • All Bradley crew evaluators 	Certified or recertified IAW BCE certification program in the 3 months (4 months for RC) before any LFX.

Figure 3-1. Training requirements.

CHAPTER 4

Training Devices

The commander balances BFV training resources and time, using appended equipment, simulators, and training aids. This allows effective and economical training to standards. However, nothing can replace live fire. The commander and master gunner must start by assessing the unit's proficiency.

4-1. TYPES

Trainers must identify the specific resources that increase a unit's ability to train, sustain, and evaluate BFV gunnery and tactical training. Tables 4-1 and 4-2, pages 4-2 and 4-3, offer a quick reference of the appended equipment, simulators, and aids that relate to specific training events.

- a. **Appended Equipment.**
 - Thru-sight video (TSV).
 - Multiple-Integrated Laser Engagement System (MILES).
 - Precision Gunnery System (PGS), ODS and below.
 - Precision Gunnery System, A3 only (PGS).
 - Captive Flight Trainer (CFT).
- b. **Simulators.**
 - Conduct of-fire trainer (UCOFT and MCOFT).
 - Bradley Advanced Training System (BATS).
 - Simulations network (SIMNET).
 - Close-combat tactical trainer (CCTT).
 - Linebacker Tabletop Trainer (LTTT).
- c. **Training Aids.**
 - Tracking board.
 - Laser target-interface device (LTID).
 - Scale models.
 - Dummy rounds (M172, M794, and MSR).

4-2. APPENDED EQUIPMENT

Appended equipment includes three-dimensional training products that mount on the actual platform and that can be activated either mechanically or electrically. All Bradley-appended equipment requires an operating temperature of 50 to 120 degrees Fahrenheit (ambient) up to a peak of 125 degrees Fahrenheit. For system specifics on the thru-sight video (TSV), refer to TM 9-6920-708-10.

a. **Thru-Sight Video.** The vehicle-appended TSV (Figure 4-1, page 4-4) provides a visible and audible record of gunnery or tactical-engagement exercises. Trainers use it to evaluate and critique vehicle gunnery training-engagement sequences. TSV is transparent to the crew. Its onboard monitor can play back training sequences immediately. The TSV system has the following components:

(1) After-action review (AAR) subsystem. This subsystem lets evaluators play back, zoom in, and freeze individual engagements. It also lets crews review their performance on the AAR subsystem. The AAR subsystem is usually located in the AAR area.

- (2) Audio-video recorder.
- (3) Environmental enclosure unit.
- (4) Camera-control junction unit.
- (5) Optical unit.
- (6) Cable assembly.

	APPENDED EQUIPMENT				SIMULATORS			
	TSV	MILES	PGS	CFT	COFT*	BATS	SIMNET, CCTT	M6 LTTT
PARTICIPANTS								
Gunner Only								
Gunner and BC	X	X	X	X	X	X		X
Gunner, BC, and Driver							X	
Infantry Riflemen		X						
Platoon		X					X	
FEATURES								
Use of Bradley	X	X	X	X				
Simulation of Bradley					X	X	X	X
Live Fire	X		X	X				
Force on Force	O	X	O	O			X	
Limited Visibility	X	X	X	X	X	X	X	X
Use in NBC	X	X	X	X	X	X	X	X
Permanent Location					X	X	X	
Portability	X	X	X	X	X			X
Variable Difficulty					X	X	X	X
FEEDBACK								
Audio	X				X	X	X	X
Video	X		X		X	X	X	X
Printout			X		X	X	X	
TRAINING EVENTS								
Preliminary Gunnery	X	X	X	X	X	X		X
Drill Training	O	X	X	X				
Device Gunnery	O	X	X	X				
Crew Gunnery	X		O	X				
Advanced Gunnery	O		X	X				
Special	O	O	O				X	
X -- Designated use O -- Alternate use				* UCOFT and MCOFT				

Table 4-1. Appended equipment and simulators.

	AIDS		
	Tracking Board	LTID	Scaled Models
PARTICIPANTS			
Gunner Only			
Gunner and BC	X	X	X
Gunner, BC, and Driver			
Infantry Riflemen		X	
Platoon		X	
FEATURES			
Use of Bradley	X		X
Simulation of Bradley			
Live Fire			
Force on Force			
Limited Visibility		X	
Use in NBC	X	X	X
Permanent Location			
Portability	X	X	X
Variable Difficulty	X		X
FEEDBACK			
Audio			
Video			
Printout			
TRAINING EVENTS			
Preliminary Gunnery	X	O	X
Drill Training		O	
Device Gunnery		X	
Crew Gunnery			
Platoon Gunnery		O	
Special		X	
X -- Designated use O -- Alternate use			

Table 4-2. Training aids.

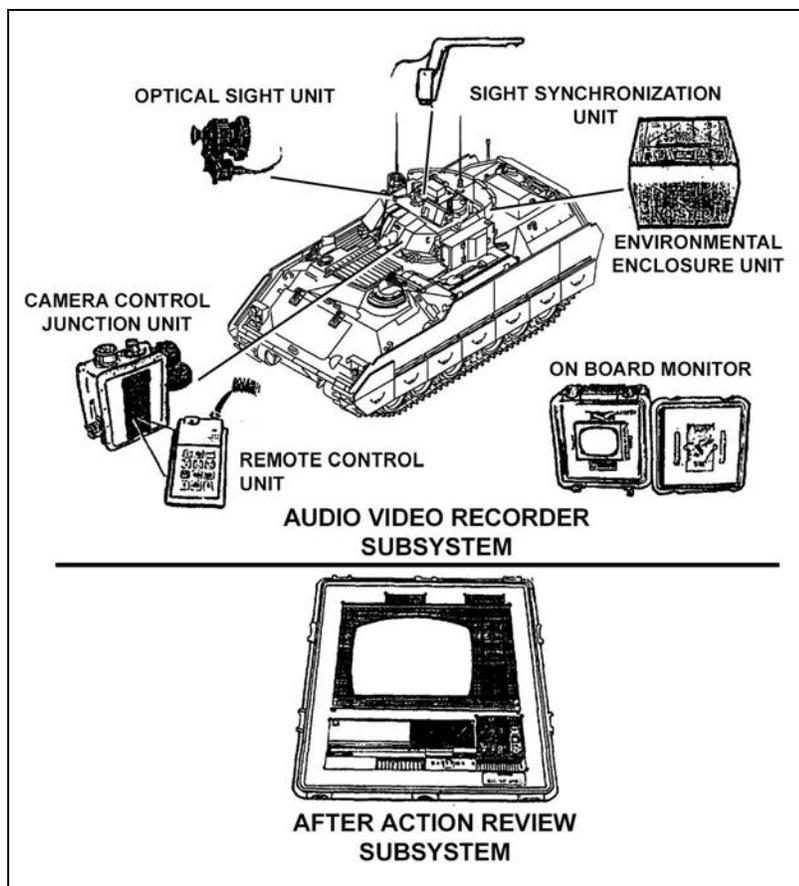


Figure 4-1. Thru-sight video.

b. **Multiple-Integrated Laser Engagement System.** MILES (Figure 4-2) is an integrated family of low-power, eye-safe, laser-based devices. It simulates the casualty-producing effects of direct-fire weapons using semiconductor laser beams. When fired, MILES sends an invisible laser beam from a transmitter attached to the 25-mm gun and to the TOW launcher. The laser beam transmits coded messages (based on the weapon and ammunition selected) to the detector belt sensors on other MILES-equipped vehicles. The MILES for the M2 or M3 fighting vehicle enables the crew to use the vehicle in realistic combat training exercises (force-on-force). MILES is unsuitable for training moving target engagements, because the gunner cannot apply lead or induce range to engage the target. Also, trainers cannot use MILES to train BOT and TOT, because the crew cannot see hit signatures or tracers (TM 9-1265-375-10).

(1) System components include—

- Control console.
- Battery box.
- TOW transmitter.
- TOW simulator tube.
- Detector belt system.
- Combat vehicle kill indicator.
- TOW training box (except A3).
- Superelevation training box (M2A2 ODS).
- Flash weapons-effects systems simulator.
- Antitank, weapon-effects-signature simulator.
- Main gun or coax transmitter.
- Coax machine gun microphone.
- Blank firing attachment, 7.62 mm.

(2) The *TOW training box* on MILES-equipped vehicles has a training-mode bypass feature that—

- (a) Synchronizes the ISU sight picture with the MILES TOW aiming point.
- (b) Eliminates drive system lag by making the gun the master axis in the TOW mode.
- (c) Has an easily operated, transparent training and tactical mode.
- (d) With the TOW selected, forces the ISU mirror to track gun-resolver input rather than TOW-resolver input.

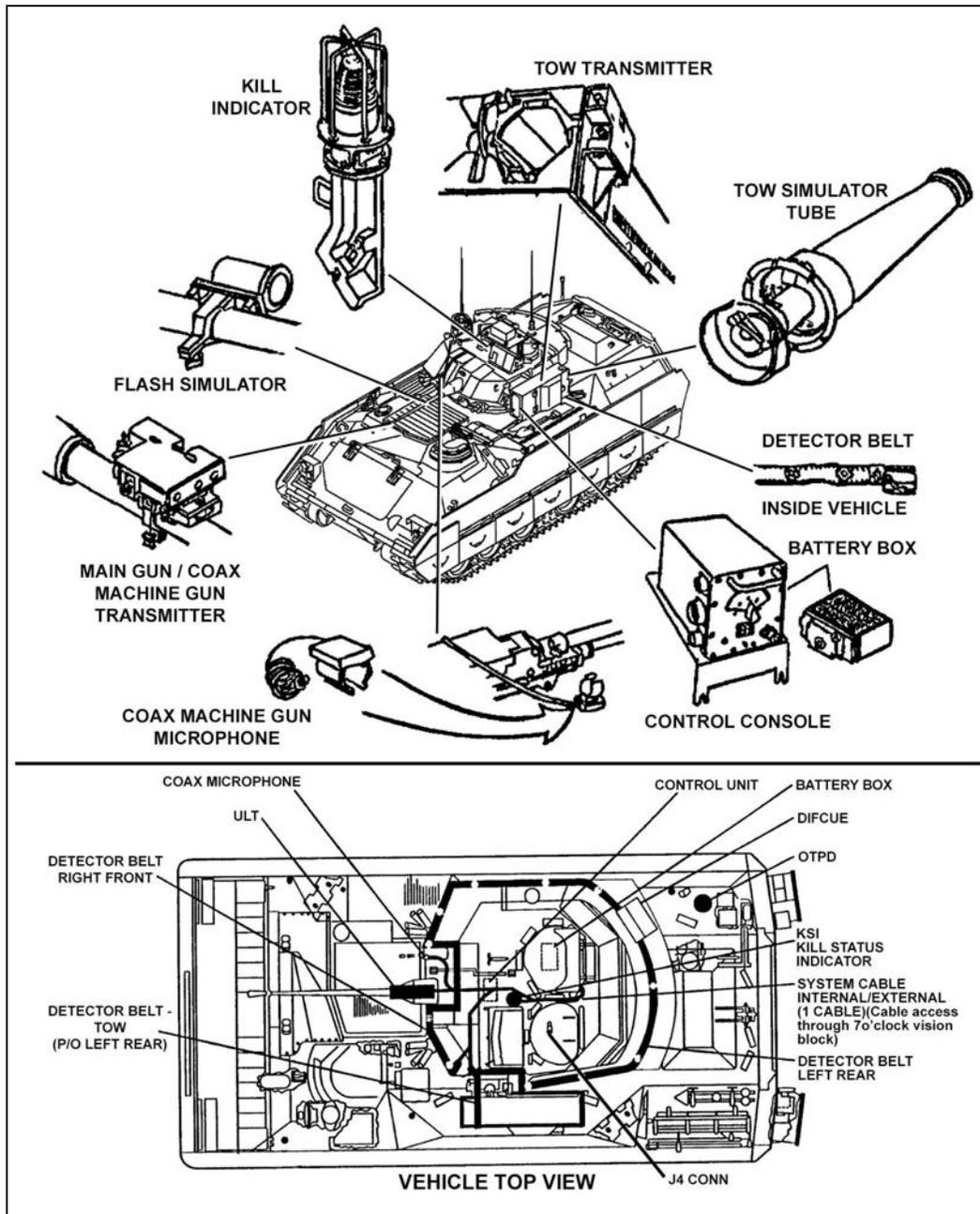


Figure 4-2. Location of MILES 2000.

c. **Precision Gunnery System, ODS and below.** The PGS (Figure 4-3, page 4-7) is an eye-safe laser appended training device that provides normal and degraded mode gunnery on unit vehicles. The system allows crews to develop and sustain gunnery skills while training using their own vehicles. Tracer and missile signatures in the commander's and gunner's sights replicate the actual weapons and ammunition. This allows crews to apply lead, BOT, and TOT procedures during engagements. The PGS is fully compatible on MILES-equipped ranges, vehicles, and targets. The system can send and receive hit, kill, and miss signals from other PGSs, tank weapons gunnery simulation systems (TWGSSs), or MILES-equipped vehicles. A redesign of the mounting reconfiguration allows the crew to fire the TOW "in simulation" while they fire the 25-mm and coax "live." The PGS lets the BCEs review all engagements during the AAR. The PGS also shows ballistic information for each simulated round fired. It identifies where each hits relative to the target, in mils, both in azimuth and elevation. (TM 9-6920-710-12&P-1 and TM 9-6920-711-12&P-1 provide additional information.) The system components include—

- Control panel.
- Controller unit.
- Hull detectors.
- Laser transceiver unit.
- Training-data-retrieval system.
- Vehicle-interface unit.

d. **Precision Gunnery System, A3 Only.** The A3 PGS simulates real-world firing conditions and effects, with images and sounds. The Bradley A3 PGS training-device interface panel (TDIP) includes fully integrated fire controls. The A3 adds the following components:

- Driver-unit's dual bracket (A3 only).
- Tracer-burst obscuration simulator.
- Vehicle interface assembly bracket (A3 only).
- Video-mixer unit for tracer-burst-obscuration simulator (A3 only).

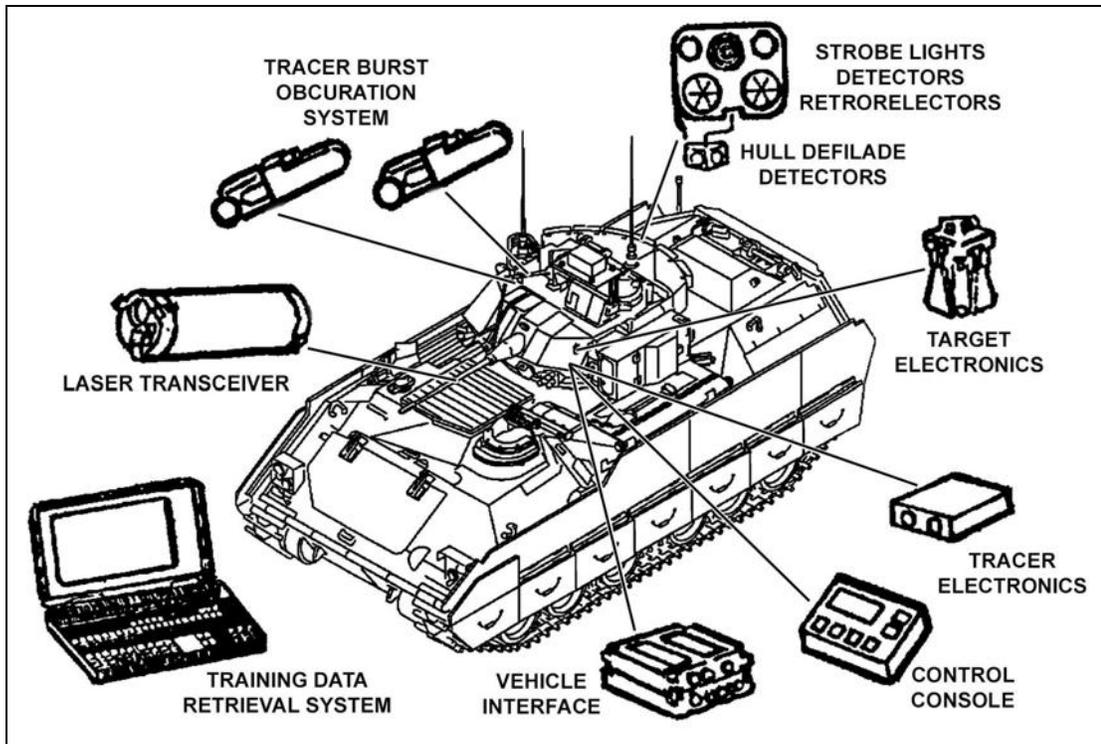


Figure 4-3. Precision gunnery system.

e. **Captive Flight Trainer.** The CFT (Figure 4-4) is a missile simulator used to train operator tracking and engagement skills. The CFT is used in conjunction with the Remotely Piloted Vehicle-Target System (RPVTS) to train engagement procedures with live targets. It consists of a Stinger-reprogrammable microprocessor (RMP), missile guidance assembly, a ballasted launch tube, and a container. The seeker and audio interface is the same as for the tactical missile, with electrical power and coolant provided by normal launcher sources.

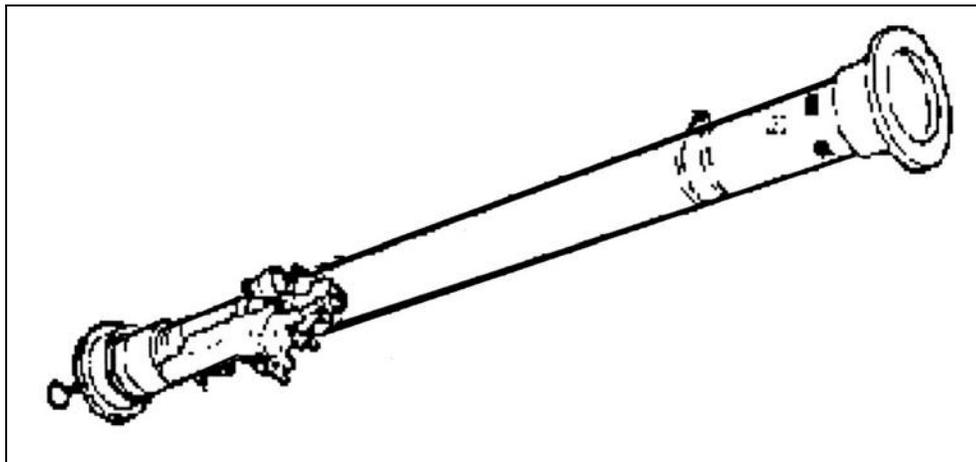


Figure 4-4. Captive flight trainer.

4-3. SIMULATORS

Simulators provide high fidelity training without the use of the actual equipment. They are stand-alone trainers that emulate the functions of equipment or systems. Simulators use electronic or mechanical means to reproduce conditions necessary for an individual or crew to practice operational tasks in accordance with training objectives. They represent the equipment physically and functionally to varying degrees and follow the mathematical equations that describe performance.

a. **Conduct of Fire Trainer.** The COFT is the primary simulator for training crew gunnery skills without using ranges, ammunition, or vehicles. The COFT allows training without regard to time of day or climatic conditions. The two COFT configurations include the unit and mobile conduct-of-fire trainers (UCOFT and MCOFT).

(1) The UCOFT (Figure 4-5) consists of three interconnecting shelters. The instructor's handbook (HB 23-1 series) and TM 9-6920-737-10 describe how to use them:

- Trainer shelter.
- Computer shelter.
- Integrated shelter.

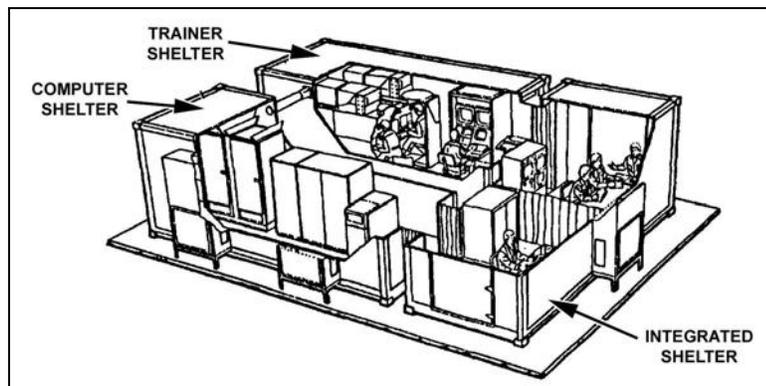


Figure 4-5. Unit conduct-of-fire trainer.

(2) The MCOFT (Figure 4-6) consists of a training shelter and a computer shelter mounted on a trailer to allow movement between various unit locations. The Army National Guard is the main user of the MCOFT. The instructor's (HB 23-1 series) and TM 9-6920-759-10 provide operating instructions.

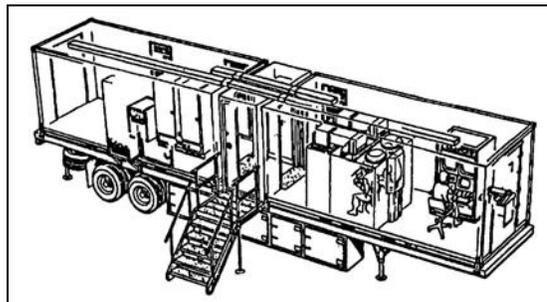


Figure 4-6. Mobile conduct-of-fire trainer.

b. **Bradley Advanced Training System.** The BATS (Figure 4-7) serves as the gunnery trainer for the Bradley A3. The purpose of the BATS is to train and sustain a crew's ability to perform fundamental gunnery techniques in simulated gunnery and combat scenarios. The BATS is the COFT for the Bradley A3:

(1) The BATS has four components.

(a) A *crew station* replicates the functions of the A3 turret controls, indicators, sights, and weapons.

(b) An *instructor/operator station* is used by I/Os to initialize the BATS and conduct training and briefings, and by senior I/Os to manage training.

(c) A *remote monitoring station* (RMS) facilitates briefings and concurrent training.

(d) A *image generator* (IG) provides images for the sights.

(2) The BATS provides sustainment and cross-training programs to train crews in a simulated gunnery or combat mode. In BATS, three-dimensional targets (IAW TC 25-8, *Training Ranges*), and range markers, ammunition allocations, and evaluation standards (IAW this manual) allow battle-focused training in the gunnery mode. The BATS provides realistic training in the combat mode by presenting realistic target models. The crew's basic ammunition load is based on DA Pam 350-38, *Standards in Weapons Training*, and on this manual. Based on target range, type, and the location of the hits, the BATS determines the probability of a hit or kill (PH or PK). The SIO inputs engagement parameters to support a specific unit's METL and its threat template.

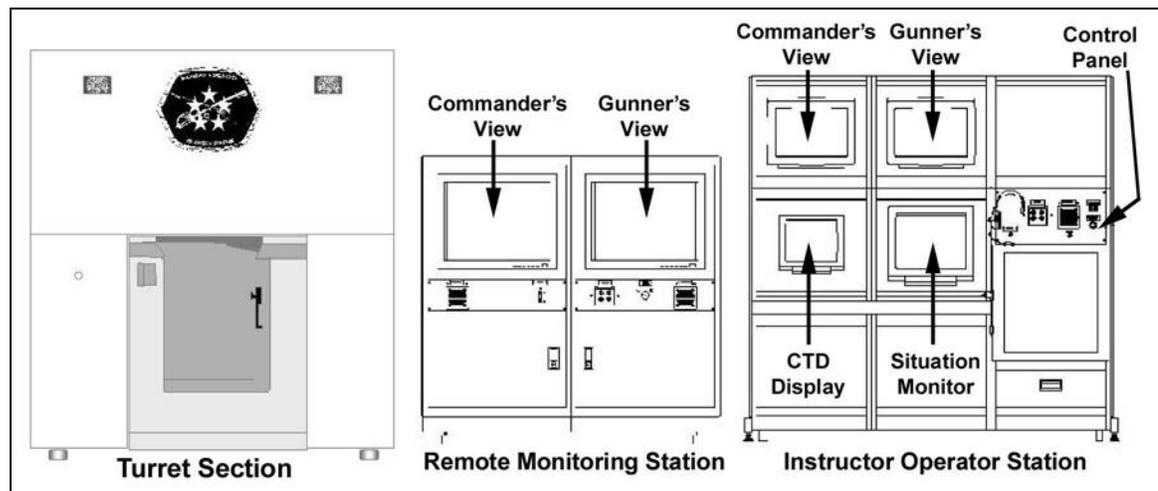


Figure 4-7. Bradley advanced training system (BATS).

c. **Simulations Network.** The SIMNET (Figure 4-8, page 4-10) is a local network of combat vehicle simulators that simulate the M1 tank and the M2 or M3 BFV. The commander can request a SIMNET configuration in any size from tank or infantry platoon up to battalion task force size. When SIMNET is used as a company- or battalion-level trainer, a complete functional tactical operation center (TOC) and combat trains command post (CP) are available to act as the administration logistics operations center (ALOC) that would normally be present during combat operations. Computer-generated imagery is used to create the illusion of riding in tanks and BFVs fighting force-on-force battles. The training benefits from SIMNET depend on two important factors: training know-how and leadership. The system and its computers are

simple to use. With few exceptions, four hours of practice will support STX training on mounted tasks. As in any training, the leader must plan and prepare his objectives in advance and must ensure that the entire chain of command knows and supports the training objectives. The system components include—

- Semiautomatic forces station
- Tactical operations center
- Combat trains command post
- Site control command post
- Infantry squad work station
- Simulator
- Emulator
- Plan view display
- Data logger

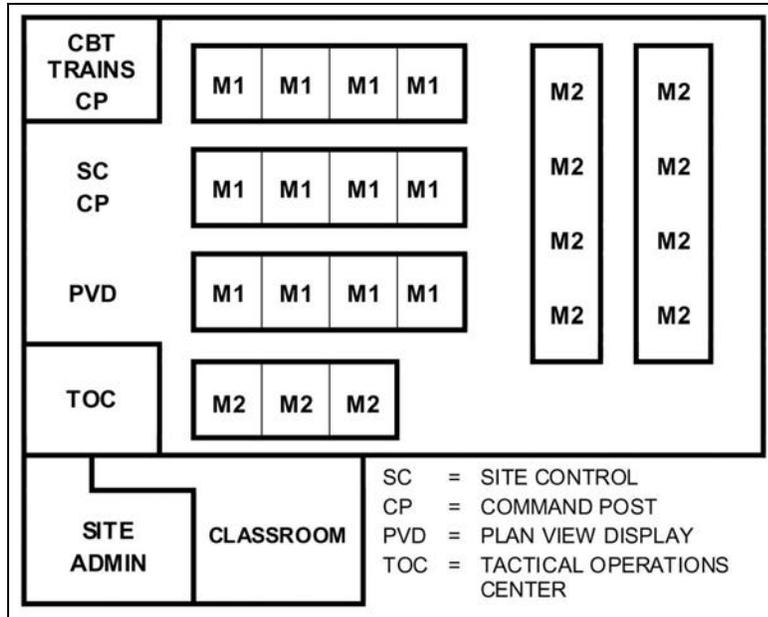


Figure 4-8. Simulations network.

d. **Close Combat Tactical Trainer.** The CCTT (Figure 4-9) is a mounted task trainer consisting of a network of individual, computer-driven, combat-vehicle (mounted task) simulators. It trains the M1 Abrams tank, the M2 or M3 Bradley, the high-mobility multipurpose wheeled vehicle (HMMWV), and the fire-support team (FIST) vehicle.

(1) The CCTT's controls duplicate those of the vehicles and functions they simulate. CCTT computers can create a complex illusion of --

- Moving and fighting over actual terrain.
- Operating or riding inside the actual vehicles.
- Employing the vehicles' actual weapon systems.

(2) The trainer selects collective tasks to train units ranging in size from mounted crews up through battalion task-force soldiers.

(3) The trainer's effectiveness depends heavily on its computer-generated force (CGF) capability. This lets the trainer simulate both friendly and opposing forces that can range in size from squad to regiment.

(4) Although this is a mounted-task trainer, the squad and platoon leaders also control the actions of any passengers, including scouts.

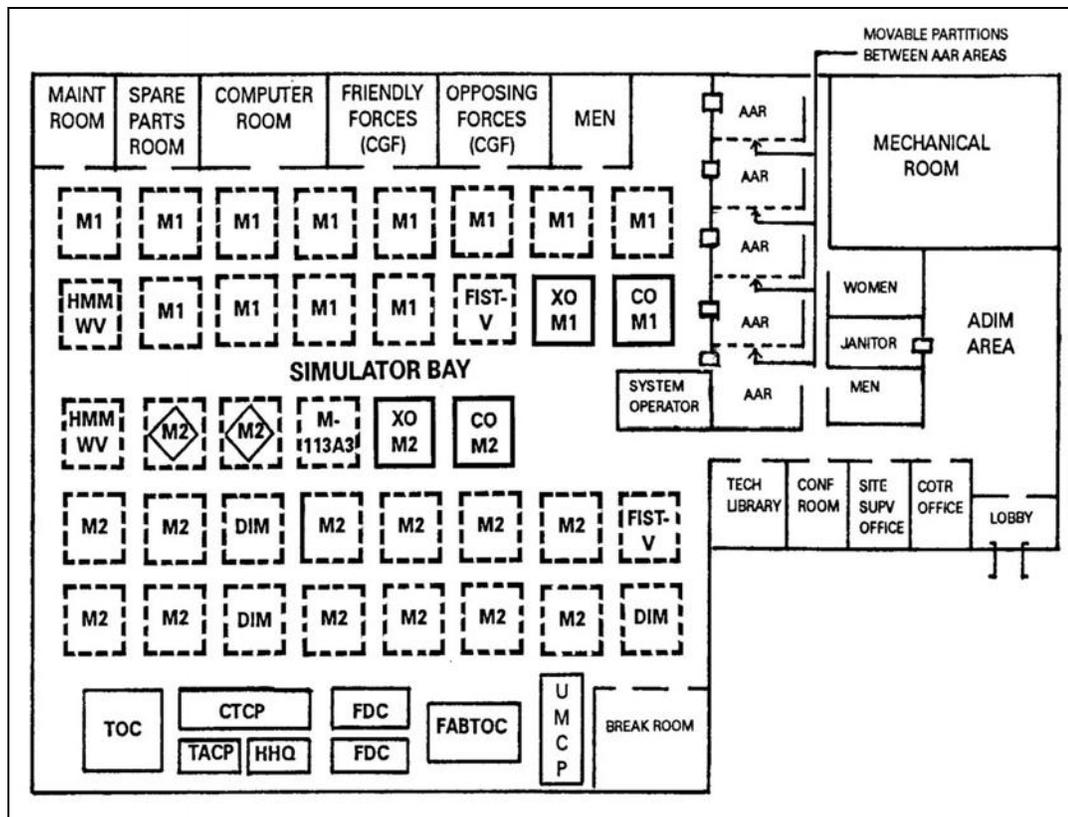


Figure 4-9. Close combat tactical trainer.

e. **M6 Linebacker Tabletop Trainer.** The LTTT (Figure 4-10, page 4-12) is a deployable training device used for institutional and unit training. The system consists of gunner, commander and an instructor operator stations. It has no driver's station. Drivers should work with the BC and gunner to develop the coordination needed to synchronize movement of the vehicle into and out of defensive positions.

(1) The LTTT targets consist of UAVs, cruise missiles, fixed wing, helicopters, 1/5 Scale SU-25s, trucks, troops and PC targets.

(2) The LTTT develops and tests the proficiency of the individual, and squad in gunnery techniques. The LTTT's aerial gunnery tables provide performance-oriented, sequentially progressive, realistic, and challenging training. The LTTT provides the squad leader and gunner a simulated environment to gain proficiency with crew coordination skills required to execute their mission in combat.

(3) Switchology on the LTTT is very challenging for the Linebacker crew. The crew must change from "Stinger Engage" mode to "25-mm and 7.62-mm Gun Engage" mode. The system scores the crew's ability to change between these two firing modes. A crew that fails to follow the correct switchology procedures fails the exercise.

(4) The Stinger scoring matrix resembles the Bradley COFT matrix. It advances or reduces a crew based on their engagement abilities. In the computer-recommended exercise, the crew is graded on target acquisition, reticle aim, and system management. They receive a grade of "A" (rapid advance), "B" (normal advance), "C" (no advance) or "F" (reduced), depending on their engagement ability.

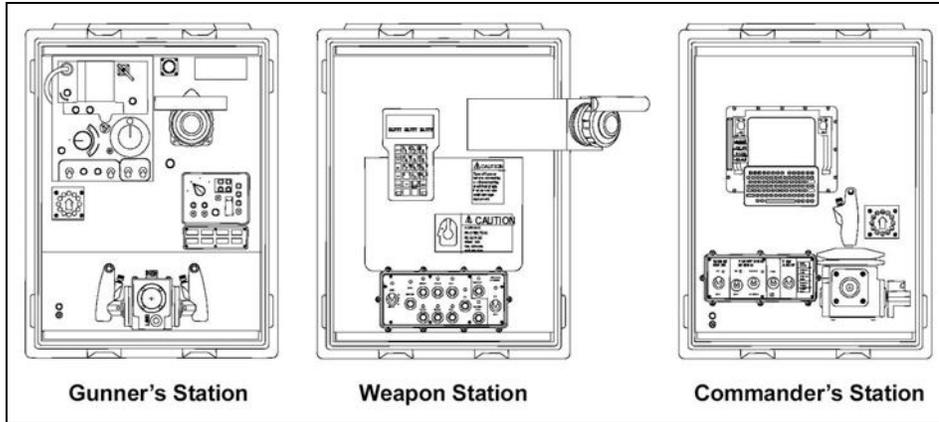


Figure 4-10. M6 Linebacker tabletop trainer.

4-4. TRAINING AIDS

Training aids are tools that help leaders conduct training.

a. **Tracking Board.** The tracking board (Figure 7-2, page 7-5) gives the Bradley commander and gunner practice in traversing and elevating the sight reticles as if they were tracking a vehicle moving cross-country. Tracking board exercises are practiced with the primary sight, the auxiliary sight, and the TOW reticle, both day and night. An advanced tracking board (Figure 7-4, page 7-7) is provided to make training more challenging to crews. (Chapter 7 provides more detailed information on the use of the tracking board.)

b. **Laser-Target Interface Device.** The LTID (Figure 4-11) aids in gunnery training with MILES or PGS. The LTID receives a coded MILES message and converts it into electrical pulses. These pulses activate the shock generator mechanism that activates a hit sensor, simulating a projectile striking the target. LTIDs can be used on full-scale, half-scale, or one-tenth-scale (on M31A1 lifters). Targets with LTIDs enhance training on BT I, BT II, BT III, and BT IV as well as on the device-based BT XI (TM 9-1265-376-10). System components include detection and electronic assemblies and a shock-generator mechanism.

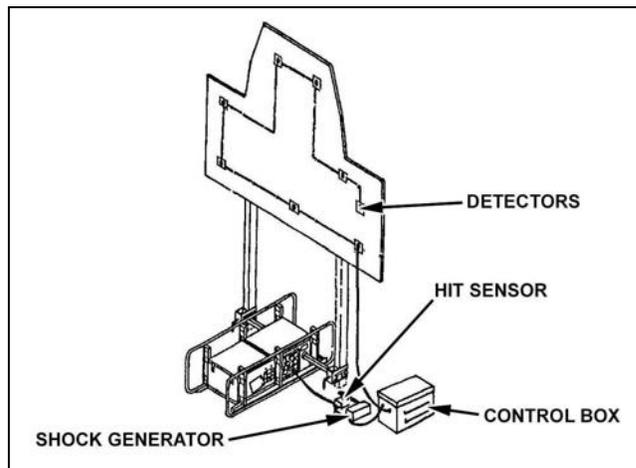


Figure 4-11. Laser target interface device.

c. **Scale Models.** Armored vehicle scale models can be used to train crews in target acquisition, range determination, and vehicle identification. These models are three-dimensional and are made of a hard plastic. Scale models enhance preliminary gunnery training such as range determination, gun lay, and combat vehicle identification. Table 7-1, page 4-2 is used when determining scale versus combat ranges. The local Training Support Center (TSC) can provide scale models in 1:10, 1:30, 1:35, and 1:60 (Figure 4-12).

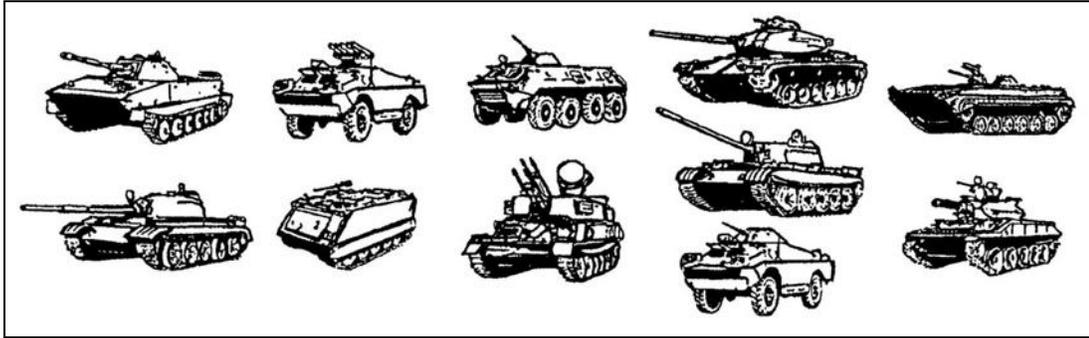


Figure 4-12. Armored vehicle scale models.

d. **Dummy Rounds.** Various dummy rounds are available to conduct training with the M240C coax machine gun, the M242 25-mm automatic gun, and the TOW system.

(1) **M172 Dummy Round (7.62 mm).** The M172 is a 7.62-mm cartridge minus the gunpowder and primer. It is used for nonfire training with the M240C coax machine gun. The crew should use the round with the metal tip rather than the plastic tip, because the plastic tips can bend and jam in the weapon or feed chute. The M172 dummy round can be used to train four of the tasks that are part of the BGST. The M172 round is a Class V item that can be requisitioned on DA Form 581, *Request for Issue and Turn-in of Ammunition*, using the information shown in Table 4-3, page 4-16:

- Load the M240C coax machine gun.
- Fire the M240C coax machine gun.
- Apply immediate action.
- Unload and clear an M240C coax machine gun.

CAUTION

Because the M172 dummy round is made of brass and can be damaged during training, the rounds should be inspected periodically and replaced as needed. Continued use of damaged rounds or links can damage the feed chute or the weapon. Rounds and links should be checked and replaced as needed.

(2) **M794 Dummy Round (25-mm)**. The M794 dummy round is a nonfiring training round used to conduct training on various 25-mm tasks. The M794 dummy round is a cast metal round that is noncorrosive and weighs about the same as the M792 and M793 rounds. Previous dummy rounds were made from fired casings and had plastic tips. Because the casing of a fired round is slightly expanded, such rounds could get stuck in the breech of the 25-mm gun. The use of such rounds should be discontinued and the cast metal rounds requisitioned. The M794 dummy round can be used to train crewmembers in the following tasks. The conditions and standards for these tasks are in Appendix A. The M794 dummy round is a Class V item and can be requisitioned on DA Form 581 using the information shown in Table 4-3:

- Load and unload the HE and AP ready boxes.
- Load the 25-mm feeder.
- Apply immediate action on the 25-mm.
- Unload and clear the 25-mm gun.

NOMENCLATURE	DODAC
CARTRIDGE, 7.62-MM DUMMY M172	1305-A159
CARTRIDGE, 7.62-MM DUMMY M172 (CARTON PACKED)	1305-A162
CARTRIDGE, 25-MM DUMMY M794 (CARTON PACKED)	1305-A966
CARTRIDGE, 25-MM DUMMY M794 (LINKED)	1303-A967

Table 4-3. Requisition information.

(3) **Missile Simulation Round**. The MSR is used to train crews in all nonfire TOW-related tasks. It is a dummy TOW round casing. It comes in a crate the same as an actual round. The MSR simulates the actual weight of a real TOW missile. Although the MSR does not have a diaphragm or humidity indicator, it does have a front cover and a forward handling ring. It is a nonexpendable, major end item that units can requisition through the supply system. It should not be discarded if it is damaged. It can be used to practice uploading the BFV, uploading the TOW launcher, applying immediate action on the TOW subsystem, removing a misfired TOW, and unloading and stowing a TOW to its storage configuration. If the guide lugs or the electrical connector on the MSR are damaged, the round should not be used. Continued use of a damaged round will cause damage to the launcher.

CHAPTER 5

Range Operations

This chapter outlines the procedures, duties, resources, and responsibilities for establishing and operating both permanent and temporary gunnery and tactical training facilities.

5-1. PREPARATION AND OPERATION

The leader develops a plan for conducting Bradley gunnery training. This plan varies with the tables to be trained. The plan covers assets, opening of the range and occupation of the site, conduct of the exercise, closure of the range, and other relevant training notes.

a. **Assets.** The plan states whether the battalion or company will conduct training.

(1) ***Battalion-Conducted Training.***

(a) *Battalion's Role.* The battalion signs for, administers, and clears the range or training site. This lets the company focus on gunnery, tactics, and maintenance.

(b) *Company's Role.* The training company helps police the range and performs other administrative duties.

(c) *Tables.* Advanced gunnery tables require a large number of target arrays and range-control personnel, so the battalion will need external help with them.

(2) ***Company-Conducted Training.*** The company signs for, administers, and clears the range or training area. It provides all personnel:

- Soldier details.
- Safety officers.
- Range guards.
- Administrative personnel.

b. **Opening of the Range or Occupation of Training Site (Sequence of Events).**

Tasks for opening the range and occupying the site follow:

(1) The OIC--

- Signs for the range from range control.
- Arrives at the range or training site before the unit.
- Checks communications.
- Arranges for backup communications for live-fire exercises.
- Briefs the safety officer, the evaluators, and the training units.
- Ensures that range equipment is present and operational.

(2) The NCOIC--

- Sets up additional training areas.
- Supervises ammunition, targets, and administrative details.

(3) The weapon systems-certified range safety officer or NCO--

- Ensures that no one brings ammunition onto a nonfiring range.
- Supervises placement of vehicles in correct order for firing or training.
- Inspects storage of restricted or suspended ammunition.
- Inspects handling and lot numbers of restricted or suspended ammunition.
- Inspects medics and vehicles.
- Gives safety briefing before all live-fire exercises.
- Ensures barriers are closed.
- Ensures that range guards are posted and briefed on their duties.

- (4) The master gunner--
 - Ensures that all DA Forms 2408-4, *Weapon Record Data*, are up-to-date.
 - Gives final briefing to Bradley crew evaluators.
 - Ensures that the concurrent training is set up.
 - Arrives at the range or training site before the firing unit.
- c. **Conduct of Exercise.** Tasks for conducting the exercise follow:
 - (1) The OIC--
 - Controls live-fire exercises.
 - Maintains efficient throughput among units going through the course.
 - Maintains all required communications.
 - (2) The NCOIC--
 - Supervises all details.
 - Controls movement of vehicles and personnel.
 - (3) The weapon systems-certified safety officer or safety NCO--
 - Ensures that the crew handles misfires IAW safety regulations.
 - Observes for any safety violation.
 - Clears each Bradley at the end of each exercise.
 - (4) The master gunner--
 - Ensures that range firing adheres to the appropriate gunnery table.
 - Ensures that crews boresight and zero correctly.
 - Conducts on-site remedial training as needed.
 - Supervises Bradley crew evaluators.
 - Helps safety personnel clear weapons, when required.
 - Helps maintenance personnel identify and correct malfunctions.
 - Helps the commander determine or verify alibi conditions.
- d. **Closure of Range.** Tasks for closing the range follow:
 - (1) The OIC--
 - Notifies range control that firing has terminated.
 - Debriefs unit personnel.
 - Ensures clearing of range or training area follows local regulations and SOP.
 - (2) The NCOIC--
 - Supervises ammunition and target details.
 - Ensures that range facilities have been policed.
 - (3) The master gunner updates DA Form 2408-4 for each M242 fired.
 - (4) The ammunition NCOIC--
 - Ensures that only authorized personnel remove munitions from range.
 - Prepares residue certificates required by ammunition supply point.
- e. **Training Tips.** The following tips will help the OIC conduct training on the range:
 - (1) **Brief Key Personnel.** Before moving to the training site, the OIC briefs key personnel about how to set up the site and react to unusual circumstances.
 - (2) **Start on Time.** The OIC prepares the training site and sets up communications early so that crews can start firing on time. He plans operations so that training stops for course maintenance at a normal or prearranged time. He posts this shutdown time in the daily range bulletin. The OIC or master gunner makes sure that he has enough targets to complete all training before the scheduled break.

(3) **Use Range Marker Lights (Live Fire).** The OIC allows night firing only when lights and thermal range markers are operational. If any of them fail, he closes the range until the problem is corrected. Repair or use alternate lighting to correct the problem IAW local range and unit SOPs.

(4) **Plan Illumination.** If possible, the OIC registers weapons before dark so he can plan indirect illumination. To ease control and reduce support requirements, he locates indirect-fire weapons on the same range as firing vehicles.

(5) **Keep a Log.** The OIC keeps an accurate log, which helps him stay current about dry- and live-firing times and other important events. In his DA Form 1594 (*Daily Staff Journal or Duty Officer's Log*), he includes, at least--

- The time that the unit occupied the range or training site.
- The time that he received range control's permission to fire live rounds.
- The name of the person who authorized live fire.
- The time that firing ceased.
- The time that the range reopened.
- Compass azimuth to stray impact points and time of each stray impact.
- The time that the unit cleared and departed the range.

(6) **Brief Guards.** The OIC has a plan to check and change guards frequently. Also, he briefs guards on their duties and importance and ensures that they understand the instructions.

(7) **Prepare for Fires.** During dry seasons, tracer ammunition could cause grass and forest fires. The OIC plans for this possibility. Then, if a fire starts, he can quickly control the situation. If the fires were to persist, units follow local SOPs.

(8) **Police the Area.** The OIC keeps the area policed at all times. Having a clean training site reduces the chance of injury, especially at night. Continuously policing the area keeps him from having to spend valuable time cleaning up after firing.

(9) **Brief Visitors.** The OIC has a plan for briefing visitors. He designates an NCO or officer to brief them before escorting them to the primary training site.

(10) **Check Safety Markers.** The OIC makes sure that range safety markers are in place before live firing begins. If he uses light markers, he checks them before nightfall.

(11) **Coordinate for Munitions.** The OIC coordinates with the support elements to make sure he has the right type of live ammunition and pyrotechnics in the right amounts, at the right times, and at the right places. To be sure the ammunition is neither restricted nor suspended, he tasks someone to check its lot numbers against TB 9-1300-385.

(12) **Conduct Other Training.** The OIC stresses the areas in which the unit needs more training, which could include--

- Prepare-to-fire checks.
- Target acquisition.
- Target identification.
- Range determination.
- Methods of adjustment.
- Movement techniques.
- Fire commands.
- Misfire procedures.
- Stabilization training.
- Crew tasks.

- Platoon tasks.
- Maintenance of vehicles and weapons.

(13) **Position Recovery Vehicle.** The OIC has disabled vehicles removed from the course quickly to avoid losing training time. He arranges for a manned recovery vehicle to support the unit.

(14) **Brief Bunker Personnel (Live Fire).** The OIC briefs bunker personnel on safety regulations and requirements and issues them control measures such as for entering and exiting the bunker and bunker area. Bunker personnel must have two ways to communicate with the tower.

(15) **Brief OPFOR Personnel.** The OIC briefs OPFOR personnel on their role in the tactical training. He makes sure that they know what to do and when to do it. He stresses that their actions must be the same for each unit going through the course.

5-2. RECONNAISSANCE

Before their unit occupies a range or training area, the OIC, the master gunner, and NCOIC should personally reconnoiter, then coordinate with range control. While reconnoitering--

- a. They should answer the following questions:
 - Where are the routes to the range or training area?
 - How many vehicles can fire the stationary or moving course simultaneously?
 - Does the area offer both hull-defilade and defilade positions?
 - What control facility (tower) is available and what is its condition?
 - What communication hookups are available to operate the range?
 - Are range limit markers visible during all levels of visibility?
 - Is a level platform area available for boresighting and zero?
 - Can zeroing and boresighting be conducted simultaneously?
 - Are surveyed boresight panels available?
 - What barriers and guard posts need to be closed or manned?
 - Where are they?
 - Who furnishes targets, target supplies, or training devices used on the range?
 - What requirements are necessary for target operators or target details?
 - What ammunition can be used on the range?
 - Has the range or training area been cleared of duds?
- b. They should locate the following areas:
 - Aid station.
 - Ammunition pads.
 - Barriers and guard posts.
 - Briefing and debriefing areas.
 - Firing line and maneuver areas.
 - Clearing and dud pits.
 - Concurrent training area.
 - Helipad.
 - Latrine.
 - Maintenance area.
 - Parking areas.
 - Range limits.
 - Tower.

5-3. PERSONNEL, EQUIPMENT, AND LAYOUT

Good planning and execution of range or tactical training allows progressive training and evaluation of the unit. AR 385-63, local range regulations, and unit SOPs describe administrative requirements. Putting together a range book with all applicable regulations and reference materials, such as range schedules, firing tables, gunnery tables, maps, range logs, and a range certification list, will help the OIC operate the range efficiently.

a. **Required Personnel.** The following personnel are required to conduct range training. The local range control office certifies each of them to operate a range.

(1) **Officer in Charge.** The OIC is responsible for the entire range or training site. He plans, prepares, coordinates, and executes the training exercise. AR 385-63, Chapter 4 lists his specific duties. Among other things, he designates assistants to be responsible for specific areas of operation. Everyone involved in the training exercise reports to him about his respective duties.

(2) **Range Safety Officer.** The RSO is a weapon systems-qualified commissioned officer, warrant officer, or NCO (staff sergeant or higher). The RSO directly represents the officer in charge of firing. The RSO--

- Conducts a safety briefing before all live-fire exercises.
- Enforces all safety regulations.
- Ensures that everyone handles ammunition correctly.
- Enforces smoking restrictions near the vehicles, ammunition, and POL.
- Ensures misfires are handled IAW AR 385-63 and operator's manual.
- Investigates and reports accidents IAW all regulations.
- Ensures weapons on live-fire ranges always point towards impact area.
- Ensures personnel keep clear of the danger area (except IAW AR 385-63).
- Checks TB 9-1300-385 for ammunition with suspended or restricted lots.
- Ensures that barriers and guards are in place before the start of the exercise.
- Checks identification and qualifications of medical personnel.
- Ensures medical personnel have transportation, if required.
- Inspects and clears all weapons following the completion of fire.
- Checks DA Form 2408-4 for round count on the firing pin and breech.

(3) **Master Gunner.** The master gunner is the commander's gunnery technical advisor; he helps the commander and the staff plan, develop, and conduct gunnery training. The master gunner--

- Prepares a surface danger-area diagram and range overlay.
- Prepares scaled ranges, if required.
- Organizes range firing exercises.
- Sets up range firing exercises.
- Ensures proper conduct of range firing exercises.
- Supervises the Bradley crews to ensure proper boresighting and zeroing.
- Coordinates target array and layout for range firing and qualification.
- Conducts remedial training on site, as needed.
- Ensures that a standard Bradley crew evaluator program is implemented.

(4) **NCOIC.** The NCOIC coordinates and supervises details and helps the OIC and RSO operate the range or training area.

- (5) **Ammunition NCO.** An ammunition NCO--
- Accounts for ammunition by type and lot.
 - Ensures ammunition for the scheduled firing is the correct ammunition.
 - Ensures proper storage of ammunition on ammunition pad at training area.
 - Ensures proper security of ammunition on ammunition pad at training area.
 - Using TB 9-1300-385, checks ammunition for suspended or restricted lots.
 - Checks ammunition number with RSO to ensure it is not suspended or restricted.
 - Issues the correct type and number of rounds as instructed by the OIC.
 - Keeps a running inventory of expenditures.
 - Cross-checks daily expenditures turned into the OIC by Bradley commanders.
 - Polices up links, brass, and packaging materials from ammunition pad.

(6) **Target NCO.** On many automated ranges, the OIC does not need a target NCO. On other ranges, the target NCO has specific duties.

(a) The target NCO ensures that the following conditions exist:

- Targets are type, color, and scale (if applicable) the OIC requires.
- Targets are properly located on the range.
- Target detail can operate and fix all target mechanisms used.
- Target detail has the required equipment and supplies.
- Pre-positioned targets are available when needed.

(b) The target NCO ensures he has enough of the following to support training:

- Spare targets.
- Target mechanisms.
- Batteries.
- Patches.
- Other related equipment.

(c) The target NCO reports to the OIC any mechanical malfunctions that require prompt replacement before firing can continue.

(7) **Bradley Crew Evaluator.** This evaluator--

- Enforces required safety precautions.
- Acts as an instructor during practice.
- Acts as an evaluator during qualification.
- Conducts an AAR after firing ends.
- Confers with OIC and master gunner on any scoring discrepancy.

(8) **Fire-Fighting Detail.** During dry seasons, some range facilities require this detail. When they do, planners should--

- Ensure availability of fire-fighting equipment.
- Designate vehicles for soldiers and equipment.
- Select access routes to the impact or target areas.

(9) **Bunker Personnel.** Bunker personnel move targets, if applicable.

(10) **Radiotelephone Operators.** Radiotelephone operators (RATELOs) maintain communications during an exercise.

(11) **Medic.** The medic or combat lifesaver (CBLS) must--

- Have a strip map.
- Know how to get to the nearest aid station or hospital.

- Know RATELO procedures for use during air evacuation.
 - Have a medical ID *or*
 - Have a commander's memo stating that the soldier is a qualified medic.
 - Have sufficient medical equipment for the mission.
- b. **Range Equipment.** The OIC and NCOIC should make sure that the following equipment is on hand:
- (1) ***Gunnery and Tactical Exercises.***
 - Current gunnery standards for the table being conducted.
 - Range regulations.
 - All other required regulations, SOPs, maps, and overlays.
 - Target and scoring detail.
 - Targets and target-operating and control mechanisms.
 - Boresight equipment.
 - Night vision devices with enough batteries.
 - Target repair equipment.
 - Briefing tent.
 - Generators to power light sets.
 - Flashlights for scorers.
 - Evaluator communications.
 - Field telephones, as required.
 - FM radio sets and antenna (GRC-292).
 - Batteries for lights and radios.
 - Scorecards.
 - Stopwatches.
 - Binoculars.
 - Vehicles.
 - Vehicle recovery assets.
 - Backup aid vehicle.
 - Fire-fighting detail.
 - Fire-fighting equipment.
 - Equipment for concurrent training.
 - Other TOE and expendable supplies.
 - (2) ***Gunnery Exercises.***
 - Ballistic firing tables.
 - Compass for marking rounds out of impact area.
 - Flag sets for vehicles and tower.
 - Range flag.
 - Range lights or lanterns.
 - (3) ***Tactical Exercises.***
 - MILES or PGS equipment.
 - OPFOR equipment.
 - OPFOR personnel.
- c. **Range and Training Area Layout for Gunnery Exercises.** A well-organized gunnery range provides maximum firing time. Planning and organizing ranges and collecting everything needed before moving to the range ensures that firing can start and finish on time. It also ensures an orderly range clearance.

(1) Having a current battalion-level range-operation SOP saves the firing unit time and energy. The SOP should provide guidelines for occupying the range. It should also describe how to conduct specific tasks such as--

- Break down ammunition.
- Conduct range scenario.
- Coordinate with maintenance contact teams.
- Depart the range.
- Fight range fires.
- Issue firing orders
- Move vehicles to the ammunition point and to the ready line.
- Operate moving targets.
- Police the range.
- Repair target mechanisms.
- Replace targets.

(2) Stationary Bradley ranges have moving and stationary targets, which crews engage from defensive positions or berms. OICs should coordinate with local range control for help planning these exercises.

(3) Moving Bradley ranges have a maneuver box that stationary ranges lack (Figure 5-1). The maneuver box is the maximum distance the vehicle could travel and still have the target exposed. If course roads exist, then the BC should move on those, also using available terrain to help mask the vehicle. (Range control will help the units plan these exercises.) Knowing the maneuver box allows the vehicle crew to acquire, range, and destroy targets arranged in a realistic array, as listed on appropriate gunnery tables. Maneuver boxes must be clearly defined. The firing vehicle must adhere to start and stop points. At no time will the vehicle extend or surpass the exposure and engagement times.

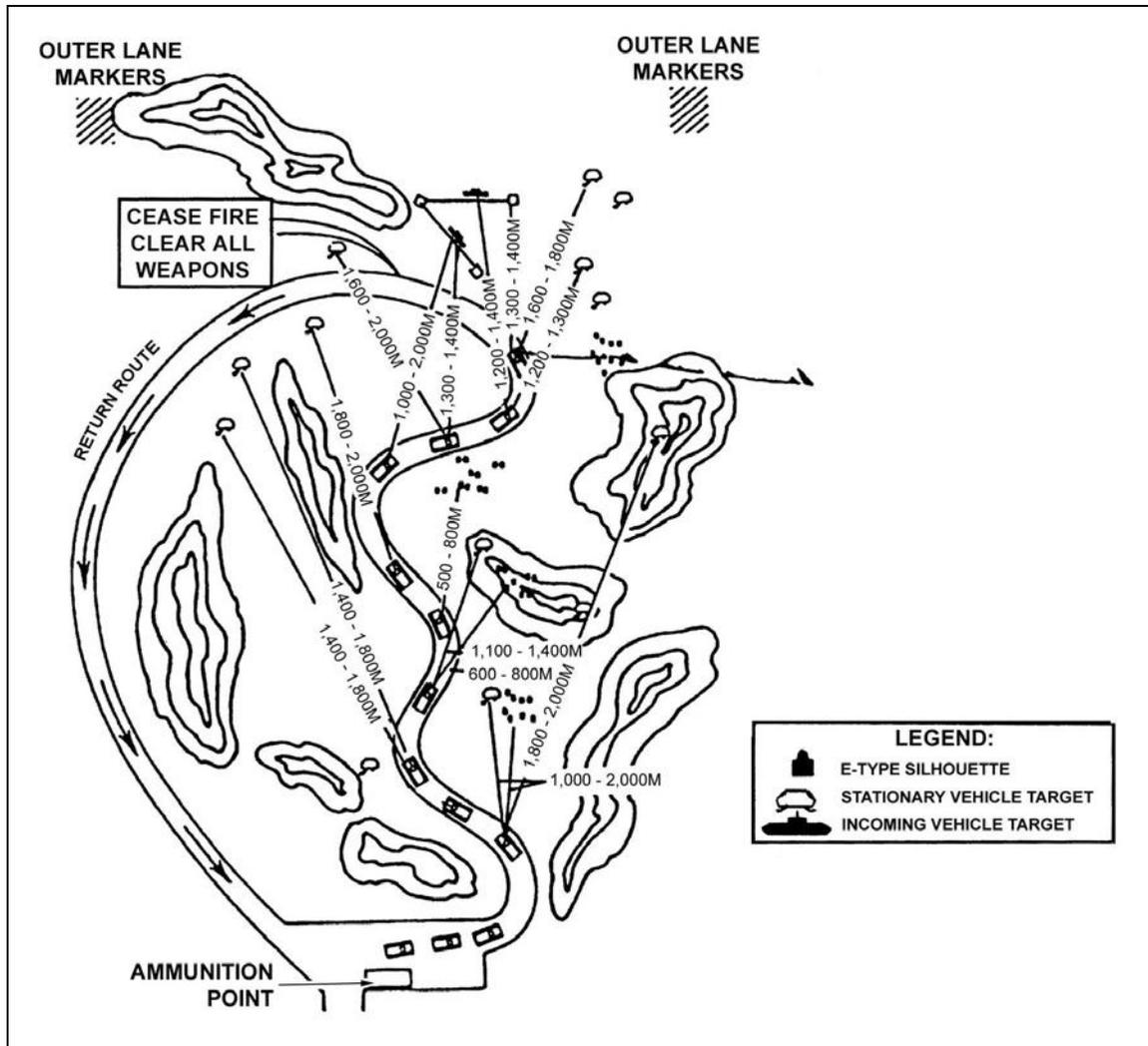


Figure 5-1. Sample layout of a Bradley moving range.

(4) To determine the size of a maneuver box, the average vehicle speed for the course and the target exposure time must be known. Figure 5-2, page 5-10, shows how to determine the length of a maneuver box. If the first number after the decimal is 5 or more, the length is rounded up to the next whole number. Figure 5-3, page 5-11, shows how to determine the length of a hunter-killer maneuver box.

(5) Lateral target dispersion for M2A3 or M3A3 Bradleys must be at least 14 degrees. The "rule of thumb" is 25 meters of lateral dispersion for each 100 meters of target range.

Vehicle Speed: 12 MPH
Target Exposure: 42 Seconds

1. Convert vehicle speed into MPS by multiplying by the constant 0.4471416:

$$12 \text{ (MPH)} \times 0.4471416 = 5.3656992$$

2. Convert MPS into maneuver box length:

$$5.3656992 \times 42 \text{ (target exposure, in seconds)} = 225.35936 \text{ meters}$$

3. Maneuver box length equals 225 meters.

The maximum distance the vehicle can travel and still have the target exposed is the length of the maneuver box. If the first number after the decimal is 5 or more, round the length to the next whole number.

Figure 5-2. Formula for determining length of maneuver box.

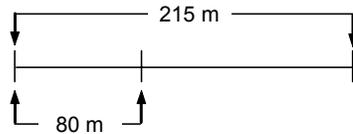
Determine length of maneuver box for first target array presented.

Determine beginning of the maneuver box for the delayed target by multiplying the MPS by the TDT (target delay time).

MPS		TGT DELAY TIME*		MANEUVER BOX LENGTH
5.3656992	X	15 sec	=	80.485 (maneuver box length)

$5.3656992 \times 15 \text{ sec (target delay time)} = 80.485$

Measure 80 meters from the beginning of the maneuver box for the first target array presented to determine the start of the delayed target maneuver box.

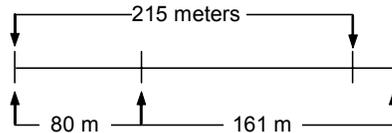


Determine the length of the delayed target maneuver box as previously described.

MPS		TGT DELAY TIME		TGT LIFT TIME		MANEUVER BOX LENGTH
5.3656992	X	22 sec*	+	8 sec	=	160.97

* Target exposure time of delayed target

Maneuver box length for the delayed target equals 161 meters.



Determine the entire hunter-killer maneuver box length for the first target:

(1) Obtain maneuver box length for first target array presented (215 m). Subtract the beginning of the maneuver box for the first target array (80 m). The result (135 m) equals the difference between the maneuver box length for the first target array and the beginning of the maneuver box for the delayed target. If this figure is less than the entire length of the maneuver box for the first target array presented, you need not continue--the delayed target maneuver box will fit inside the maneuver box for the first target array presented.

(2) Subtract the difference (135 m) from the total length of the delayed target maneuver box. This difference equals 26 m.

(3) Add the maneuver box length for the first target array presented (215 m) to the difference of the two maneuver boxes (26 m). The sum (241 m) equals the entire length of the hunter-killer maneuver box.

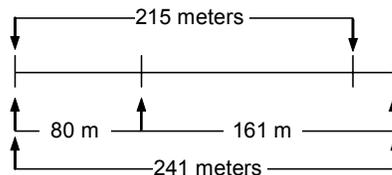


Figure 5-3. Formula for determining length of hunter-killer maneuver box.

d. **Range and Training Area Layout for Tactical Training.** Tactical training occurs either on ranges or in training areas, whichever is available. Most of the preparation that goes into a gunnery exercise also applies in tactical training.

(1) The configuration of the course depends on the local terrain. The unit leader must adjust each task to fit a specific piece of terrain, so tasks seldom occur in the same order as any particular table.

(2) As with the gunnery tables, tactical tables also need a range-operation SOP. This will save the firing unit time and energy. The SOP should include guidelines for setting up the tactical range or training area and should describe actions for specific tasks. Figure 5-4 shows an example checklist for setting up a tactical range or training area.

1. Coordinate with maintenance contact team for MILES devices.
2. Test MILES or PGS equipment.
3. Set up tactical table layout based on mission, enemy, terrain (and weather), troops, time available, and civil considerations (METT-TC) as well as on table standards.
4. Brief OPFOR and controller personnel on duties for each engagement.
5. Test firing weapons machine guns with blank adapters.
6. Test firing devices.
7. Move vehicles to the start point.
8. Issue FRAGOs to initiate movement down the course.
9. Conduct an AAR after each engagement.
10. Assemble Bradley crews.
11. Reset MILES or PGS equipment.
12. Control movement on the course to prevent congestion.
13. Police the range or training area.
14. Depart the range or training area.

Figure 5-4. Example checklist for setting up tactical range or training area.

e. **Targets.** Full-scale targets should match the shape, size, and color of the threat targets they represent. (TC 25-8 describes targets, target mechanisms, and target control in detail.)

(1) **Hard Targets (Live Fire).** When available, and where ricochets present no safety hazard, the unit uses hard targets for 25-mm fire. Old tank hulls and turrets, armored personnel carriers, and wheeled vehicles make good hard targets. When filled with sand or dirt, these targets can withstand many hits.

(2) **Soft Targets (Live Fire).** The unit or range control activity makes soft, olive drab targets from target cloth or wood. (TC 25-8 describes targets, target mechanisms, and target sizes.)

(3) **Target Kill Cues.** The unit uses a visual cue, such as a target drop, an indicator light, or red or black smoke, to indicate target kills.

f. **Flags.** On all ranges, vehicles use flags to display their weapons status IAW unit SOPs.

(1) **Red--Firing.** A red flag indicates that a Bradley is either preparing to or already engaged in firing. Its weapons are loaded and pointing at the target area, and both the electrical and manual safeties are off.

(2) **Green--Clear.** A green flag indicates that all weapons are cleared and elevated, and that both the electrical and manual safeties are on. All ammunition onboard the vehicle is either loaded in the ready boxes or stowed.

(3) **Yellow (and Red or Green)--Malfunction, Weapons Status.** Combining a yellow flag with a red or green one indicates a Bradley malfunction and the current Bradley weapons status (Appendix D).

(a) **Yellow and Red--Malfunction, Not Clear.** This combination indicates a possible Bradley malfunction with weapons pointing at the target area and not clear. (If the crew cannot set the electrical and manual safeties, they must notify range safety personnel at once.)

DANGER
INABILITY TO SET WEAPON SAFETIES
IF EITHER THE ELECTRICAL OR MANUAL WEAPON
SAFETY FAILS TO SET, NOTIFY RANGE SAFETY
PERSONNEL AT ONCE.

(b) **Yellow and Green--Malfunction, Clear.** The Bradley has a malfunction. All weapons are clear. Both safeties are on.

(4) **Red and Green.** The crew is either preparing to fire the Bradley or conducting a nonfiring exercise and, even if the 25-mm and coax guns have rounds in them, neither is ready to fire.

(a) **25-mm.** The 25-mm gun feeder might be loaded, but the bolt is in the sear position, and both the electrical and manual safeties are on.

(b) **Coax.** The coax might be loaded, but the bolt is to the rear, and the manual safety is on.

g. **Range Control.** The range control officer coordinates and ensures the safe conduct of range activity for all units. He delivers a mandatory briefing to each unit leader before he allows the leader to occupy, or fire a weapon on, his range. He schedules this briefing promptly to prevent any delay in training. During the briefing, the range control officer provides the unit leader with a set of local range regulations and policies. He also reminds the unit leader that he must prepare a surface danger-area diagram (discussed later), if applicable.

h. **Range Communications.** The installation range officer controls all ranges by wire and radio communication. Leaders use this control system to obtain clearance to fire, report, coordinate, and call cease-fires.

(1) The OIC controls all training activities, including firing, by the best means available. He always plans a backup system.

(2) Ideally, target operators and personnel in the impact area communicate by wire. In the case of tactical training, the OPFOR does the same. In all cases, to prevent delays, the OIC plans for a backup communication system.

5-4. ESTABLISHMENT OF LIVE-FIRE RANGE

Before a unit leader selects a site for a scaled or full-caliber range, he conducts a ground reconnaissance and prepares a detailed map of the areas available for firing.

a. **Site Selection.** The range must be large enough to accommodate all weapon systems and types of ammunition to be fired. It must also meet the scenario requirements of the table(s) to be fired. The unit should construct whatever they need to create realistic conditions on the selected terrain. Some examples include--

- (1) Defilade stationary firing positions.
- (2) Sufficient maneuver area and enough targets to provide multiple firing points and target locations.
- (3) Targets in realistic arrays and, if possible, unmarked by berms.

b. **Ballistic Firing Table.** The Bradley master gunners and range-control personnel use the ballistic data in Bradley ammunition firing tables to develop or modify surface danger area diagrams. With the master gunner's knowledge of the fire-control system, they jointly develop realistic gunnery tables. This helps the crews use Bradley weapons more effectively. (Table 5-1 shows two extracts from ballistic firing table FT 25-A-2.) The following terms explain the data in all gunnery firing tables. However, the relative locations of the data columns might differ among the tables for the various rounds of ammunition and types of weapons:

- (1) **Range.** This refers to the distance from the vehicle to the target.
- (2) **Superelevation.** This refers to the additional elevation induced into the fire-control system to raise the ballistic flight of a given projectile. This ensures that the projectile hits the target at a given range.
- (3) **DR/DSE.** This refers to the number of meters a 1-mil elevation change will move the round in linear range, on the ground, at a given range and superelevation.
- (4) **DH/DR.** This refers to the change in height (in meters) of a projectile for a 100-meter change in linear range on the ground, at a given range.
- (5) **Drift.** This refers to the number of mils the projectile moves to the right of the gun-target line due to the spin caused by the rifling in the gun.
- (6) **Time of Flight.** This refers to the time a projectile takes to reach a target at a selected range.
- (7) **10 KPH Crosswind Deflection.** Generally, thanks to crosswind deflection, a round is most unstable when it exits the muzzle. This effect of wind deflection assumes a crosswind speed of 10 KPH. The firer applies the correction into the wind. If the wind speed is more or less than 10 KPH, the firer estimates the point of aim.
- (8) **Maximum Ordinate.** This refers to the maximum height the projectile travels above the line of sight at a given range.
- (9) **Range to Maximum Ordinate.** Out to this range (the range at which the round reaches maximum ordinate) the projectile ascends. Beyond this range, it descends. This range (to the maximum ordinate) always occurs shortly past half of the target range.
- (10) **Angle of Fall.** This refers to the number of mils between the trajectory of the projectile at impact and at the line of sight.

(11) **Remaining Velocity.** This refers to the speed of the projectile in meters per second and at a selected range.

CARTRIDGE, APDS-T, M791			MUZZLE VELOCITY, 1,345 MPS		
RANGE (M)	SUPER- ELEVATION (mils)	DR / DSE (M / mil)	DH/DR (M / 100 M)	DRIFT (mils)	TIME OF FLIGHT (seconds)
1,600	5.12	263	0.6	0.1	1.33
1,700	5.49	257	0.6	0.1	1.42
1,800	5.88	252	0.7	0.1	1.52
1,900	6.72	247	0.7	0.1	1.61

10 KMPH CROSS WIND DEFLECTION (mils)	MAXIMUM ORDINATE (M)	RANGE TO MAXIMUM ORDINATE (M)	ANGLE OF FALL (mils)	REMAINING VELOCITY (M / sec)	RANGE (M)
0.2	2.2	830	6	1,075	1,600
0.3	2.5	884	6	1,058	1,700
0.3	2.8	938	7	1,041	1,800
0.3	3.2	993	8	1,025	1,900

Table 5-1. Extracts from FT 25-A-2.

c. **Surface Danger-Area Diagrams.** Bradley units establishing or modifying ranges must, before firing starts, provide the range control officer with a safety overlay showing the modifications. Specifically, the overlay must show the surface danger area, to include range boundaries and range limit markers for firing positions. The overlay must also show any other features affected by the modifications and relevant to safety in any way. To prepare the overlay, the unit uses the ballistic firing tables FT 25-A-2 (Table 5-1) and FT 7.62-A-2. These tables are useful because they state the range, maximum ordinates, and superelevation values for each ammunition type within that caliber (Figures 5-5 and 5-6, page 5-16).

(1) When diagrams of surface danger areas on established ranges provide only unrealistic conditions, or when they use available terrain poorly, the unit should modify the diagrams. AR 385-63 provides restrictions and precautions for diagrams of surface danger areas. When engaging ground targets, the unit may reduce Distance X (maximum range) to 15 degrees elevation, provided they maintain the gun's firing elevation at less than or equal to 15 degrees (Tables 5-2 through 5-7, pages 5-18 through 5-20). If they cannot control the weapon at or under 15 degrees, such as could happen when firing while moving over rough terrain with inoperative stabilization, they will use the maximum range (Distance X). At 15 degrees elevation, range equals the greatest distance the projectile can travel when fired at elevations at or under 15 degrees. The unit derives this value by evaluating ricochet and ballistic firing table data.

(2) The M2A2 ODS, M3A2 ODS, M2A3, and M3A3 vehicles have eye-safe laser range finders. Using other (non-eye-safe) laser range finders requires that the unit designate an additional buffer area, Area C (AR 385-63, Chapter 19). Every object the laser beam strikes reflects energy. In most cases, this energy diffuses and presents no hazard. The crew removes all mirrors, plastic, glass, or other flat mirror-like objects with vertical or near-vertical surfaces, that is, any reflective objects that could reflect the laser beam and cause injury, from the target area. If this proves impractical, they can cover the surfaces with lusterless paint or with a nonreflecting material such cloth or cardboard.

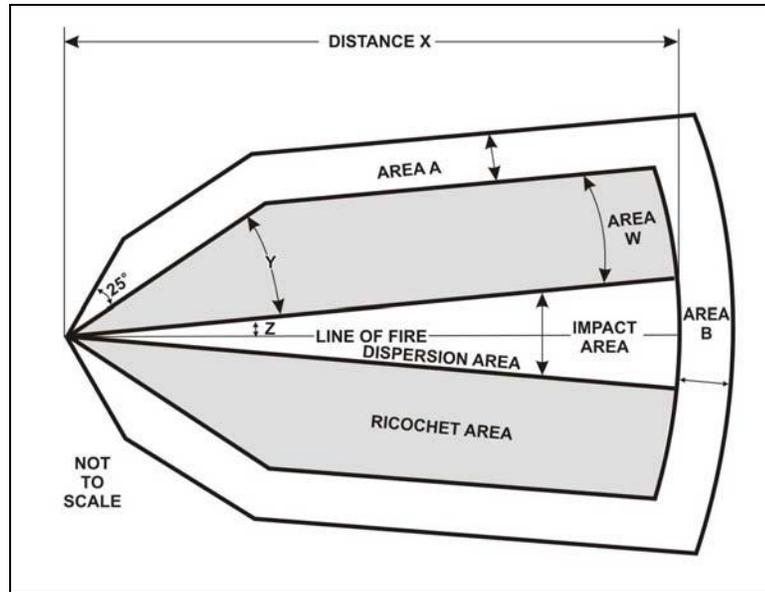


Figure 5-5. Surface-danger-area diagram for M792 ammunition.

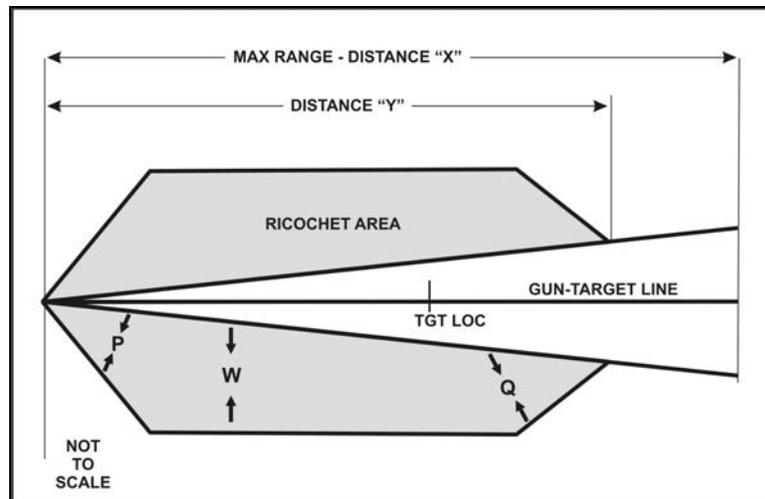


Figure 5-6. Surface-danger-area diagram for 7.62-mm, M80, A131 ammunition.

IMPACT MEDIA	Area A (Meters)	Area B (Meters)	Area W2 (Meters)	Angle Y Z (Degrees)	Distance X1 (Meters)	Ricochet Range (Meters)	15-Degree Elevation Range (Meters)
Armor	NA	NA	1,510	24 5	14,578	7,294	11,561
Concrete	NA	NA	2,208	34 5	14,578	7,622	11,561
Earth	NA	NA	1,466	18 5	14,578	7,402	11,561
Water	NA	NA	263	6 5	14,578	5,655	11,561

NOTES:

1. You may reduce Distance X (maximum range) to ricochet range when engaging ground targets at ranges up to 3,500 meters from stationary firing positions. When firing from a moving vehicle over level terrain at ground targets up to 3,500 meters, use the 15-degree elevation range. When firing on the move over rough terrain, use Distance X.
2. When firing at aerial targets with gun elevation greater than 15 degrees, you need not use the ricochet area defined by Area W and Angle Y.
3. Area A and Area B: fragmentation areas do not apply to the M791 round, because it produces no significant fragmentation.

Table 5-2. Dimensions for 25-mm M791 (APDS-T) ammunition.

IMPACT MEDIA	Area A (Meters)	Area B (Meters)	Area W2 (Meters)	Angle Y Z (Degrees)	Distance X1 (Meters)	Ricochet Range (Meters)	15-Degree Elevation Range (Meters)
Armor	300	400	1,373	28 5	6,381	5,265	5,244
Concrete	300	400	1,290	27 5	6,381	5,071	5,244
Earth	300	400	908	19 5	6,381	4,792	5,244
Water	300	400	1,047	19 5	6,381	4,823	5,244

NOTES:

1. Firer may reduce Distance X (maximum range) to ricochet range when engaging ground targets at ranges up to 3,000 meters from stationary firing positions. When firing from a moving vehicle over level terrain at ground targets up to 3,000 meters, he can use the 15-degree elevation range; except for armor impact medium, he uses the Ricochet Range distance, which is greater. When firing on the move over rough terrain, he uses Distance X.
2. When firing at aerial targets with gun elevation greater than 15 degrees, he need not use the ricochet area defined by Area W and Angle Y.

Table 5-3. Dimensions for 25-mm M792 (HEI-T) ammunition.

IMPACT MEDIA	Area A (Meters)	Area B (Meters)	Area W2 (Meters)	Angle Y Z (Degrees)	Distance X1 (Meters)	Ricochet Range (Meters)	15-Degree Elevation Range (Meters)
Armor	NA	NA	799	20 5	6,404	4,472	5,868
Concrete	NA	NA	1,143	27 5	6,404	4,643	5,868
Earth	NA	NA	734	15 5	6,404	4,692	5,868
Water	NA	NA	148	4 5	6,404	3,724	5,868

NOTES:

1. Firer may reduce Distance X (maximum range) to ricochet range when engaging ground targets at ranges up to 3,000 meters from stationary firing positions. When firing from a moving vehicle over level terrain at ground targets up to 3,000 meters, he uses the 15-degree elevation range. When firing on the move over rough terrain, he uses Distance X.
2. When firing at aerial targets with gun elevation greater than 15 degrees, he need not use the ricochet area defined by Area W and Angle Y.

Table 5-4. Dimensions for 25-mm M910 (TPDS-T) ammunition.

IMPACT MEDIA	Area A (Meters)	Area B (Meters)	Area W2 (Meters)	Angle Y Z (Degrees)	Distance X1 (Meters)	Ricochet Range (Meters)	15-Degree Elevation Range (Meters)
Armor	NA	NA	1,289	26 5	18,260	7,867	14,861
Concrete	NA	NA	1,289	26 5	18,260	7,867	14,861
Earth	NA	NA	801	21 5	18,260	7,725	14,861
Water	NA	NA	801	21 5	18,260	7,725	14,861

NOTES:

1. Firer may reduce Distance X (maximum range) to ricochet range when engaging ground targets at ranges up to 3,500 meters from stationary firing positions. When firing from a moving vehicle over level terrain at ground targets up to 3,500 meters, he uses the 15-degree elevation range. When firing on the move over rough terrain, he uses Distance X.
2. When firing at aerial targets with gun elevation greater than 15 degrees, he need not use the ricochet area defined by Area W and Angle Y.
3. Because this round produces no significant fragmentation, Areas A and B, the fragmentation areas, do not apply.

Table 5-5. Dimensions for 25-mm M919 (APFSDS-T) ammunition.

IMPACT MEDIA	Area A (Meters)	Area B (Meters)	Area W2 (Meters)	Angle Y Z (Degrees)	Distance X1 (Meters)	Ricochet Range (Meters)	15-Degree Elevation Range (Meters)
Armor	NA	NA	1,373	28 5	6,048	5,265	5,114
Concrete	NA	NA	1,290	27 5	6,048	5,071	5,114
Earth	NA	NA	908	19 5	6,048	4,792	5,114
Water	NA	NA	1,047	19 5	6,048	4,823	5,114

NOTES:

1. Firer may reduce Distance X (maximum range) to ricochet range when engaging ground targets at ranges up to 3,000 meters from stationary firing positions. When firing from a moving vehicle over level terrain at ground targets up to 3,000 meters, he uses the 15-degree elevation range, with one exception. When armor is the impact medium, he uses the greater distance given in the Ricochet Range column. When firing on the move over rough terrain, he uses Distance X.
2. When firing at aerial targets with gun elevation greater than 15 degrees, he need not use the ricochet area defined by Area W and Angle Y.
3. Values listed for Area W, Angle Y, and Ricochet Range match those listed for the ballistically similar M793, TP-T projectile.

Table 5-6. Dimensions for 25-mm M793 (TP-T) ammunition.

IMPACT MEDIA	Area A (M)	Area B (M)	Angle P (Degrees)	Angle Q (Degrees)	Area W (M)	Left and Right of GTL (Degrees)	Distance X (M)	Distance Y (M)
Earth	NA	NA	43.81	38.90	1,461	5	4,100	4,073
Water	NA	NA	43.81	38.90	1,461	5	4,100	4,073
Steel	NA	NA	20.17	75.54	861	5	4,100	4,053
Concrete	NA	NA	20.17	75.54	861	5	4,100	4,053

NOTES:

1. Firer may reduce Distance X (maximum range) to ricochet range when engaging ground targets at ranges up to 3,000 meters from stationary firing positions. When firing on the move over rough terrain, he uses Distance X.
2. When firing at aerial targets with gun elevation greater than 15 degrees, he need not use the ricochet area defined by Area W and Angle Y.

Table 5-7. Dimensions for 7.62-mm M80 (A131) ammunition.

5-5. DIGITAL RANGE SETUP

Digitally enhanced gunnery ranges support the incorporation of digital communication equipment during firing exercises:

a. **Data Sets.** Each digital scenario requires a data set, which consists of a digital script and one or more overlays, to handle digital gunnery requirements. Users can store these data sets in the mission data loader (MDL). This lets users retrieve and distribute the data sets to any FBCB2-equipped BFVs when the lower tactical Internet (LTI) is unavailable, or to restore data to the net control station (NCS), if needed.

b. **Range Overlay.** Units should develop standard overlays, both FBCB2 and hardcopy, for each range. At the least, each overlay includes the following graphic control measures:

(1) **Objectives.** These are included for orientation.

(2) **Battle Positions.** In limited visibility, this control measure shows tower and safety personnel the positions of the firing vehicles.

(3) **Boundaries.** These usually consist only of outer range safety markers.

(4) **Target Reference Points.** These help orient vehicle commanders on the battlefield. They usually include inner and outer range safety markers or easily identified points on the battlefield.

(5) **Phase Lines.** These help control movement.

(6) **Routes.** These help orient the vehicle and aid in combat service support (CSS) operations.

c. **Digital Base Station.** For reliable range communications, the NCS serves as the digital base station. In case this station fails, units should establish a backup digital base station. However, the NCS is the only radio set to frequency hopping/master (FH/M). At least one evaluator should have FBCB2 to monitor and evaluate the firing vehicles' digital traffic.

d. **Rehearsal.** The unit should rehearse range setup before executing gunnery tables. This allows for target synchronization, establishment of safety procedures, fratricide avoidance, and testing of communications.

e. **Execution.** Crews or platoons conduct engagements with digital communications equipment as follows:

(1) Before firing the table, they receive the order and operational graphics.

(2) Each BC displays the overlay(s) on his FBCB2 screen.

(3) As soon as he is ready to start the course, he reports REDCON 1 to the exercise controller.

(4) Upon completion of both the day and night phases, the firing vehicle crew completes and sends a digital SALT and SITREP to the exercise controller.

f. **Icon Management.** The unit's tactical SOP (TACSOP) provides guidelines for managing icons. After the unit completes the table, the FBCB2 operator or BCE, acting as the PL, XO, or S2, removes the red icons from the system.

CHAPTER 6

Engagement Process

On future battlefields, Bradley crews must rapidly engage multiple targets while operating within irregular battle lines. Depending on the tactical situation and the area of operations, enemy targets could intermingle with friendly coalition and neutral vehicles. Survival depends on the crew's ability to detect, locate, identify, and rapidly engage and destroy the enemy. Fire commands are the language used to organize and execute the engagement process to destroy the enemy and continue the mission. To engage the enemy successfully, Bradley crews must know the techniques and procedures for acquiring, deciding to engage, engaging, and commanding fire. Figure 6-1 shows the relationship between the steps in each process.

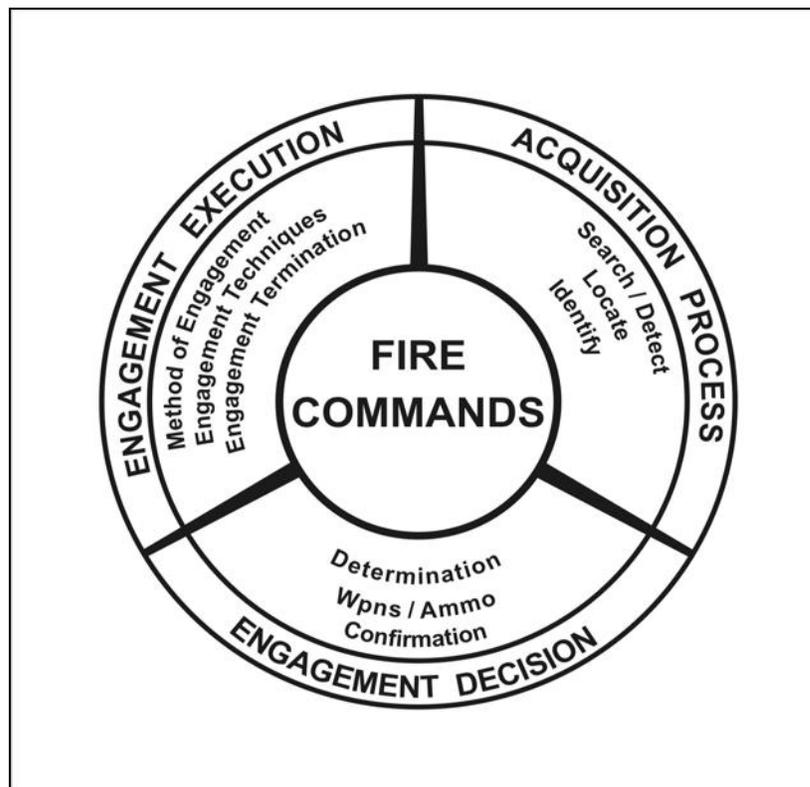


Figure 6-1. Engagement.

Section I. TARGET ACQUISITION

Acquiring a target is a series of progressive and interdependent steps (or actions) that include searching, detecting, locating, and identifying it. Effective target acquisition requires a constant combined effort from each Bradley crewmember and squad member.

6-1. SEARCH

Crew and squad search (observation) is the act of carefully watching designated areas. The BC assigns a sector of observation (and target acquisition) to each crewmember and squad member. If the Bradley vehicle is in a hide position with the squad inside, then the BC positions an observer (or two) forward of the vehicle IAW FM 3-21.71 (Figure 6-2).



Figure 6-2. Dismounted observer.

a. **Ground Search Techniques, All Bradleys.** Crew and squad members scan their sectors at all times to detect targets or possible target locations. Crew and squad members use the naked eye, binoculars, night vision devices (NVDs), or vehicle optics for ground searches in both good and limited visibility. Crewmembers can locate targets quickly using the following techniques:

(1) **Rapid Scan.** Use this method first to detect obvious signs of enemy activity quickly (Figure 6-3).

(a) *Center Out, Near to Far.* From center of sector, scan rapidly, near to far.

(b) *Left and Right to Center, Near to Far.* Orient left or right; scan rapidly, near to far. Overlap center of previously scanned sector.

(c) *Reverse.* After completing one side, scan other side the same way.

(d) *BC Far to Near, Gunner Near to Far.* The BC and gunner scan as this title implies:

- BC--far to near.
- Gunner--near to far.

(e) *Weapons on Nearest Targets First.* Place weapons systems on nearest target first.

(2) **Slow (50-Meter) Scan.** In a defensive position or during a short halt, if crew and squad members detect no targets during a rapid scan, they conduct a slow scan. They scan more deliberately, using their vehicle optics (day, thermal, or FLIR mode) or their binoculars (Figure 6-4).

(a) The BC or gunner slowly searches a 50-meter-deep strip of the target area, right to left, pausing at short intervals to focus.

(b) The gunner then searches a strip farther out, this time left to right, overlapping the first area.

(c) The BC searches a closer area in front. He continues until he has searched the entire assigned sector.

(d) When the BC or gunner detects a suspicious area or possible target signature, he begins searching in more detail.

NOTE: (A3 only) In FLIR mode, the BC or gunner can digitally zoom the Bradley A3 IBAS or CIV to 2X or 4X to observe potential targets in more detail.

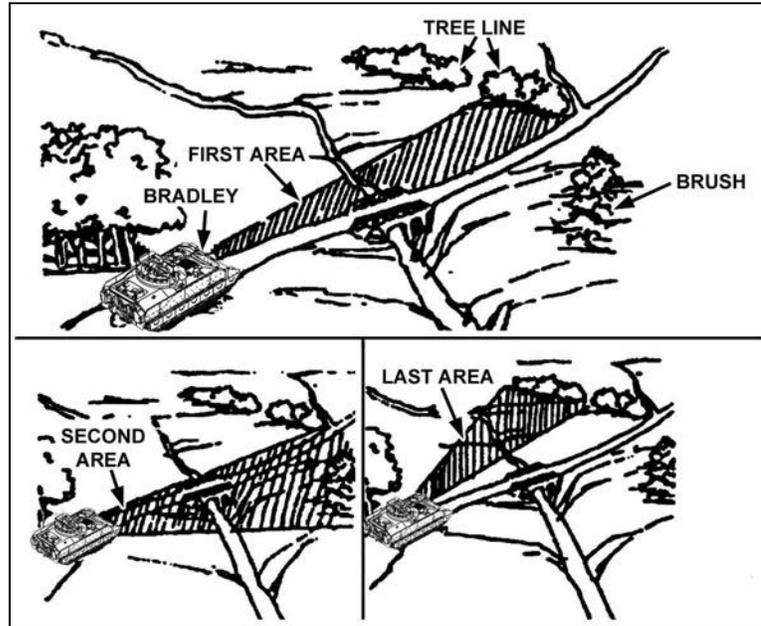


Figure 6-3. Rapid scans.

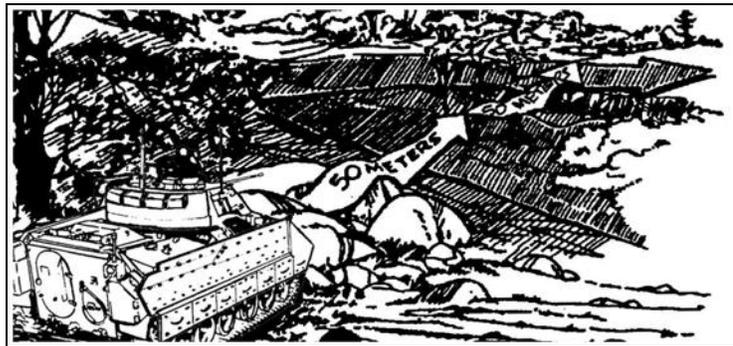


Figure 6-4. Slow (50-meter) scan.

(3) **Detailed Search.** If neither the rapid nor the slow scan reveals a target, the crew uses the vehicle optics (day, thermal, or FLIR mode) to search carefully and deliberately, while stationary or moving (Figure 6-5, page 6-4). They also use this method to search small areas, suspected avenues of approach, or detected targets in detail.

(a) The crew concentrates on one specific area or location and studies that area intensely.

(b) They look for direct or indirect target signatures in a clockwise manner around the focal point area. When two soldiers are using optics, such as when one uses the IBAS and the other uses the CIV, one scans clockwise and the other scans counterclockwise.

(c) On the Bradley A3, the crew can zoom in FLIR as needed to cover detailed-search areas.

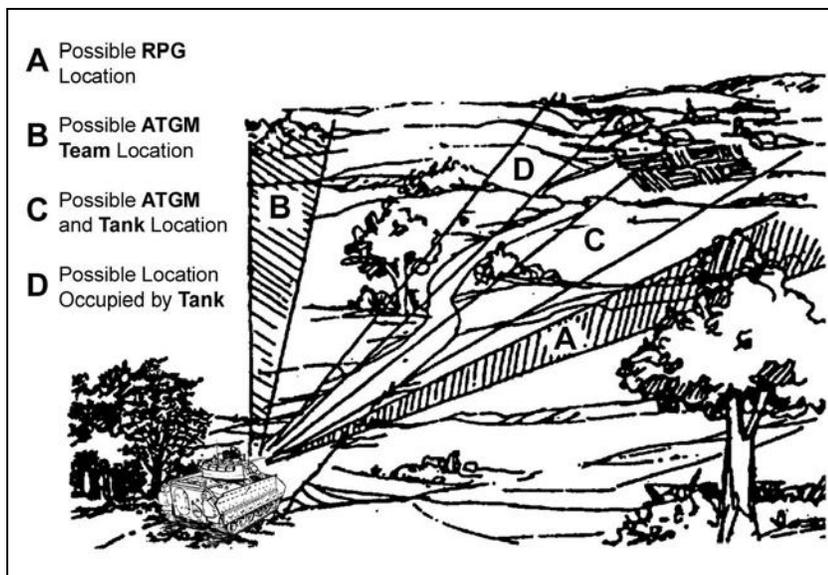


Figure 6-5. Detailed ground search.

(4) **Off-Center Vision Method.** At night, crew and squad members use the off-center vision method without optics. At each likely target area, they pause for a few seconds to see if they can detect a target or any movement. If they do detect something, they use off-center vision to observe it. To prevent object fade-out, they move their eyes frequently in short, abrupt, irregular movements. To increase their night vision, they cup their hands around their eyes.

(5) **Additional Ground Search Techniques for the Bradley A3.** The commander can use the CIV and all IBAS (DVO, Day TV, and FLIR) systems to search for targets. The A3's infantry squad can use the squad leader's display (SLD) to detect and acquire targets and, before infantry squad ground operations, to maintain situational awareness.

b. **Air Search Techniques, All Bradleys.** When using air search techniques, crewmembers and squad members concentrate their search just below the tops of trees or vegetation to detect helicopters in hide positions.

(1) **Enemy Aircraft.** Enemy aircraft operate in one to four pairs. So, if soldiers detect one pair of aircraft, they should expect a second set, and perhaps a third and fourth set.

(2) **Flat and Hilly Terrain Scans.** Crewmembers and squad members use the flat and hilly terrain scan methods to detect aerial targets quickly. Both methods derive from the slow (50-meter) scanning method. Whereas crewmembers and squad members should always search for ground targets from near to far, they should search for airborne targets from far to near.

(a) **Flat Terrain Scans.** In flat terrain, crew and squad members search the horizon by moving their eyes in short movements from object to object (Figure 6-6). They can see more detail this way than with a continuous scan of the horizon.

(b) **Hilly Terrain Scans.** In hilly terrain, crew and squad members search the sky, starting just below the horizon and moving upward (Figure 6-6). They use prominent terrain features as points of reference to ensure overlapping the areas of the search.

(5) **Combination.** Because searching the air at night is much like searching the ground at night, crew and squad members can combine ground and air techniques. This

lets them scan for targets in the air and on the ground at the same time. How they do this depends on the area of operations (AO) and on METT-TC.

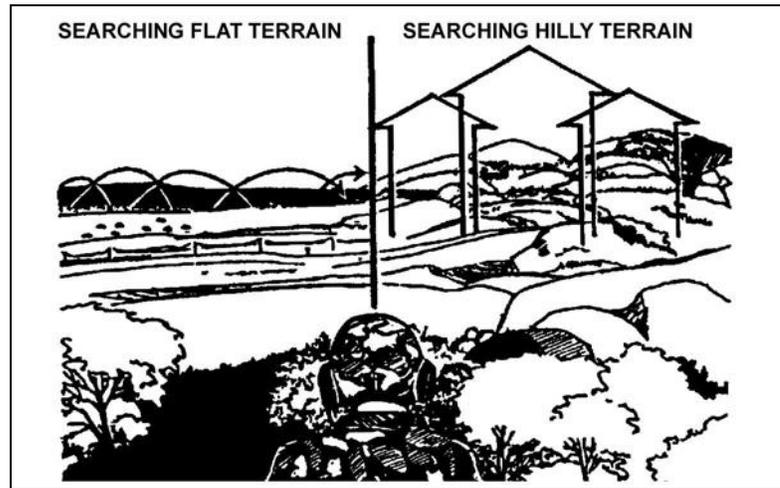


Figure 6-6. Terrain scan for aerial target.

c. **Search Tips.** Regardless of whether they are searching air or ground, soldiers can use any of the optical devices on the Bradley to acquire targets.

- (1) They can scan without optics at first.
- (2) The Bradley crew and infantry riflemen should scan different locations.
- (3) They scan for targets continuously, because they might at any time detect a possible target that they missed on an earlier scan.
- (4) The Bradley crew and infantry riflemen are much more likely to detect targets and target locations in their assigned sectors when they use correct scanning methods.
- (5) While on the move, the gunner should use the rapid-scan method, constantly scanning his sector from the right limit to the left limit.
- (6) To help him see possible target indicators, the gunner should--
 - Reduce reticle brightness until he can barely see the reticle.
 - Leave the turret and hull dome lights off or filtered.
 - Dim the panel lights.
- (7) The BC should cover the sight extension when not using it. Doing this enhances the gunner's sight picture by reducing the amount of ambient light reflected through the ISU optics from the commander's sight extension (CSE).
- (8) Operating in NBC conditions limits the soldiers' abilities to acquire and locate targets. Among other limitations, protective masks greatly narrow fields of view, except on the A3, because it has a biocular display.
- (9) The soldiers concentrate their searches where targets are most likely to appear. This includes, for example, avenues of approach, wood lines, and reverse-slope firing positions.
- (10) When the A3 crew uses the CIV or the IBAS to scan for targets rapidly, they should avoid using the zoom. When the Bradley A3 crew detects targets, the infantry squad can use the SLD to monitor one of the four videos (DVE, IBAS, CTD, or CIV).

d. **Sector Search Techniques.** When they have more than one optical device, the crew uses the following techniques:

(1) **Overlapped Sector.** The gunner scans the whole sector, left to right, near to far, using the IBAS or ISU. The commander also scans the whole sector (the same sector), but he scans right to left and far to near. He uses the CIV, binoculars, or NVDs to ensure coverage of the entire sector (Figure 6-7).

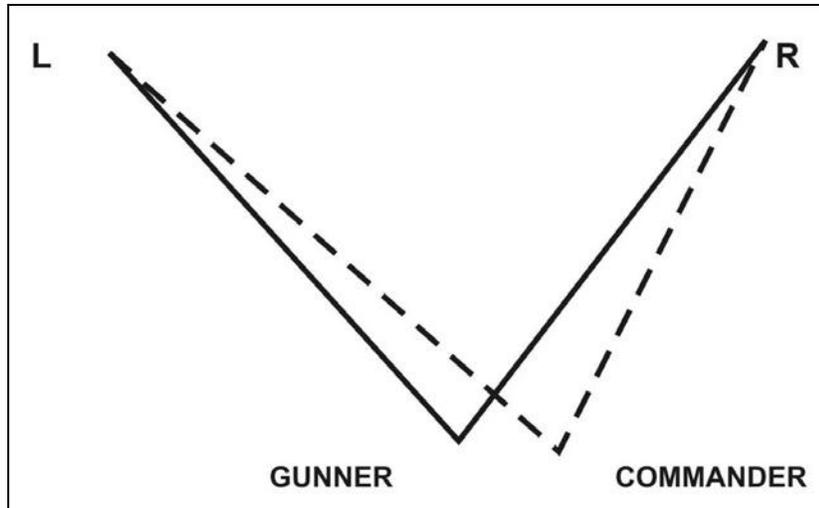


Figure 6-7. Overlapped sectors.

(2) **Divided Sector.** The BC and gunner can divide and search the same sector. Each scans one-half of it, and they ensure they overlap in the center (Figure 6-8 and FM 3-21.71).

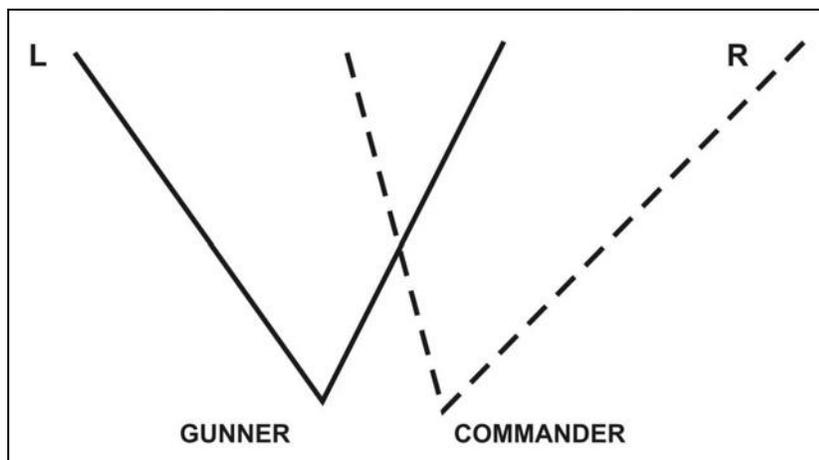


Figure 6-8. Divided sector.

(3) **Near-to-Far Sector Search.** The BC and gunner search the same sector.

- The commander uses the CIV, binoculars, or NVDs to search far.
- The gunner uses the IBAS or ISU to search near.

6-2. TARGET DETECTION

The crew searches for personnel, vehicles, equipment, or objects of potential military significance on the battlefield.

a. **Signatures.** Target signatures help the observer detect potential targets.

(1) Each weapon and vehicle produces signatures that are specific to its design and function. For example, firing a vehicle's main weapon system produces several signatures: blast, flash, noise, smoke, and dust. A list of typical battlefield signatures follows:

(a) *Soldiers.*

- Foxholes.
- Voices (which carry farthest in cold, dry weather and at night).
- Broken vegetation.
- Footprints (weather conditions permitting).
- New and old fires.
- Trash.
- The noise and flash from small-arms weapons.

(b) *Tracked Vehicles.*

- Vehicle tracks on the ground (if weather conditions permit).
- Hot spots from road wheels or tracks (visible in thermal sight).
- Hot spots from engine compartments (visible in thermal sight).
- Hot spots from weapon barrels (visible in thermal sight).
- Engine noise.
- Exhaust plumes and smoke.
- Dust clouds from movement.
- Disturbed areas of vegetation.
- Reports and smoke from firing weapons.
- Bright flashes at night.
- Open hatch silhouettes.

(c) *Antitank Weapons.*

- Sharp crack of a fired ATGM.
- Missile launch "swish."
- Fast-traveling hot spots with vapor trails in thermal image.
- Long, thin wires from fired ATGMs.
- Destroyed armored vehicles.

(d) *Artillery, Non-Self-Propelled.*

- Loud, dull sound.
- Grayish-white smoke cloud.
- Bright orange flash and black smoke from airbursts.
- Rushing noise several seconds before round impacts.

(e) *Artillery, Self-Propelled.* Self-propelled artillery pieces produce the same thermal, infrared signatures as tracked vehicles.

(f) *Artillery, Towed.* These vary according to the towing vehicle.

(g) *Aircraft, All.*

- Engine noise.
- Vapor trails from engine exhaust or fired missiles.

(h) *Aircraft, Fixed-Wing.* Reflected glare from the canopy, wings, and fuselage.

(i) *Helicopters*. Threat helicopters will most likely move on the far side of wood lines, ridgelines, and significant folds in the terrain. Signatures include--

- Reflected glare from windows and rotor blades.
- Dust caused by hovering helicopters.
- Foliage movement caused by hovering helicopters.

(j) *Obstacles and Mines*.

- Loose dirt or dirt that has been disturbed in a regular pattern.
- A destroyed or disabled vehicle that appears to have struck a mine.

(2) Crewmembers use their senses of sight, hearing, and smell to detect, locate, and identify targets. Environmental conditions in the operational environment, such as visibility, temperature, and weather conditions, affect each type of target's signatures in specific ways. For example--

(a) Vehicles make more noise while moving through urban areas than while crossing open fields.

(b) Different types of aircraft produce different signatures.

(c) A hovering helicopter and a fixed-wing aircraft make different sounds.

(3) The observer is most likely to detect the signatures of wheeled or tracked vehicles in open areas or rolling terrain. Naturally, that is where threat tanks and APCs will most likely emplace and move (FM 3-21.71). For this reason, the BC positions antitank weapons to cover visually the threat's primary avenues of approach.

b. **Challenges**. The crew will have more difficulty detecting some targets than they will others. Leaders must train soldiers to detect and locate all kinds of targets. Some examples of these more difficult targets and challenges include--

(1) **Target**.

- Peripheral targets (on the edge of the field of view).
- Camouflaged targets.
- Shadowed targets.
- Audible, but still invisible targets.
- Targets under poor indirect-fire illumination.
- Mirage effects caused by high temperatures and heat waves near the ground.
- Small, single targets such as lone rifle infantry ATGM or RPG positions.
- Natural and man-made obstacles.

(2) **Soldier**. Behavioral or physical deficiencies such as--

- Fatigue.
- Eye reactions to gun flashes.

(3) **Light and Shadow**. To search an illuminated area, soldiers should keep one eye closed. They should avoid looking directly into the source of the illumination.

(a) *Illumination in Front of Target*. Illumination in front of the target produces a shadow darker than the target.

(b) *Illumination Behind Target*. Illumination behind the target "washes out" passive optics. If not, it should clearly stand out. While searching under illumination, crewmembers should always keep one eye closed. They must also avoid looking directly at the source of the illumination.

c. **Thermal Sights**. The threat usually moves, digs in, or continues an attack at night. In daytime, he tries to cover his intentions. A thermal sight can detect camouflaged

targets that a day sight might not detect. It displays an image of the heat radiating from the viewed objects. Thermal sights sense heat from the following sources:

- (1) **Body Heat.** The thermal sight detects all kinds of heat, including body heat.
- (2) **Thermal Reflections.** Glossy, smooth surfaces, such as the windshield of a vehicle, can reflect radiated heat.
- (3) **Solar Heat.** Objects absorb heat from the sun at different rates depending on the material. The amount of heat absorbed determines how the object shows up in a thermal sight. Target signatures vary if heated only by the sun. As the sun sets, the gunner will notice how the image changes form.
- (4) **Fuel Combustion.** Naturally, burning fuel produces heat. A vehicle can produce one plume of heat from its exhaust and another one from its engine compartment. The location of the engine and the direction of the exhaust plume differ between vehicles. The strength of the signature produced by fuel combustion depends on how long the engine runs and where it is located in the vehicle relative to the viewer's position.
- (5) **Friction.** Moving parts cause friction, which produces heat. Therefore, they, too, show up in a thermal sight. Moving parts include, among other things, tracks, road wheels, drive sprockets, and support rollers. Vehicles moving through mud or snow create fuzzy images. Vehicle track-shrouding materials can hide road-wheel and track-shoe signatures. After long use, these moving parts, just like the engine, produce a more intense thermal image than they do when used for shorter periods. A vehicle looks very different through a thermal sight after a 12-kilometer road march than it does in a defensive position.

d. **Thermal Sights, Bradley.** Obviously, the possession and effective use of thermal imaging systems to maneuver and engage at night gives the BFV crew a clear advantage over the enemy. In daytime, the thermal sights increase the crew's ability to detect targets behind foliage or in shadows.

(1) Both the BC and the gunner can use the Bradley's thermal sight to acquire targets in any visibility conditions. The ISU (in thermal mode) and DVE can sense radiant heat differences as small as 1 degree Fahrenheit between objects and their surroundings.

(2) The Bradley A3 IBAS or CIV FLIR is a second-generation thermal sight. To aid in target identification, the crewmember can use both the biocular and remote biocular displays (BD and RBD). The IBAS or CIV FLIR sight can digitally zoom the image from 2X to 4X. These capabilities make the FLIR the primary sight. They can sense a radiant heat difference of less than 1 degree Fahrenheit between objects and their surroundings.

(3) Some camouflaged targets show up poorly in daylight, but show up well with thermal sights. For example, a vehicle in a wood line appears as an irregular shape compared to the surrounding vegetation and shows up well in WHITE HOT. a camouflaged vehicle moving across an open area stands out in BLACK HOT.

6-3. TARGET LOCATION

A crewmember locates a target by searching, observing, and detecting. Once he does so, he gives all personnel the target location. How he does this depends on his specific position, unit SOP, and time available. When the BC locates a target, he can lay the gun and issue a fire command. This fixes the target's location for the gunner. The following paragraphs describe the eight most common target-location methods:

a. **Clock Method.** The BC and gunner can use the clock method to locate the target. Twelve o'clock represents the direction of vehicle movement while traveling or the hull's

orientation (the direction the front of the vehicle is pointing) while stationary, for example, *BMP, NINE O'CLOCK*. The BC or gunner can use the turret position indicator or, on the A3, use the one in the biocular display.

b. **Sector Method.** The sector method is similar to the clock method--it is quick and easy to use. The BC is most likely to use the sector method to indicate the target's direction of movement relative to that of the Bradley or, if the Bradley is stationary, relative to its hull orientation. Center sector is always to the front, for example, *THREE TANKS, LEFT REAR*.

c. **Traverse Method.** The BC can use this fairly quick method to locate the target for the gunner. However, when his handstation malfunctions, the BC can use this method to guide the gunner on target, for example, *TRAVERSE LEFT (OR RIGHT), STEADY, ON*.

d. **Reference-Point Methods.** The BFV crew uses these methods along with the vehicle optics.

(1) **Binocular Method.** Using binoculars, the BC determines the mil value from a terrain feature, known position, or target reference point (TRP). He then announces this mil value to the gunner.

(2) **Mil-Relation Method.** Using the mil-reticle relationship, the gunner traverses onto the target. Both the BC and gunner must know the mil-sight relationship, for example, *ATGM, TRP ONE, RIGHT FIVE MILS*.

e. **Quick Target-Reference-Point Method.** All personnel use the quick TRP method to identify targets near a TRP, for example, *"Two PCs, TRP One."*

f. **Precise-Reference-Point Method.** Crewmembers use this method when they want a precise target location relative to a known TRP.

g. **Grid Method.** The BC uses this time-consuming method only when all he knows about the location of the target is the grid coordinates. The BC must locate the target on his map or FBCB2 map screen. Then, he must orient the turret towards the target for the gunner.

h. **Target-Designation Capability.** When the A3 commander locates a target using the CIV, he presses the TARGET-DESIGNATE button. This moves the gunner's LOS in the IBAS to within one degree of the target. The handstation palm switch must be engaged in order to use the target designation feature.

6-4. RANGE ESTIMATION

At times, the BC or gunner must estimate range (Table 6-1). They can each use one of two methods, but only to estimate range. Proficiency in these methods requires constant practice.

a. **100-Meter Unit-of-Measure Method.** To use this method, the BC or gunner must be able to picture a distance of 100 meters on the ground.

(1) For ranges up to 500 meters, he estimates the number of 100-meter increments between the two objects he wishes to measure.

(2) For ranges beyond 500 meters, he--

(a) Selects a point halfway to the object(s).

(b) Determines the number of 100-meter increments to the halfway point.

(c) Doubles that number to find the range to the object(s).

Factors Affecting Range Estimation	Factors Causing Underestimation of Range	Factors Causing Overestimation of Range
The clarity of outline and details of the object.	When most of the object is visible and clearly outlined.	When only a small part of the object is visible, or when the object is small relative to its surroundings.
Nature of terrain or position of the observer.	When looking across a nearly hidden depression. When looking downward from high ground. When looking down a straight, open road or along a railroad. When looking over uniform surfaces like water, snow, desert, or grain fields. In bright light or when the sun is shining from behind the observer.	When looking across a depression that is totally visible. When vision is confined, as in streets, draws, or forest trails. When looking from low ground toward high ground. In poor light, such as dawn and dusk; in rain, snow, fog; or when the sun is in the observer's eyes.
Light and atmosphere.	When the object sharply contrasts with or is silhouetted against the background due to the size, shape, or color of the object. When seen in the clear air of high altitudes.	When object blends into the background or terrain.

Table 6-1. Factors of range estimation.

b. **Flash-to-Bang Method.** To use this method to determine the range to an explosion or to enemy fire, the BC or gunner counts the seconds between the flash and the report. He can use a stopwatch, or he can count steadily, *ONE-THOUSAND-ONE, ONE-THOUSAND-TWO...* for a three-second estimated count. If he must count higher than ten must, he starts over with one. To get the approximate range, he multiplies the number of seconds by 350 (meters).

6-5. RANGE DETERMINATION

Range determination greatly affects target engagement. Range-determination errors cause more first-round misses than do deflection errors. Those that cause the first round to fly beyond the target present the greatest challenge, because observing and adjusting from a round that lands out of sight is hard. The BC bears the main responsibility for determining range. He has more ways to do so than do other crewmembers. Also, he knows more than they do about the terrain and tactical situation. The gunner and driver have limited means to determine range. This paragraph describes how each crewmember can determine range.

a. **Driver.** The driver's ability to determine range is limited, especially with his hatch closed. He can use the football-field method to estimate range to close-in targets. However, depth perception problems with the night vision sight AN/VVS-2 and the DVE prohibit accurate range determination.

b. **Bradley Commander.** The BC is mainly responsible for navigating, commanding, and controlling. To determine range, he relies on his experience and knowledge of the terrain, the tactical situation, and friendly control measures, both on the

map and on the ground. The BC can determine range using the following methods alone or together:

(1) ***Binoculars (Using Mil-Relation Formula)***. To use this method, he obtains the target's width, height, and length from the binocular's mil scale. He substitutes the mil relation and computes the range (Table 6-2). His accuracy depends on his knowing the target's dimensions and measuring precisely with the binoculars.

(a) To obtain *frontal width*, he measures the vehicle's front slope, from the vehicle's left front corner to its right front corner. To obtain the *flank width*, he measures the width of the entire vehicle (Figure 6-9). The mil is a unit of angular measurement equal to 1/6,400 of a circle. One degree equals about 18 mils.

(b) At a range of 1,000 meters, one mil equals the width, height, or length of 1 meter. This relationship remains constant as the angle or range changes.

(c) The BC completes and expresses range using metric measurements. He can express target size or range in other units of measurement (yards, feet, or inches). Whichever unit of measurement he chooses, he must use it for everything.

(d) Since the relationship between target width in mils and meters (W) remains constant at varying distances, the BC can use them to determine range accurately (Figure 6-10, page 6-14). The mil relation holds true whether the W factor is width, height, or length. Therefore, the BC can determine range if he knows the dimensions of the target.

(e) Target height might be the most consistent measurement, because length and width change as the target moves on the battlefield. Therefore, the BC uses target height to determine the "battlecarry" (preindexed range and ammunition), which he must identify before offensive operations.

(f) He obtains the mil and "W" measurements from the target measurement on the mil scale in the binoculars. He divides the known target measurement ("W") by the mil measurement. The resulting figure equals the range factor ("R"). He multiplies that by 1,000 to determine range to target.

(g) The distance between tick marks on the horizontal scale is 10 mils. Table 6-2 provides a quick reference for determining various threat vehicle ranges. The table groups the vehicles, averages their sizes, and rounds their ranges to the nearest hundred meters. This table provides a quick reference for determining the ranges of threat vehicles. It groups the vehicles and averages their sizes. The table shows ranges rounded to the nearest hundred.

GROUP 1 (BMP, TANK, BTR, ZSU, OT, AND MT-LB)									
Target Width (Mils)	5	4.5	4	3.5	3	2.5	2	1.5	1
Flank 6.75 Meters	1,400	1,500	1,700	1,900	2,300	2,700	3,400	4,500	6,800
Front 3.0 Meters	600	700	800	900	1,000	1,200	1,500	2,000	3,000
GROUP 2 (BRDM)									
Target Width (Mils)	5	4.5	4	3.5	3	2.5	2	1.5	1
Flank 5.5 Meters	1,100	1,200	1,400	1,600	1,800	2,200	2,800	3,700	5,500
Front 2.35 Meters	500	500	600	700	800	1,000	1,200	1,600	2,400
GROUP 3 (HIND HELICOPTER)									
Target Width (Mils)	22.5	20	17.5	15	12.5	10	7.5	5	2.5
Flank 17.25 Meters	800	900	1,000	1,200	1,400	1,700	2,300	3,500	6,900
Target Width (Mils)	5	4.5	4	3.5	3	2.5	2	1.5	1
Front 6.9 Meters	1,400	1,500	1,700	2,000	2,300	2,800	3,500	4,600	6,900

Table 6-2. Mil relation for various targets.

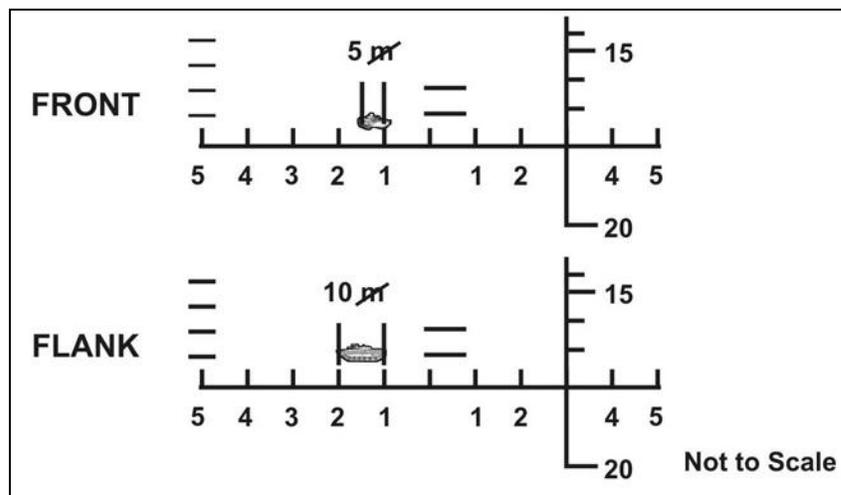


Figure 6-9. Target measurement using binocular reticle.

(2) **Printed and (A3 only) Digital Maps.** The FBCB2 and PLGR do not eliminate the need for printed maps. The BC must have one to navigate. He must always know where he is and where he is going. He can also use the map to determine range. In both the offense and the defense, he uses a map to continually assess likely enemy locations, engagement areas, and engagement ranges. He adds TRPs to his sector sketch.

(a) He uses the TRPs--

- To control direct and indirect fires.
- To ensure that he reports enemy sightings accurately.
- To help determine range to the target, and to do it quickly.

(b) He uses a map to determine the best battlecarry setting for the terrain and enemy situation. He uses the map again to adjust the battlecarry as the situation changes.

(3) **Range Card.** The main function of the range card is to help the crew engage targets in limited visibility. Since the BC already records range data on the range card, he might as well use it to help him determine range, too (Chapter 8).

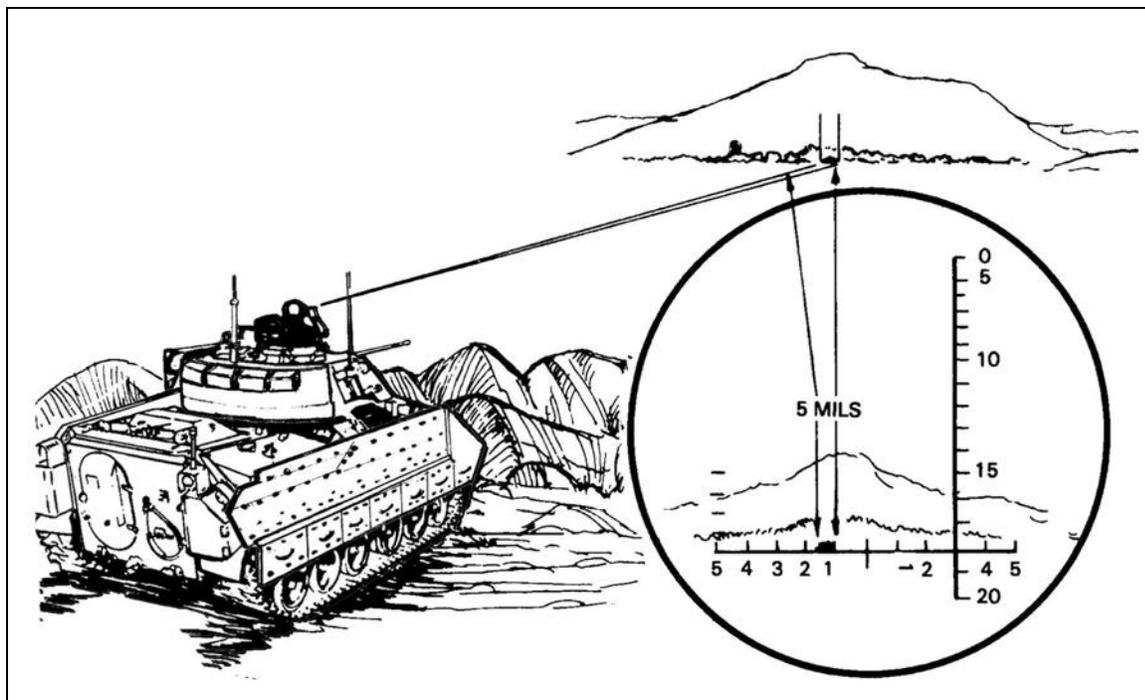


Figure 6-10. Range determination using binoculars.

(4) **ISU.** The BC and the gunner can use the horizontal ranging stadia or reticle lead-line method. Using his sight extension limits the BC's field of view. A3 only: However, if he selects the horizontal ranging stadia, he can use those through the RBD.

(5) **Laser Range Finder, AN/GVS-5.** Using the laser range finder, the BC can quickly and accurately determine the range for the gunner. The AN/GVS-5 is not organic to an infantry company but is organic to the scout platoon.

(6) **Eye-Safe Laser Range Finder.** The ELRF allows the commander or gunner to determine, rapidly and accurately, the target range. The ELRF displays range in 5-meter increments from 190 to 9,990 meters, plus or minus 10 meters.

c. **Gunner.** The gunner can determine range using any of the following methods:

(1) **Choke Sight.** He only uses the ISU reticle lead lines (Figure 6-11A, page 6-17) and horizontal ranging stadia (Figure 6-11B, page 6-17) to determine range from a defensive position. The ISU reticle has a choke sight he can use to estimate the range to BMP-type target, that is, any target that measures 1.8-meters high. (Reticles do not show the ADR for the M2A2 or M3A2.) Many different kinds of vehicles around the world derive from the BMP. The gunner can use the ISU or IBAS ranging stadia to determine the correct range to any of these (Figure 6-12, page 6-18).

(a) To use the choke sight, he moves the turret until the ranging stadia line appears to touch the vehicle. He aligns the horizontal line with the bottom of the target vehicle's track. He moves the turret horizontally along the target until the top of the hull appears to touch the stadia line. He reads the range where the top of the hull touches the angled stadia line. If the hull touches the line between the tick marks, he estimates the range, then indexes it into the ISU. Then, he re-lays the reticle on the target.

(b) He can use the choke sight to range to targets in defilade (hull down). He aligns the bottom horizontal line to the bottom of the target. He moves the sight until the top of the target appears to touch the angled stadia line (Figure 6-13, page 6-18). He reads this range and divides that number in half. This technique offers less accuracy than ranging a fully exposed target. He must remember to choke only the hull, not the whole vehicle. He avoids choking weapons or lights mounted atop the turret.

(2) **Reticle Lead Line and Mil Relation.** He can use the lead lines on the reticle to determine the range to a target, since each lead line is 2.5 mils from the center of the reticle. First, he must classify the target as a frontal or a flank view (Figure 6-14, page 6-18). Second, he gets the width of the vehicle, either frontal or flank, by comparing the vehicle's frontal and side views. Figure 6-15, page 6-19, shows how much of the front and side of the BMP-based vehicle he can see when the vehicle rotates from full frontal (0 degrees) to full flanking (90 degrees).

(3) **A3 IBAS or CIV Reticle.** He can use the Bradley A3 IBAS, its CIV, and the ISU horizontal-ranging stadia to estimate range. (Figure 6-16, page 6-19.)

(4) **Auxiliary (or Backup) Sight.** He can use the backup (AUX) sight when either the ISU or IBAS--fails to operate or when turret power fails.

(a) The auxiliary sight has stadia lines to help him determine range and, based on that, to apply the correct superelevation. It also has stadia lines for both APDS-T and HEI-T ammunition. Thus, he can use the AUX sight to determine the range and to engage a frontal or flank BMP-type target.

(b) The auxiliary sight has two range scales. The HE scale on the left side of the reticle (the broken line) extends to 3,200 meters (Figure 6-17, page 6-20). The AP scale on the right side (the solid line) extends to 3,400 meters (Figure 6-18, page 6-20). The numbers 4 and 6 represent 400 meters and 600 meters, respectively. The HE range scale continues to 32 (not shown in figure). He can determine the range to a flank target by elevating the gun until both the front and rear of the target appear to be touching the AP stadia lines (Figure 6-17, page 6-20). He can use the HE lines the same way to choke the range to a flank HE target.

(c) To determine the range to a frontal target, he uses the half-stadia method. He aligns the center vertical ranging lines with one side of the target. He aligns the appropriate ammunition stadia line on the other side of the target (Figure 6-18, page 6-20). (He will also use the HE stadia lines for the coax.)

(5) **25-mm Gun Reticle.** To determine range with the 25-mm gun reticle, he must know the width of the vehicle. This reticle provides greater magnification and smaller graduated markings.

(a) To determine range, he uses the reference markings (Figure 6-19 and Figure 6-20, page 6-21):

- 2 mils.
- 2.5 mils.
- 3 mils.
- 5 mils.

(b) The Bradley M2A3 gun reticle has no zoom. Therefore, target range depends on the size of the target, which he can estimate using the mil-relation formula. The recommended maximum engagement range for APDS-T is 2,000 meters. However, when firing APDS-T with an index setting of 12, the maximum range is 1,400 meters.

Figure 6-19, page 6-21, shows where to position the reticle for a target at that range. Figure 6-20, page 6-21 shows the front and flank sight pictures of a BMP beyond 2,000 meters.

(c) On ODS Bradleys, he cannot use the ELRF with the TOW selected. Before he can use the TOW, he must determine the maximum engagement range. To do it himself, he must either switch to another weapon system, determine the range, and reselect TOW; or he must ask a wingman vehicle to get that information for him. Figure 6-21, page 6-22, shows the sight picture of a TOW target at maximum engagement range (3,750 meters) as it would look through the 25-mm reticle.

(6) **Range Card.** (See Chapter 8.)

(7) **ELRF.** This applies only to Bradley ODS and A3 models.

(8) **Reticles.** When using the Bradley A3 IBAS reticle and CIV reticle, the crew can select the default reticle, gun reticle, air-defense reticle, and horizontal-ranging stadia through the CTD (Figure 6-16, page 6-19).

(a) The crew uses the horizontal-ranging stadia and gun reticles on Bradley A3 to determine target distance. They determine range either by choking the ground to the top of the vehicle's hull with the ranging stadia, or by using the gun reticle and mil relation.

(b) Figure 6-21, page 6-22, shows the reference markings on the Bradley A3 default reticle. These marks measure 1.2, 1.3, 2.5, and 5 mils (Figure 6-22, page 6-22). This technique does not call for the use of reference marks 13.72 and 12.38.

(c) Figure 6-23, page 6-23, shows how to determine the maximum engagement range for the TOW using the A3 gun reticle.

(d) Figure 6-24, page 6-23, shows a TOW sight picture of a target at its maximum engagement range (3,750 meters).

(e) Table 6-2, page 6-13 (mil relation for various targets), provides a quick reference for determining the range to threat vehicles.

- NOTES:**
1. On both the IBAS and CIV, the gun reticle, air defense reticle, and horizontal ranging stadia display only in high magnification on the Day TV and FLIR.
 2. On the IBAS, the DVO sight displays the selected reticle in both high and low magnifications (IBAS only).
 3. On Bradley A3 vehicles, crewmembers can use the ELRF with the TOW selected.

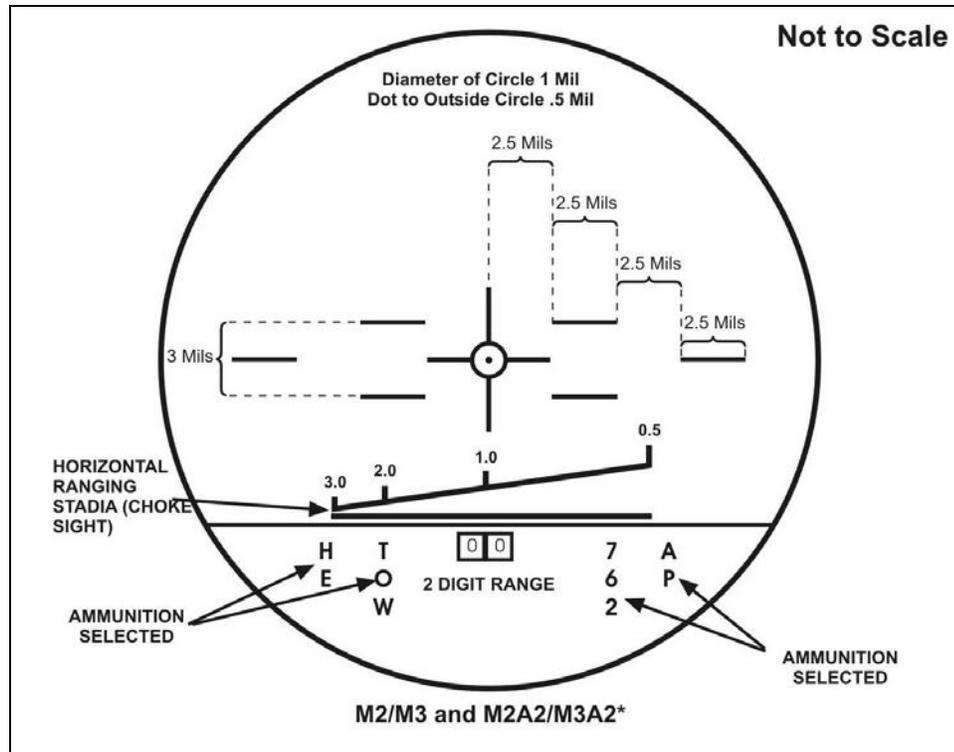


Figure 6-11A. 25-mm choke sight reticle, reticle lead lines.

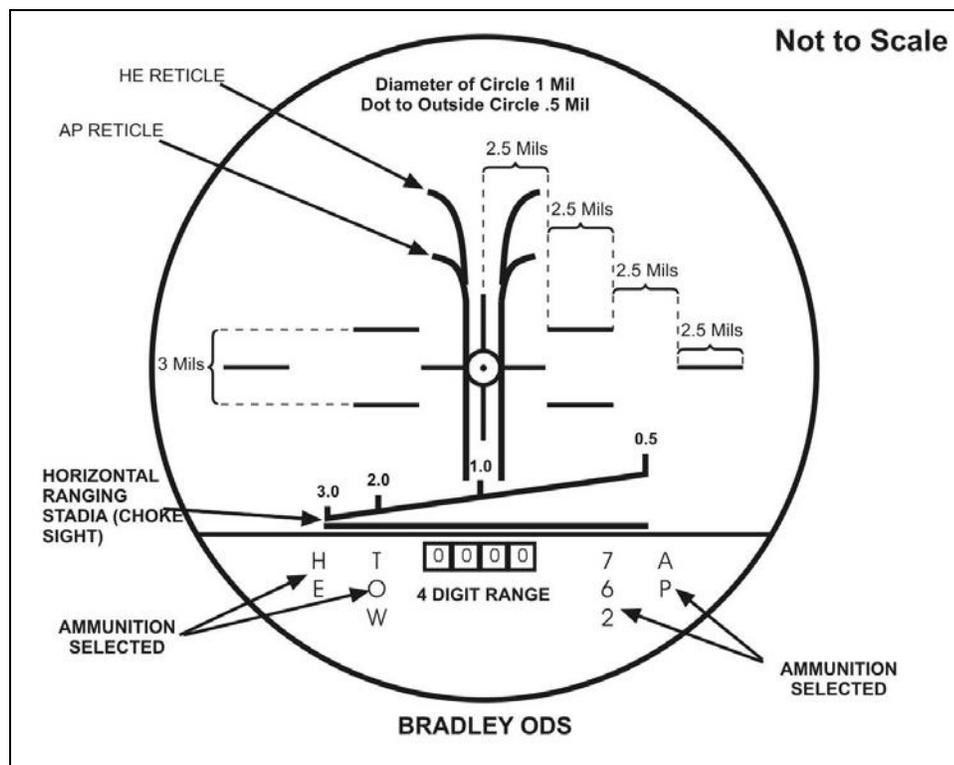


Figure 6-11B. 25-mm choke sight reticle, horizontal-ranging stadia.

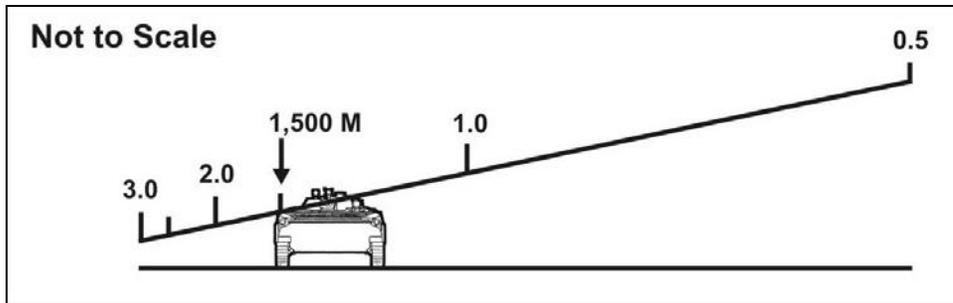


Figure 6-12. Choked hull.

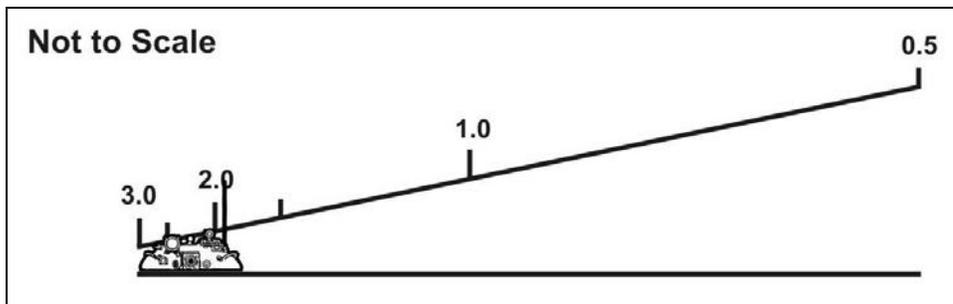


Figure 6-13. Choked hull-down vehicle.

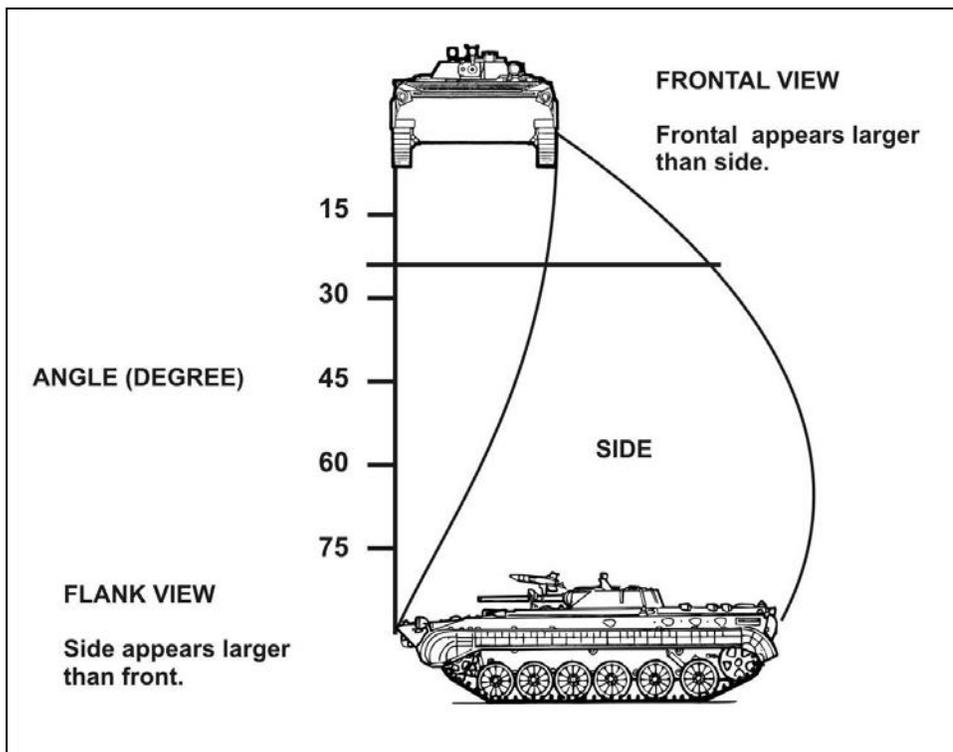


Figure 6-14. Determination of range, frontal or flank view.

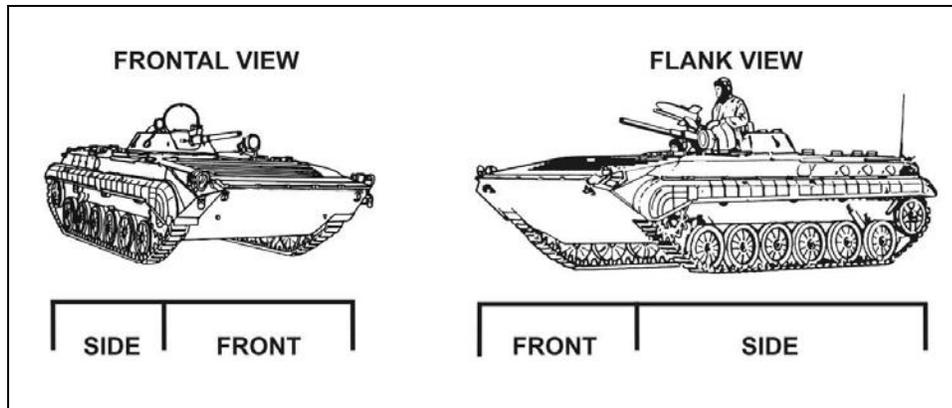


Figure 6-15. Determination of vehicle width by comparison of frontal and side views.

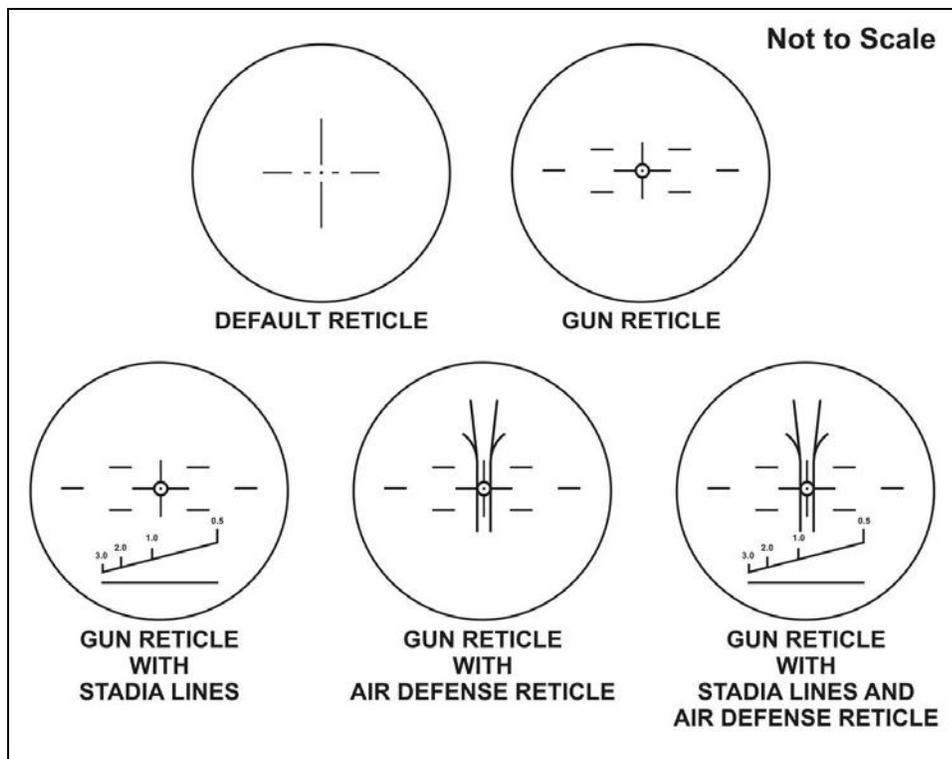


Figure 6-16. Selection of Bradley A3 reticle.

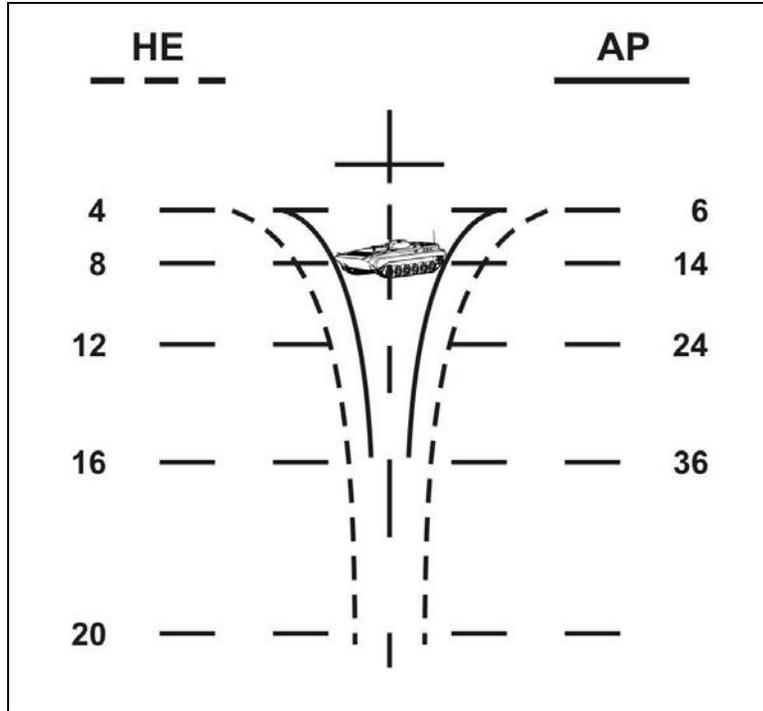


Figure 6-17. Determination of range to a flank view of a BMP, 1,400 meters.

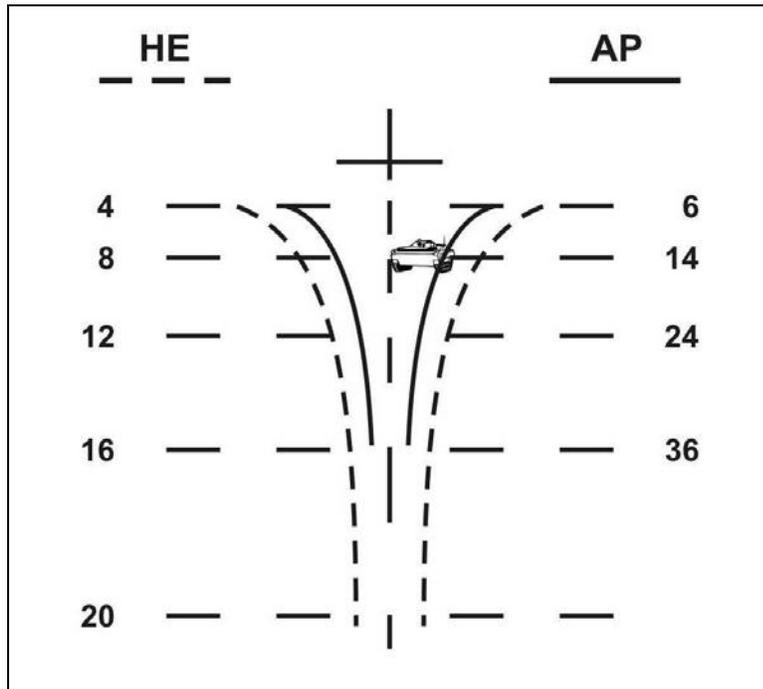


Figure 6-18. Determination of range to a frontal view of a BMP, 1,400 meters.

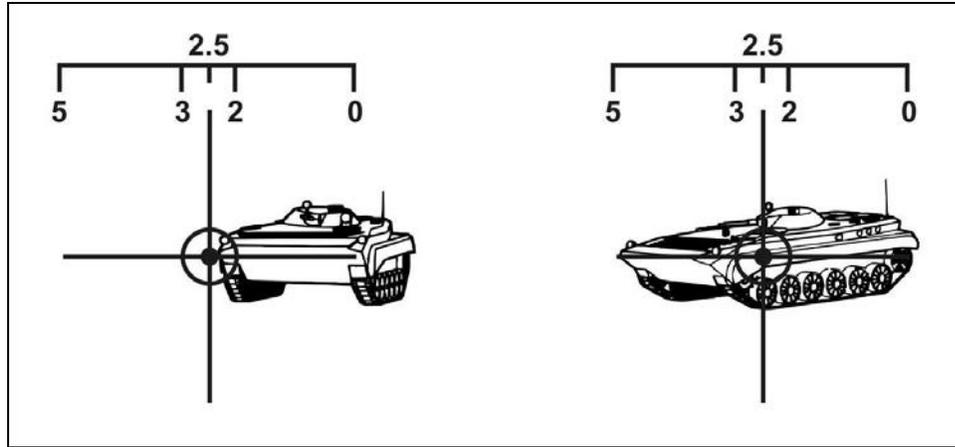


Figure 6-19. Reticle position for a BMP at 1,400 meters.

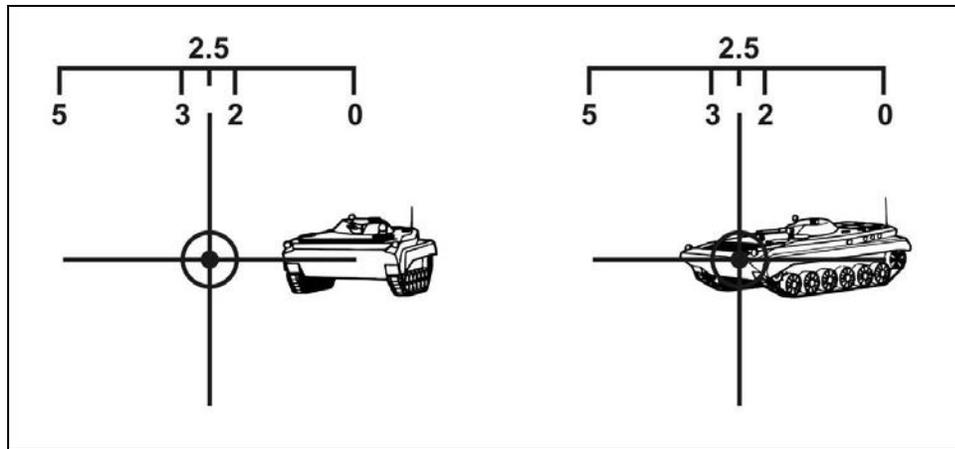


Figure 6-20. Front and flank sight pictures of a BMP at 2,000 meters.

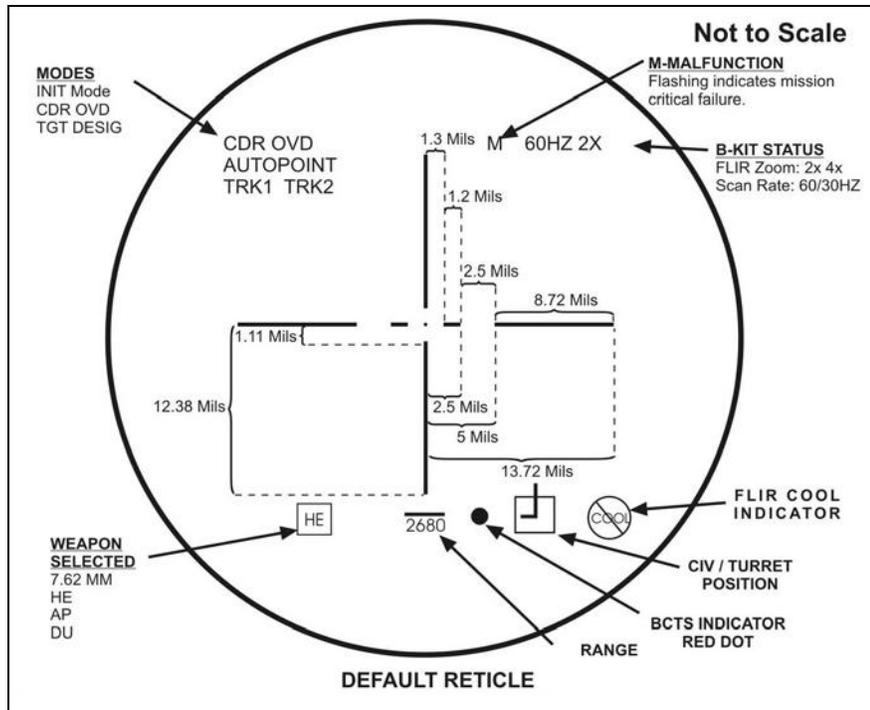


Figure 6-21. Bradley A3 default reticle lead line and mil relation.

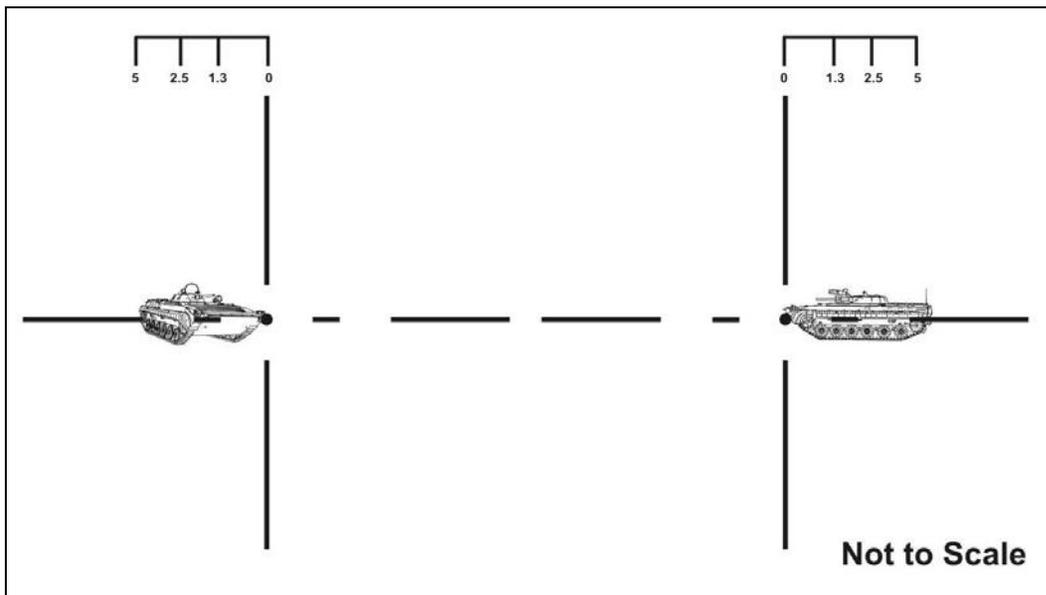


Figure 6-22. Determination of ranges for a BMP at Target 1 (1,400 meters) and Target 2 (1,800 meters).

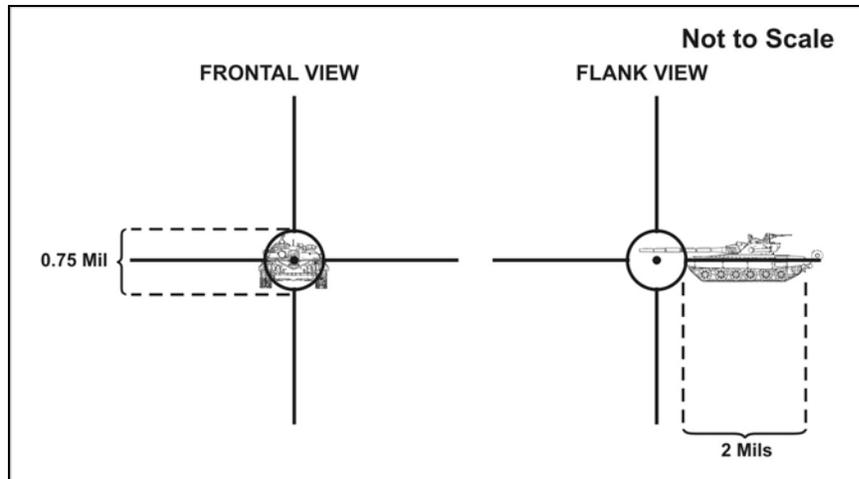


Figure 6-23. Determination of TOW maximum engagement range.

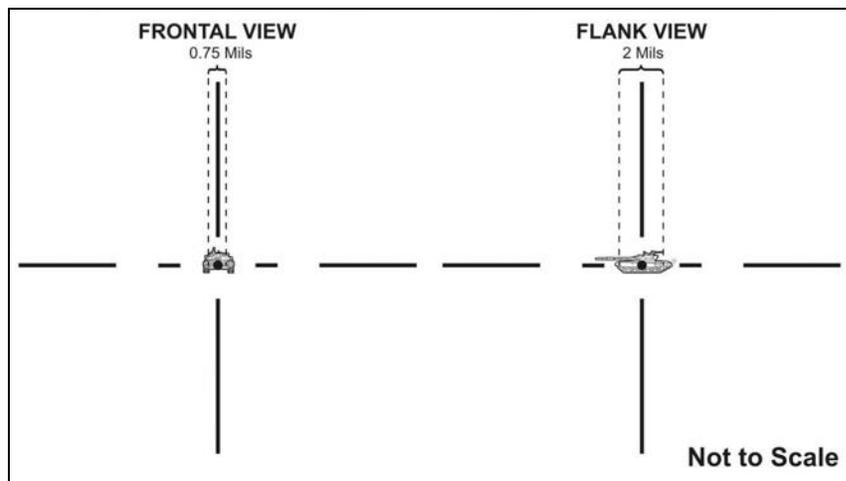


Figure 6-24. Determination of TOW maximum engagement range for an A3 default reticle.

6-6. TARGET IDENTIFICATION

Target identification consists of classifying a potential target by type, describing it by nomenclature, and discriminating it as either friend or foe. For example, the gunner might identify a potential target by classifying it as a tank, describing it as a T-55, and discriminating it as a foe.

a. **Classification.** In classifying a target, the crew identifies a target by vehicle type (truck, tank, APC). Soldiers can quickly scan the target's key recognition features, then classify it accordingly. For example, the gunner classifies a target as a tank because of the low silhouette, large gun tube, and tracks.

b. **Description.** In describing a target, the crew identifies a target by nomenclature (M998, T-55, BMP) based on key recognition features. For example, they look at the target and note that the turret is smooth and rounded, that the gun tube's evacuator is at the end of the tube, and that the suspension system has no support rollers. He therefore describes the target as a T-55 tank. Figure 6-25, page 6-24, shows an example target description.

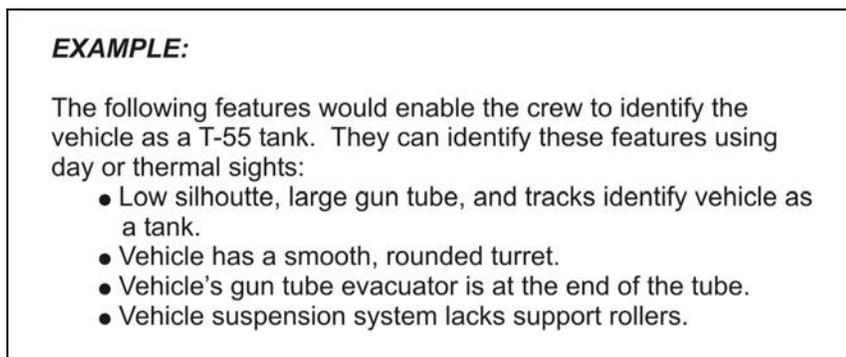


Figure 6-25. Example target description.

c. **Discrimination.** In discriminating a target, the crew identifies a target as friend or foe. Although equipment manufactured by the former USSR has been sold in large numbers worldwide, soldiers could also find themselves facing British, French, and American-made equipment. The following techniques might help Bradley crews discriminate a target:

NOTE: Situational awareness with METT-TC will support correct discrimination of friend or foe.

(1) **Combat Identification Panel.** Combat identification panels (CIPs), also known as "battleboards," allow the crewmember using a thermal sight to discriminate friendly vehicles up to 4,000 meters away. Bolted onto combat vehicles, the CIPs, provide a "cold" image on a "hot" background.

(2) **Unit Markings.** The unit SOP determines unit markings. Only imagination and resources limit unit markings. The markings must discriminate a vehicle as friendly, but soldiers must also train well to identify the markings. The units can mark vehicles with any of several items.

(a) The VS-17 panels provide a bright recognition feature that allows crews to discriminate friendly vehicles through the daysight.

(b) Chemical lights provide a means of marking vehicles at night. However, chemical lights do not appear in a thermal sight.

(c) The unit can use symbols to mark friendly vehicles. An inverted "V" painted on the flanks, rear, and front of a vehicle helps discriminate it as friendly.

6-7. ACQUISITION REPORTS

As soon as a crew or squad member acquires a target, he reports it immediately to the BC via acquisition report. This target-handover technique must occur before the determination step of the engagement decision.

- a. An acquisition report has three elements: *alert* (optional), *description*, and *location*, for example, "DRIVER REPORT, TWO MOVING PCS, LEFT FLANK."
- b. In the rear, soldiers who can identify each other by voice deliver the acquisition report verbally. Also, the description element of the report usually serves as the alert element, for example, "TWO MOVING PCS, ELEVEN O'CLOCK."
- c. "TARGET" is not the description element.

Section II. DECISION PROCESS

The engagement decision process consists of a series of progressive and interdependent steps (or actions). First, determining target threat levels; second, selecting weapon(s) or ammunition; and third, confirming the target. Only the BC can make these decisions.

6-8. DETERMINATION OF TARGET THREAT LEVELS

To defeat multiple targets on the battlefield, the crew must engage the most dangerous targets first. Commanders determine target threat levels based on the threat analysis of the mission area. All soldiers must know their unit's engagement priorities. However, the BC determines the immediate target threat level based on the current threat posture.

- a. **Target Threat Levels.** The three threat levels are as follows:

- (1) **Most Dangerous.** This type of target presents the greatest threat, so the crew must engage it immediately.

- Obvious enemy vehicles or troops.
- Vehicles that have armor-defeating capabilities
- Vehicles showing signs of preparing to engage.

- (2) **Dangerous.** The crew must engage this type of target only after destroying the most dangerous targets.

- Vehicle with armor-defeating capability.
- Vehicles showing *no* sign of preparing to engage.

- (3) **Least Dangerous.** The crew engages this type of target after they have destroyed all of the most dangerous and dangerous targets. The only exception occurs when a particular vehicle, such as a command and control vehicle, has a high priority of engagement. Least dangerous vehicles include any vehicles that have no armor-defeating capability.

- b. **Other Determining Factors.** When the crew encounters multiple targets of the same threat level, it must prioritize the targets according to the degree of threat they represent. For example, the crew would engage targets in this order of priority:

- Close-range before long-range.
- Stationary before moving.
- Frontal before flank or rear.

6-9. SELECTION OF WEAPON AND AMMUNITION

Weapons and ammunition selection refers to the logical selection of a weapon or ammunition based on its appropriateness for a given target. Before selecting the weapon and ammunition type to use against target(s), the crew must first determine the threat type and range (Table 6-3, page 6-26).

THREAT TYPE	RANGE (METERS)	BFV WEAPONS	RANGE (METERS)	INFANTRY WEAPONS
Armored vehicle	65 to 3,000 ¹ 65 to 3,750	Basic TOW TOW 2, 2A, and 2B	10 to 300 65 to 1,000 65 to 2,000	AT4 Dragon Javelin
Light-armored vehicle	² 0 to 2,000 65 to 3,000 ¹ 65 to 3,750	AP Basic TOW All other TOWs	10 to 300 65 to 1,000 65 to 2,000	AT4 Dragon Javelin
Unarmored vehicle	0 to 900 300 to 3,000	coax HE	0 to 900 0 to 300 31 to 150 0 to 550 0 to 150	M249, M240B AT4 M203 (Point Target) M16A2 (Point Target) M18A1 Mine
Reinforced position	300 to 3,000 65 to 3,000 ¹ 65 to 3,750 0 to 900 0 to 1,800	HE Basic TOW All Other TOWs Coax (Suppression) TP-T (Punch holes in cinderblock)	10 to 300 65 to 1,000 65 to 2,000 31 to 150 0 to 600 0 to 550 0 to 10	AT4 Dragon Javelin M203 (Point Target) M249, M240B (Point Target) M16A2 (Point Target) Hand Grenade
Troops	0 to 900 300 to 3,000 0 to 300	Coax HE FPW	0 to 600 0 to 200 0 to 150 31 to 350 0 to 100 5 to 35	M249, M240B (Point Target) M249 (Area Target) M16A2 (Moving Man) M16A2 (Stationary Man) M203 (Point Target) M203 (Area Target) M18A1 Mine Hand Grenade
Aerial	1,200 to 2,000 0 to 1,200 2,000 to 3,000 2,000 to 3,750 ³ 1,000 to 5,000	AP HE Basic TOW All Other TOWs (Linebacker)	³ 1,000 to 5,000 SAAD SAAD	Stinger M249, M240B M16A2 (Burst)
¹ Minimum arming distance for TOW 2B is 110 meters; maximum arming distance is 200 meters. ² Planning effective range for APDS-T is 2,000 meters. APFSDS-T ranges are greater. ³ Maximum planning range for Stinger is 5,000 meters.				

Table 6-3. Weapon for threat.

6-10. TARGET CONFIRMATION

Confirming a target means rapidly verifying its initial identification and discrimination. The BC confirms a target after he initiates the fire command, at the same time the gunner completes the initial lay, and before he issues the execution element. The gunner also confirms the target. As he makes his final precise lay, he checks one last time to ensure that the target is hostile before he announces "IDENTIFIED."

a. The BC finishes evaluating the nature of the target based on its identification and on the tactical situation.

b. If the gunner confirms that the target is hostile, he completes his final lay and engages the target on order.

(1) If the gunner determines that the target is friendly or unknown, he announces his confirmation to the BC as "FRIENDLY" or "UNKNOWN."

(2) If he cannot determine the nature of the target, he announces "DOUBTFUL."

(3) The BC then determines whether to continue or to end the engagement.

c. The BC must know the tactical situation in order to help confirm targets. He gains his battlefield situational awareness from subordinates and higher elements. On ODS models that have FBCB2 and on the A3, the BC gets his battlefield situational awareness (SA) from the CTD, while the squad leader's display (SLD) provides battlefield awareness for the Bradley crew or squad.

Section III. ENGAGEMENT EXECUTION

The crew uses the Bradley's weapon systems to engage and destroy targets with direct precision and area fires. In order for crews to take advantage of the BFV's weapons systems to quickly lay, engage, and destroy threat targets, they must be experts in the use of target-engagement methods and techniques.

6-11. METHODS

Once he acquires and discriminates a target, the BC must determine the method of engagement. Two engagement methods apply to the 25-mm and to the coaxial machine gun--battlesight gunnery and precision gunnery. Each has its own fire commands (Section V). The Bradley ODS and A3 gunner uses the ELRF to determine range, then the BC gives a precision fire command. He selects the method of engagement based on his estimate of the situation.

NOTE: Battlesight and precision methods do not apply to the TOW system, because the TOW's ammunition has fixed ranges.

a. **Battlesight Gunnery.** For the Bradley without a ELRF or whose ELRF fails, battlesight gunnery offers the fastest way to engage a target. It relies on preselected ammunition and range settings. This set of "preindexed" information is called *the battlecarry*. This *battlecarry* allows the gunner or BC to aim, shoot, and burst on target (if necessary). This relieves the BC from having to identify and the gunner from having to select either the ammunition or the range. While planning fire and selecting battlecarry, the BC considers several factors. First, he selects ammunition for the most likely enemy target. Second, he selects the most likely engagement distances and range settings for those targets. The BC has two options when selecting battlecarry--ballistic and extended. Each is based on target height, ammunition characteristics, capabilities, and expected engagement range bands.

(1) **Ballistic Battlecarry.** The BC uses the ballistic firing tables (FT 25-A-2) to obtain the necessary ammunition information for his selected battlecarry target. From these firing tables, the BC can obtain the height of the expected target. Then, regardless of the target's motion, the gunner aims at half its height. The BC chooses a range that will keep the highest path of the selected ammunition from passing over the target. If, for example, the expected target is a BMP 2, the BC will use the M791 ammunition. The target measures 2.45 meters high. He has the gunner aim at half that height, or 1.225 meters. *Maximum ordinate* is the highest measurement the round will travel above the line of sight. When he checks the maximum ordinate column in the firing table (FT 25-A-2), the BC notes that 1.1 is the largest number that does not exceed 1.2 (rounded down from 1.225 meters). Reading right or left to the range column, he sees that a range of 1,200 meters corresponds to a maximum ordinate of 1.1. He instructs the

gunner to index 1,200 and select "AP" for the battlecarry. If the gunner engages the target within 1,400 meters, he has a good chance of achieving a first-round hit (Table 6-4).

AMMO	SUPERELEVATION (meters)							
	600	800	1,000	1,200	1,400	1,600	1,800	2,000
M919				0 to 1,400	1,062 to 1,613	1,340 to 1,787	1,589 to 1,965	1,820 to 2,146
M791				0 to 1,400	1,118 to 1,602	1,354 to 1,771	1,620 to 1,948	1,868 to 2,141
M792		0 to 945	842 to 1,101	1,102 to 1,277	1,344 to 1,450	1,554 to 1,648	1,766 to 1,831	1,978 to 2,021
COAX	0 to 900							

BALLISTIC BATTLESIGHT
 EXTENDED BATTLESIGHT

Table 6-4. Ballistic and extended battlecarry.

(2) **Extended Battlecarry.** The BC uses this technique when the gunner must engage the expected targets at or near the maximum effective range (tracer burnout) of the selected ammunition. (See Table 2-2, page 2-13 and Table 6-3, page 6-26.)

b. **Precision Gunnery.** Precision gunnery is the most accurate method of engagement. It requires both ammunition selection and range determination at the time of engagement.

(1) The BC uses precision gunnery when--

(a) He has time to determine precise range (defense).

(b) He already knows the range to the target.

(c) The target appears outside the battlesight range band for the type of ammunition needed to destroy it.

(d) The engagement requires a change in selected ammunition or range.

(e) Both the ODS and A3 crews use the ELRF.

(2) Precision gunnery is the usual method of engagement for HEI-T and coax, due to the limited ballistic battlecarry range of HEI-T and the high trajectory of coax.

(3) Range determination is the key to precision gunnery. The techniques for determining range do vary widely in their degrees of precision. However, precision gunnery is the *decision* to determine and index range, not the degree of precision.

c. **Multiple Targets.** When engaging multiple targets in different range bands, the BC may choose precision or battlesight gunnery, adjusting the method to match battlesight in the offense and precision in the defense. When selecting an engagement method, the BC balances the requirements for speed and accuracy. On any Bradley variant with an ELRF, he issues a precision fire command, except when the ELRF fails. If more than two targets are presented during an engagement, he can issue a reduced fire command to supplement or expedite the process. However, he must have issued a correct precision fire command first.

6-12. TECHNIQUES

The Bradley crew's goal is to engage and destroy or suppress targets as fast as possible. This paragraph discusses the various techniques and terms used for direct fire and

effective adjustments of fire. It also discusses techniques for engaging point and area targets with the 25-mm; for engaging coax machine gun, TOW missile, and FPW targets; and for employing smoke.

a. **Procedures.** The basic procedures used in all engagements follow:

(1) The BC might have to lay the gun for direction if the gunner's scan is far from the target. The BC releases control to the gunner (target handoff) and issues the fire command. For the Bradley A3 crew, the BC can use TARGET DESIGNATE to lay the gunner on the target.

(2) On acquiring the target, the gunner discriminates the target as "*Friend*," "*Unknown*," or "*Doubtful*..." He announces "*Identified*," centers the target in his field of view, and switches to high magnification. Depending on the situation (range, visibility, and his level of experience), the gunner might have to switch to high magnification before he can discriminate the target, and then he announces, "*Identified*."

(3) The gunner ranges the target with the ELRF before announcing "*Identified*" or "*On the way*" (Bradley ODS and A3s). This ensures that he has lased the target or that he can announce the range readout from the ELRF.

(4) The BC then confirms the target, gives the command FIRE. Then, he either observes the target and provides corrections to the gunner, or he searches for other targets.

(5) The gunner completes his switch checks by--

(6) Lasing or selecting the announced range (if other than the battlecarry) in the ISU or IBAS. If using the auxiliary sight, he does not select range.

(7) Selecting the ammunition and weapon.

(8) Arming the system.

(9) Establishing the correct sight picture (depending on target type, ammunition, target, or BFV motion).

(10) Announcing "*On the way*" and firing.

b. **Observations.** Everyone tries to observe where the round strikes relative to the target. If the gunner sees where the round goes, he announces at once that he does so, using specific terms (Figure 6-26, page 6-30). This tells the BC that the gunner has control of the engagement and needs no subsequent fire command. It frees the BC to perform other tasks such as acquiring more targets, controlling the driver, navigating, or communicating. Only if the gunner announces "*Lost*," indicating that he did not see where the round went or where it struck, does the BC announce what he saw. If he does, he uses the same terminology. If the BC must also announce "*Lost*," then the driver must announce what he saw. The crew uses the following terms to describe where they observed the round go:

(1) **Target.** The crew sees the round hit any part of the target with direct fire.

(2) **Lost.** The crew says this if they see neither the round nor its effects relative to the target.

(3) **Over.** The crew sees the round, tracer, or their effects pass over the target.

(4) **Short.** Somewhere between the firing vehicle and the target, the crew sees the round, tracer, or effects.

(5) **Doubtful.** The crew sees the round, tracer, or effects appear to the left or right of the target, but at the correct range. Although the observation "*Doubtful*" might not require

a range correction, it always requires a deflection shift. When a crewmember observes "Doubtful..." he does so as "Doubtful Left" or "Doubtful Right."

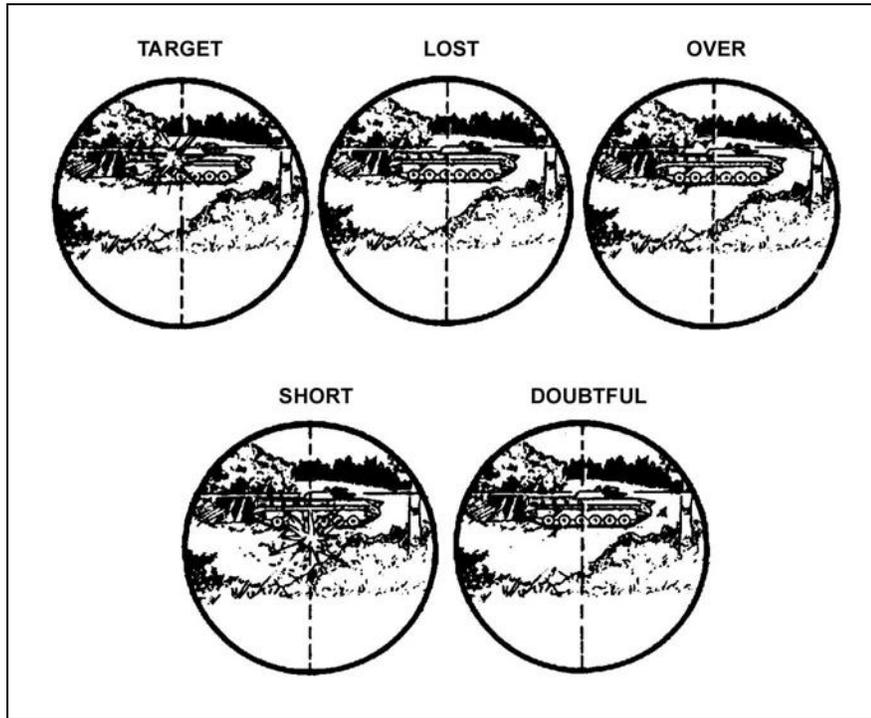


Figure 6-26. Target observations.

c. **Target Lead.** When engaging a moving target, the gunner must lead (aim in front of) the target to compensate for the movement. The amount of lead depends on the velocity of the ammunition, target speed, and target angle, but he uses the standard lead to start the engagement. This only applies to the A3 when in degraded mode.

(1) When using AP ammunition, the gunner uses a 5-mil lead from the center mass of the target. This rule is called the "gap lead." To apply gap lead, the gunner centers the target in the gap of the gun reticle. Figure 6-27 shows a BMP given a gap lead. The lead lines are shown as 2.5 mils long, except for the lead lines around the 1-mil circle, which are 2 mils long.

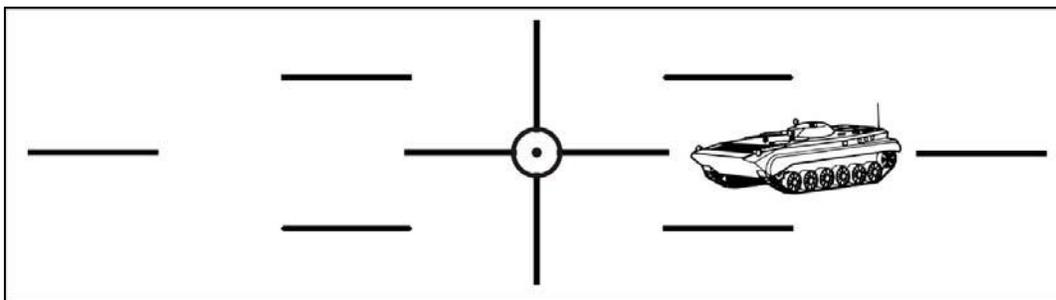


Figure 6-27. Gap lead applied to a moving BMP.

(2) When using HEI-T and 7.62-mm ammunition, the gunner uses far lead. To apply far lead, he centers the farthest lead line of the ISU on the target. Figure 6-28 shows a far lead truck engagement.

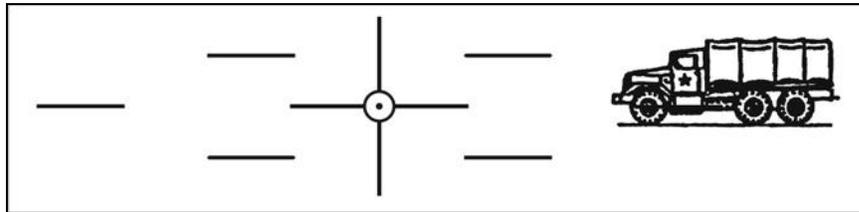


Figure 6-28. Far lead applied to a moving truck.

(3) When engaging targets moving toward or away from the position, the gunner may need to make small vertical adjustments (Figure 6-29). When the target is approaching, he aims at the center base of mass. When the target is moving away, he aims at the top center mass. As the range changes, the gunner must carefully adjust this aim point.

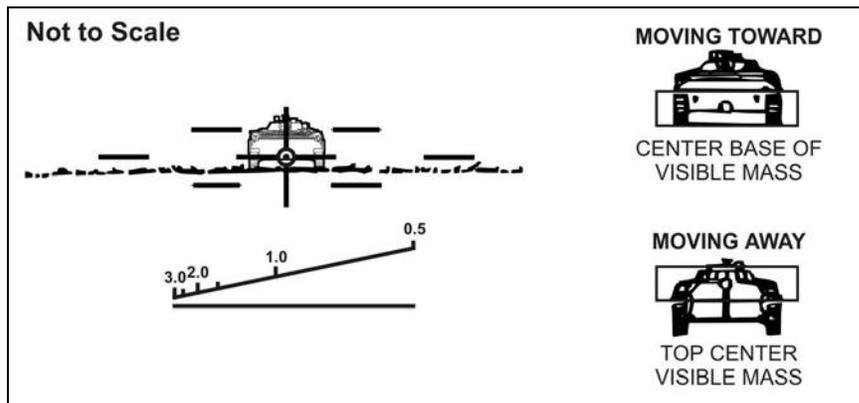


Figure 6-29. Target moving toward or away from Bradley position.

(4) When a moving Bradley fires over its flank (side) at a stationary target, the standard lead rule applies. The gunner leads the target in the opposite direction of the BFV's travel (Figure 6-30).

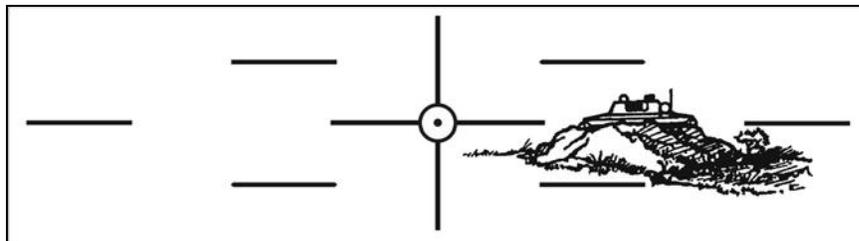


Figure 6-30. Gap lead applied to a stationary BMP when a Bradley fires over its left flank.

(5) If the Bradley and target are moving parallel to each other, in the same direction, and at the same speed, the gunner need not apply any lead. The vehicles' matching movement eliminates the need.

(6) If the Bradley and target are moving parallel but in opposite directions, the gunner doubles the initial lead (Figure 6-31). With HE ammunition, this can cause the gunner to run out of lead lines. If this happens, he changes to AP ammunition for that specific situation.

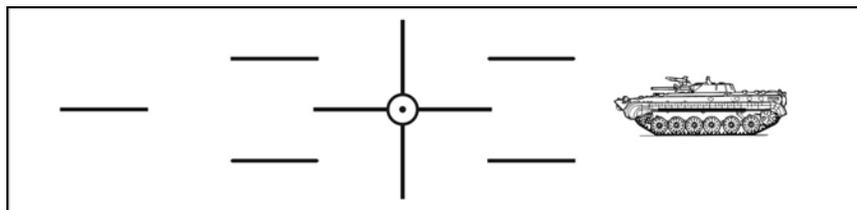


Figure 6-31. Far lead applied when a target and a Bradley are parallel and moving in opposite directions.

6-13. DIRECT-FIRE ADJUSTMENT

The crew has various ways to adjust direct fire, including burst-on-target and tracer-on-target.

a. **Burst on Target.** Burst on target, the fastest method of adjustment, moves the strike of the round from the ground onto the target.

(1) After the gunner has made his initial reticle lay on the target and fired, he applies BOT by--

(a) Concentrating on the target, noting the point on the sight reticle where the round appears as it hits or misses the target.

(b) Announcing his observation and BOT.

(c) Immediately adjusting the reticle aiming point based on his observation, to bring the next round or burst on target. He must adjust quickly and accurately. This makes additional adjustments or subsequent fire commands unnecessary.

(d) Announcing "On the way" and firing a burst of three to five rounds.

(e) Continuing to fire, adjusting each burst onto center mass until one destroys the target or the BC commands *CEASE FIRE*.

(2) When the gunner applies BOT, the BC can observe the first round fired and the subsequent burst of fire for deflection and range.

(3) Accuracy of the BOT method of adjustment depends on the gunner's ability to maintain correct sight pictures and to make precise observations. To engage moving targets accurately using BOT, the gunner must track continuously—before and during the engagement.

b. **Tracer on Target.** TOT is similar to BOT. As the name implies, the gunner or BC fires the 25-mm or coax machine gun. The firer adjusts the strike of the rounds onto the target area based on the tracers.

c. **Adjustment Techniques.** The gunner and BC can announce adjustments using any of the following methods:

(1) **Target-Form Adjustment.** Target form is the simplest method of adjustment. One form is the visible height or width of the target. Range adjustments (up or down) refer to

the height of the target; azimuth adjustments refer to the target's width. They can use target form adjustment with the ISU, IBAS, or the auxiliary sights. They can add the word "form" after the announced change, or they may let the change stand alone. If "target form" is the unit's standard adjustment technique (IAW unit SOP). The commander always gives changes in full- or half-form increments.

(2) **Mil Change.** This method is simple and accurate at all ranges, but the gunner must know his reticle's mil measurements. He gives mil changes whenever he uses a nonballistic reticle in the ISU or IBAS.

(3) **Meter.** Because the auxiliary sight is marked in meters, the gunner uses meters rather than mils. He must know how to read both of the ballistic reticles in his sight (AP and HE). Though he can use this technique with the ISU, converting meters to mils can cause confusion.

6-14. 25-MM-POINT TARGETS

Likely point targets on the battlefield include unarmored vehicles, lightly armored vehicles, bunkers, RPG teams, and helicopters. When firing 25-mm point target engagements, the gunner first fires a sensing round (two if the ammunition has changed). He announces his observation and adjusts rounds by BOT (Figure 6-32). Then, he fires three- to five-round bursts on the target. He continues firing bursts until he destroys the target or the BC commands *CEASE FIRE*.

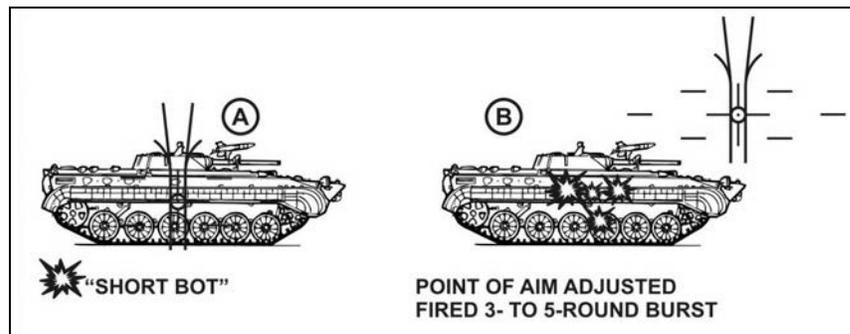


Figure 6-32. Burst on target against point target.

6-15. FIRE-CONTROL SUBSYSTEM

The FCS controls the Bradley A3's weapons system. Fire-control software (FCSW) provides the main link between the system and the CIV, IBAS, ballistic solution software (BSS), and TDS.

a. The FCS takes--

(1) Target range from the LRF.

(2) Barometric pressure and temperature data from the environmental parameters screen.

(3) Ammunition and gun type from the system control box (SCB).

b. Using these figures, the FCS computes the correct angles needed to kill the target.

With this information--

(1) The crew independently searches, tracks, and hands-off targets for engagement.

(2) The crew tracks targets automatically.

(3) The commander overrides the gunner.

6-16. KINEMATIC LEAD

When the 25-mm is selected, the Bradley A3 applies lead automatically, based on the target's range, speed, and the rate of input into the handstation. This lead automatically adjusts the offset between the line of sight and line of fire. This allows the gunner to keep his reticle center mass of target through the engagement.

a. Using kinematic lead eliminates the need for manual target lead. To activate kinematic lead, the gunner ranges the target using ELRF, or manually induces range while depressing the handstation's palm switches. He keeps the palm switches depressed and after he induces range, he applies a rate command by tracking the target with his handstation.

b. For all 25-mm engagements, the gunner must keep the reticle center mass of the target. BOT techniques apply only if the initial three-round burst fails to hit the target. If this happens, he *drops palms*, re-lases, and fires.

c. To deactivate kinematic lead, the gunner releases the palm switches. This returns the system to normal operation. However, re-lasing the target reactivates kinematic lead.

d. Based on the range and speed of the target, the Bradley A3 system offsets the line of fire relative to the IBAS line of sight. This lets the gunner keep his reticle center mass of the target (Figure 6-33).

NOTE: Kinematic lead is only available for the 25-mm gun.

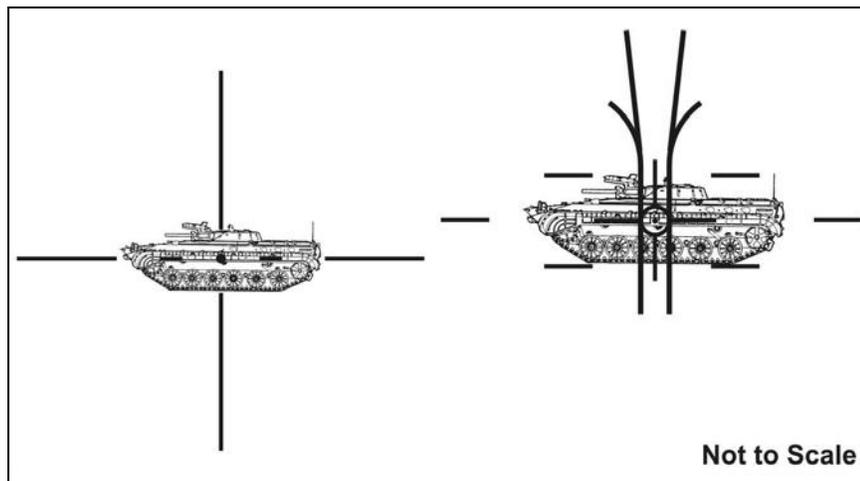


Figure 6-33. A3 kinematic lead.

6-17. BRADLEY A3 25-MM POINT TARGETS

Crewmembers will fire three- to five-round bursts until they destroy the target. They use sensing rounds only with the auxiliary sight or if the ELRF fails.

6-18. FAILURE OF EYE-SAFE LASER RANGE FINDER

To operate the ELRF A3 in degraded mode, such as when the ELRF fails, crewmembers first manually select the range. Next, they apply BOT, as previously discussed. The gunner fires a sensing round, followed by a burst of three to five rounds on the target, again as previously discussed. When the system degrades, crewmembers should select

the gun reticle and the horizontal-ranging stadia line. Even though they still have a kinematic lead, they will not have range-finder capabilities for the BOT.

6-19. 25-MM AREA TARGETS

One of the Bradley's primary missions is suppressing enemy positions to support the infantry rifle squad's movement. With its 5-meter bursting radius, HEI-T ammunition supports this capability beyond coax range (900 meters), out to 3,000 meters.

a. Suppressive fire is direct fire on known or likely target locations to degrade one or more of the enemy's *basic combat functions: moving, shooting, observing, and communicating*. Success depends on suppressing the enemy--denying him the terrain, the ability to observe, and the chance to engage.

b. A section repeats suppressive fire as often as needed to keep the enemy from establishing a strong base of fire, or until the section clears the area of activity. To sustain suppressive fire, the section can alternate fire between vehicles. This prevents each one from using all of its ammunition.

c. *Area targets* can include terrain features, man-made objects, deployed soldiers, or a location defined by enemy fire.

(1) The specific type of enemy units and weapons systems might be unidentifiable.

(2) Area targets include any that are too large for a point engagement. They also include any that are very wide, very deep, or both, thus requiring extensive traversing. Two examples of area targets include enemy positions in a tree line or troops on a hilltop, when either spans an area wider than 10 meters.

d. Accurate range estimation ensures the effectiveness of area fire. Beyond 2,000 meters (tracer burnout), the round's slow flight and high angle of fire require the gunner to check his sight picture by firing a sensing round. If the ammunition has changed, the gunner fires two rounds, leaving the reticle in place until the round impacts. This verifies the correct range and aiming point for the specific engagement.

e. To engage an area target with HEI-T, the gunner uses a suppression technique such as the "Z" pattern (Figure 6-34, page 6-36). He corrects range by indexing a different range or by adjusting the reticle. The number of rounds in a burst depends on the size of the target and degree of success (one round for every 10 to 25 meters). Developing and maintaining the ability to engage targets at extended ranges (1,800 to 3,000 meters) requires practice.

(1) The gunner lays the reticle on center mass of the target area and fires an initial burst of 3 to 5 rounds. Then, he starts firing using suppression technique such as the "Z" pattern.

(2) Once he reaches the opposite edge, he fires a second burst diagonally across the target area to the opposite corner of the area.

(3) Finally, he fires a burst across the far depth of the target, covering the entire width.

(4) He continues firing until he has covered the entire width and depth of the target area, or until the BC commands CEASE FIRE.

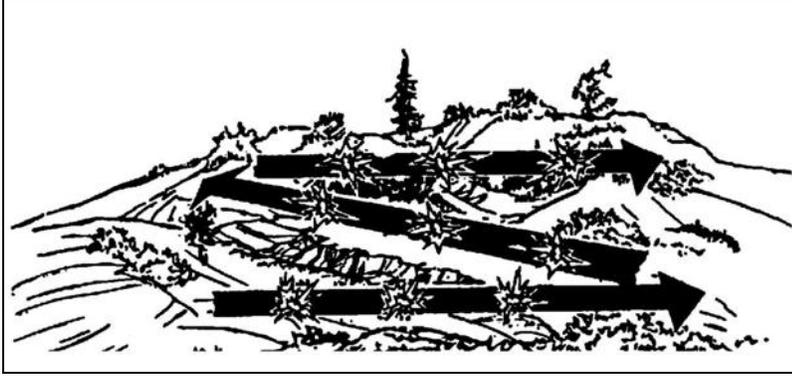


Figure 6-34. High explosives against area target.

- f. The gunner can use the 25-mm HEI-T to--
- (1) Designate area or point targets.
 - (2) Fire incendiary rounds.
 - (3) Reconnoiter by fire at ranges from 900 to 3,000 meters.

6-20. COAX MACHINE GUN

The coax machine gun destroys unarmored point targets, suppresses area targets and troops, and conducts reconnaissance by fire. For suppressive fire, he uses the same techniques with the coax that he uses with the 25-mm weapon system.

6-21. SUPPRESSIVE FIRE

Suppressive fire is defined as "*direct fire on known or likely target locations to degrade one or more of the enemy's basic combat functions: moving, shooting, observing, and communicating.*" For effective suppressive fire, the gunner or commander must fire three to four distinct bursts into the target area. To conserve 25-mm ammunition, the crew uses the coax machine gun for suppressive fires up to 900 meters against unarmored vehicles or troops. Machine gun suppressive fire is usually effective in bursts of 10 to 15 rounds.

6-22. COAX POINT TARGETS

The crew can engage targets such as jeeps, trucks, RPG teams, troops, and ATGMs while the BFV is moving or stationary. For personnel consolidated in a small area (1 to 10 meters), they use the point target-engagement technique.

a. To engage a point target, the gunner indexes range or lases the target, lays precisely on target, and fires an initial burst of 10 to 15 rounds (Figure 6-35). The initial burst should hit as much of the target as possible. The gunner fires additional bursts until he destroys the target or the BC commands CEASE FIRE.

b. If the initial burst falls short or long, the gunner adjusts the tracers onto the target. Once the tracers move onto the target, he continues firing bursts until the BC commands CEASE FIRE.

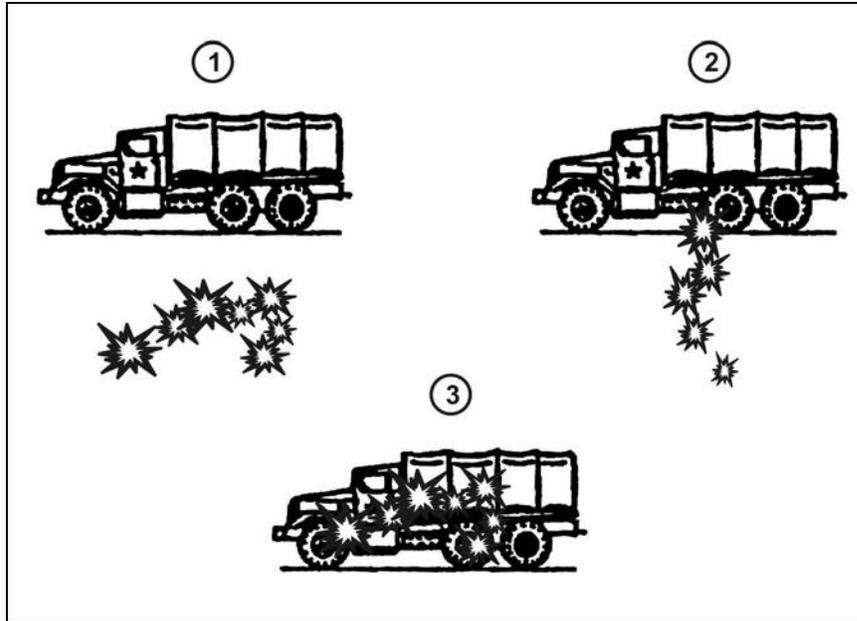


Figure 6-35. Point target technique.

6-23. COAX AREA TARGETS

For personnel dispersed over a large area (over 10 meters), the gunner uses the area target-engagement technique (Figure 6-36). He can engage area targets while the BFV is moving or stationary.

a. **Example Area Target in Depth.** To engage an area target, the gunner lays the reticle on center mass of the target area and fires an initial burst. Each burst consists of 10 to 15 rounds. Once he has confirmed the range to the target, he fires a second burst horizontally across the front of the target area. He fires the third burst diagonally across the target area. He fires the fourth burst horizontally across the rear of the target area. After the gunner successfully suppresses the target, the BC commands CEASE FIRE.

b. **Example Frontal Area Target.** When a target presents a frontal area, the movement of the BFV's turret and of the vehicle itself carries the burst on through the target (Figure 6-37, page 6-38). Round dispersion also helps cover the width of the target.

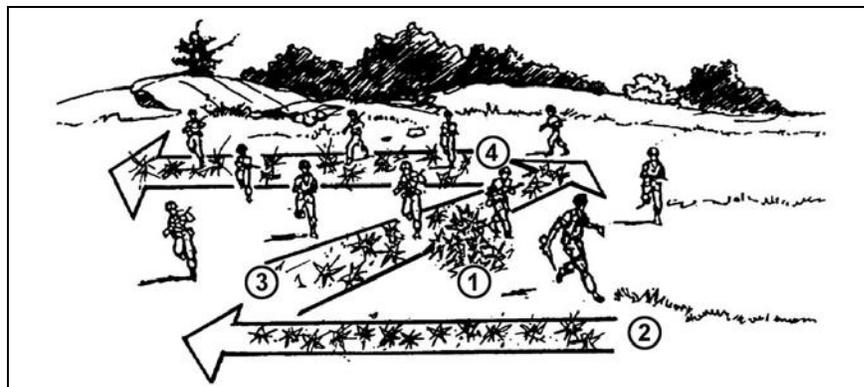


Figure 6-36. Example technique for area target in depth.

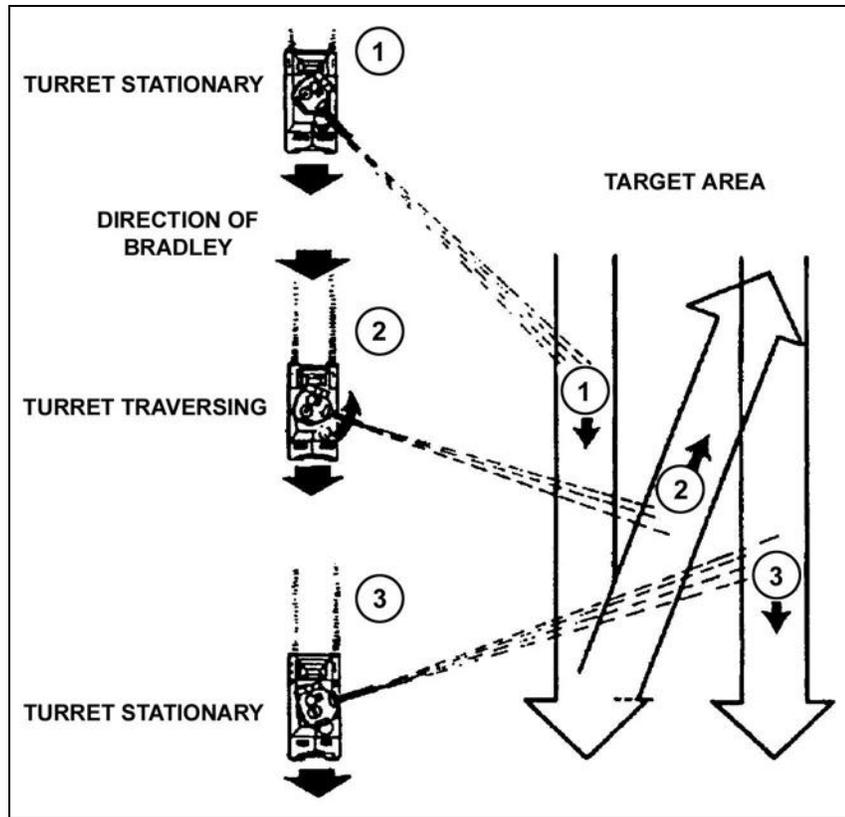


Figure 6-37. Example technique for area target from a moving Bradley.

6-24. BRADLEY A3 COAX

Selecting COAX on the system-control box (SCB) disengages kinematic lead but keeps superelevation. Engagement techniques for the coax machine gun apply. The gunner may use low magnification to engage coax area targets within 500 meters. This allows the crew to see the entire target area (Figure 6-38).

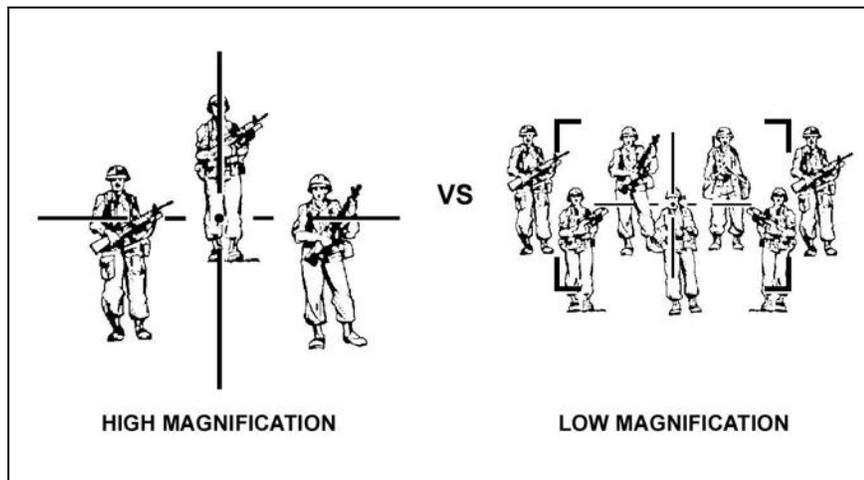


Figure 6-38. Bradley A3 coax area target technique.

6-25. OTHER USES OF MACHINE-GUN FIRE

The coax machine gun also serves other purposes:

a. **Reconnaissance by Fire.** The gunner reconnoiters by fire to cause hidden enemy forces to react. He fires a single burst, constantly watching for possible enemy movement or return fire (Figure 6-39).

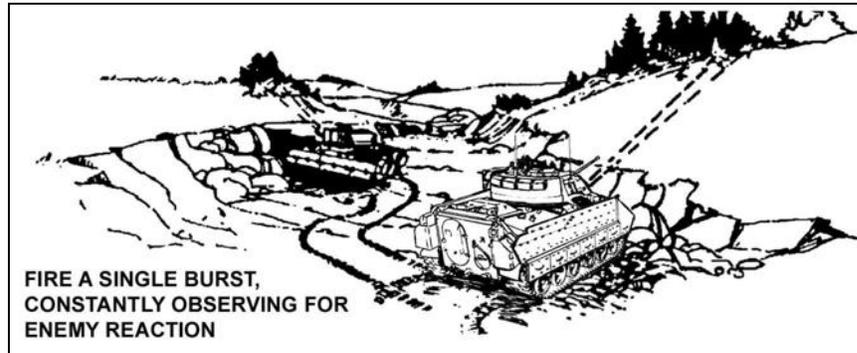


Figure 6-39. Reconnaissance by fire.

b. **Firing through Concealment.** The gunner can use the coax machine gun to penetrate most of the means used to conceal dismounted enemy infantry, including trees, hasty barricades, or lightly constructed buildings. He treats each such means as an individual point target (Figure 6-40).

c. **Incendiary Fire.** Machine gun tracer ammunition, particularly armor-piercing incendiary tracer rounds, can set fire to any readily combustible material, such as dry grass, grain, dried brush, or wood. Fire denies a particular area to the enemy, and smoke from a burning field can screen movements (Figure 6-41, page 6-40).

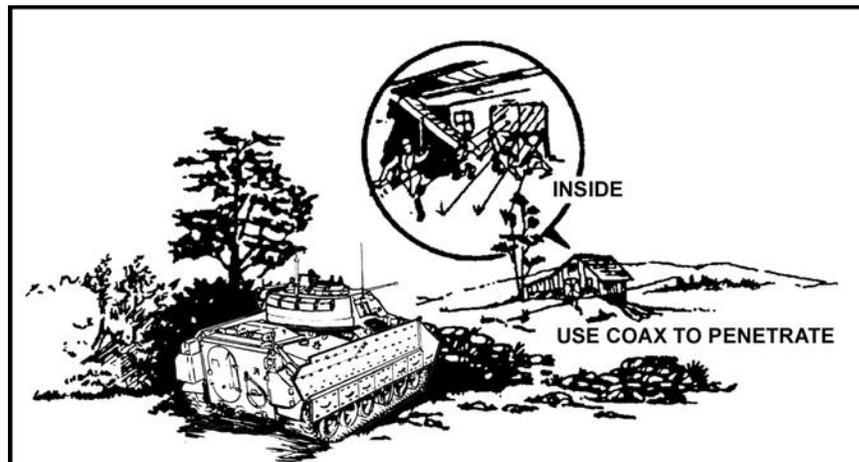


Figure 6-40. Firing through concealment.

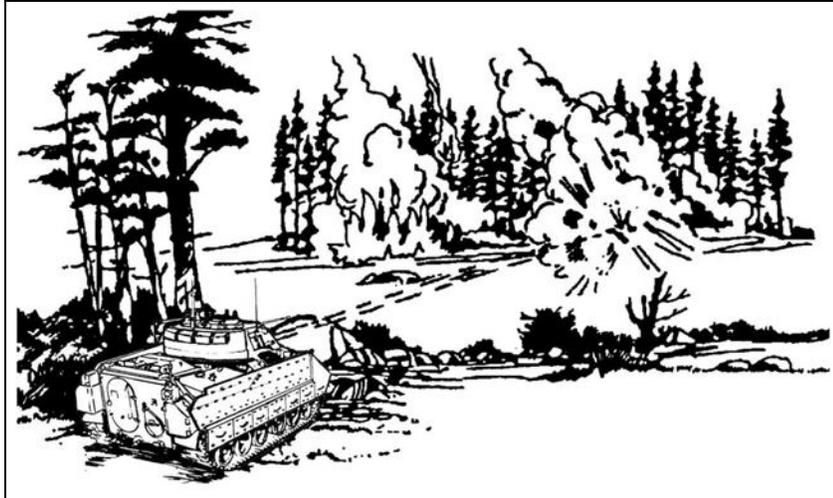


Figure 6-41. Incendiary fire.

6-26. TUBE-LAUNCHED, OPTICALLY TRACKED, WIRE-GUIDED MISSILE

The TOW is used against armored vehicles out to 3,000 meters (basic TOW) or 3,750 meters (all other TOWs). Only a stationary Bradley can fire its TOW. When it does, the driver and cargo hatches must remain closed. The vehicle must be on ground that is sloped less than 10 degrees (the crew checks vehicle slope indicators). The gunner ensures that both ballistic doors on the ISU or IBAS are open.

a. Before firing the TOW, the gunner must identify any obstacles between the vehicle and the target that could interfere with the missile. If the target is moving, the gunner must determine if it will remain in sight long enough for the missile to reach it.

b. The gunner uses the sight to determine if the target is engageable (Figure 6-42). He places the crosshairs on center mass of the target. On high magnification, if the area between the vertical crosshair and the edge of the sight is clear of obstructions in the direction of travel, then the target is engageable.

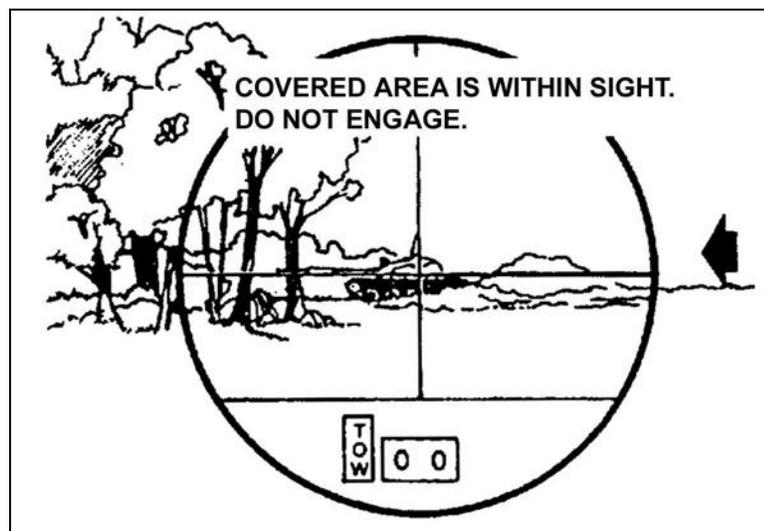


Figure 6-42. Obscured target.

c. Figure 6-43 shows the sight picture the gunner will see when engaging with the TOW. The word "TOW" displays on the status indicator at the bottom of the field of view (FOV).

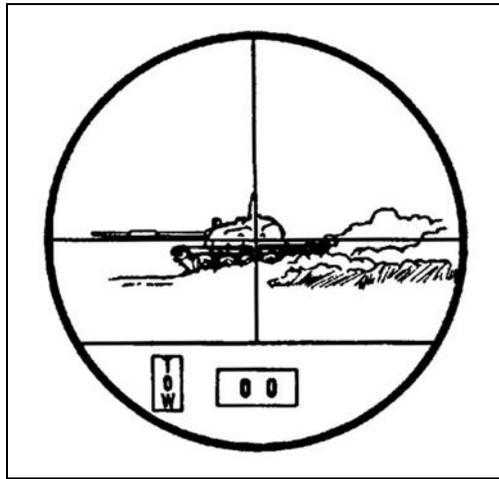


Figure 6-43. TOW sight picture.

d. When engaging a moving target with a TOW, the gunner must continuously track the target, keeping the reticle crosshairs on center mass. The TOW 2B missile flies above the target to kill. The center mass aim point must remain the same while the missile travels to the target. Figure 6-44 shows this missile-tracking concept.

NOTE: Gunners, instead of guiding the missile when it enters the picture, maintain reticle center mass of target.

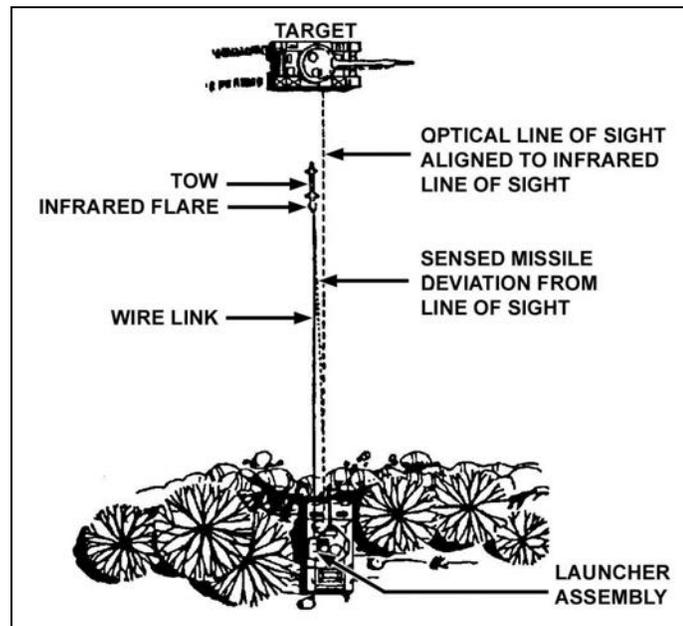


Figure 6-44. Missile-tracking concept.

e. Night engagements require more crew coordination and more detailed planning than day engagements.

f. To fire the TOW over water, the BC analyzes the sector to determine if the water will affect employment of the TOW.

(1) The gunner can fire various types of TOWs at their minimum and maximum ranges over water (Figures 6-45 and 6-46, page 6-43). This assumes that both the TOW launcher and the target sit at water-surface level.

(2) For firing over water with a TOW or at a target that sits above the surface level of the water, the BC determines the type of missile used, then uses Figure 6-47A (basic TOW, page 6-44) and 6-47B (all TOWs after basic TOW, page 6-45), to determine the extended range of missiles.

(a) He determines the TOW launcher's height above the water surface, then places a tick mark at the corresponding height in the left-hand column of the table.

(b) He determines the height of the target above the water surface and places a tick mark at the corresponding height in the right-hand column of the table.

(c) He connects the two tick marks with a straight line. The point where the lines intersect the center column is the maximum range the missile can travel without getting too close to the water.

6-27. M257 SMOKE-GRENADE LAUNCHER

The following fire command coordinates the crew's actions when firing the M257 smoke grenade launcher:

a. While traversing the turret toward the area where he wants the smoke screen, the BC commands GRENADE LAUNCHER to alert the crew to use the grenade launcher.

b. After laying the turret, the BC verifies that all hatches and the combat door are closed.

c. The BC or gunner moves the grenade launcher ON-OFF switch to ON. The BC commands FIRE or FROM MY POSITION. After firing the grenades, the gunner announces GRENADES LAUNCHED. The BC then issues driving commands appropriate to the tactical situation and returns to the open-hatch position to resume acquiring targets.

d. The crew should reload the grenade launchers as soon as they can do so safely. However, the BC first has the driver move the Bradley to an area where the BC expects no enemy contact.

6-28. M231 FIRING-PORT WEAPON (M2 ONLY)

The FPW is mainly an offensive weapon that gives the M2 close-in, rear suppressive fire.

- FPW is fully automatic.
- FPW gunner engages targets by guiding tracers into the target area.
- FPW gunner uses TOT adjustment techniques followed by suppressive burst.
- FPW is located in the ramp only.

6-29. AERIAL TARGETS

Correctly matching weapon and ammunition to the range and target is the key to success. Table 6-5, page 6-45, shows each weapon and the type of aerial targets that it can destroy.

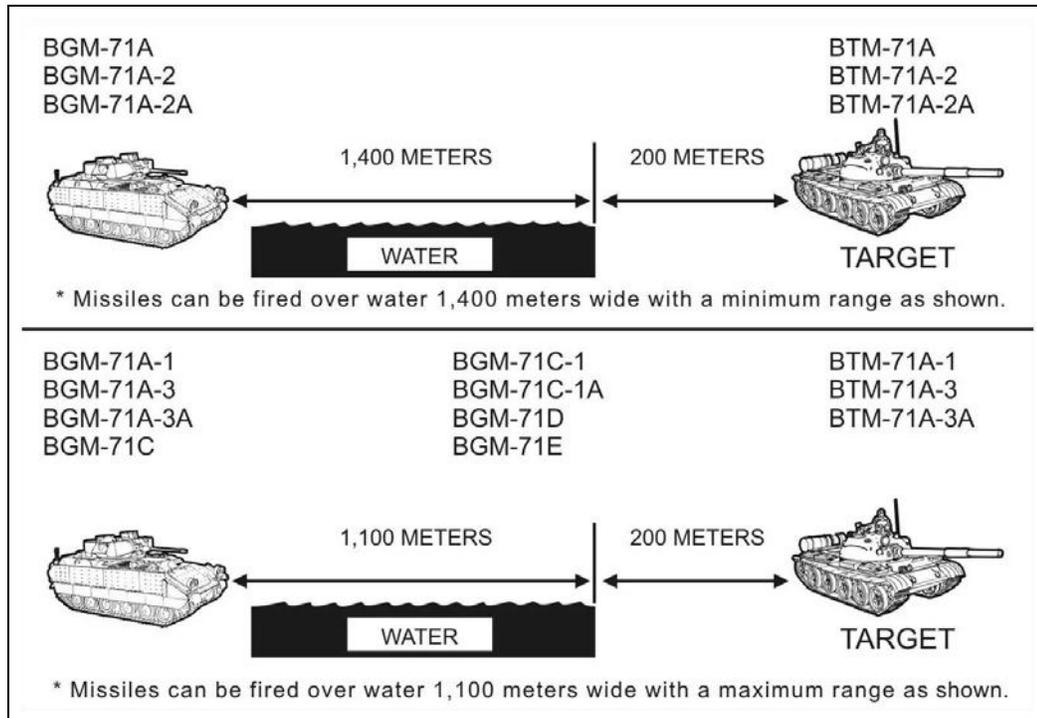


Figure 6-45. Minimum TOW missile ranges over water.

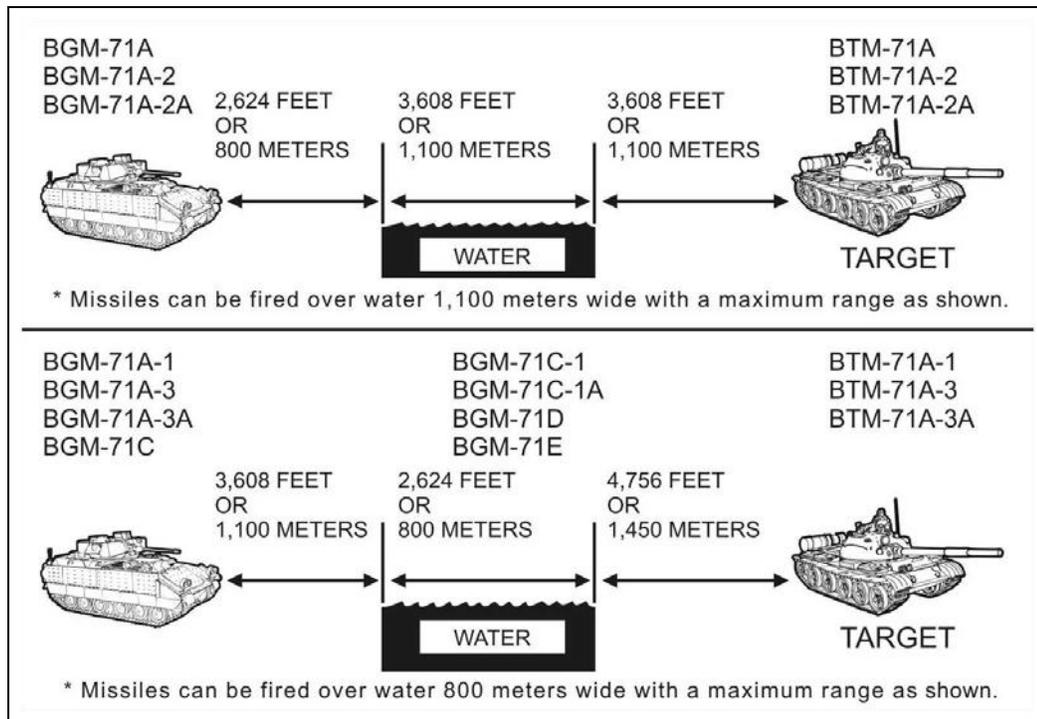


Figure 6-46. Maximum TOW missile ranges over water.

a. The 25-mm gun is effective against slow-moving, fixed-wing aircraft and helicopters (Figures 6-48 and 6-49, page 6-46). When using the ADR sight, the gunner indexes 1,800 meters. He can use APDS-T, APFSDS-T, or HEI-T ammunition. To sustain the volume of fire and kill the target, he fires a continuous burst of 20 to 25 rounds (high rate), using TOT to adjust rounds on target. The APDS-T and APFSDS-T rounds have higher probabilities of hitting the target than does the HEI-T round. However, its greater dispersion factor gives the HEI-T round a higher probability of kill. For helicopter targets--

- (1) At ranges beyond 1,200 meters, the APDS-T is the most effective round.
- (2) At ranges within 1,200 meters, the HEI-T is the most effective round.
- (3) The ADR applies only for use on frontal targets.

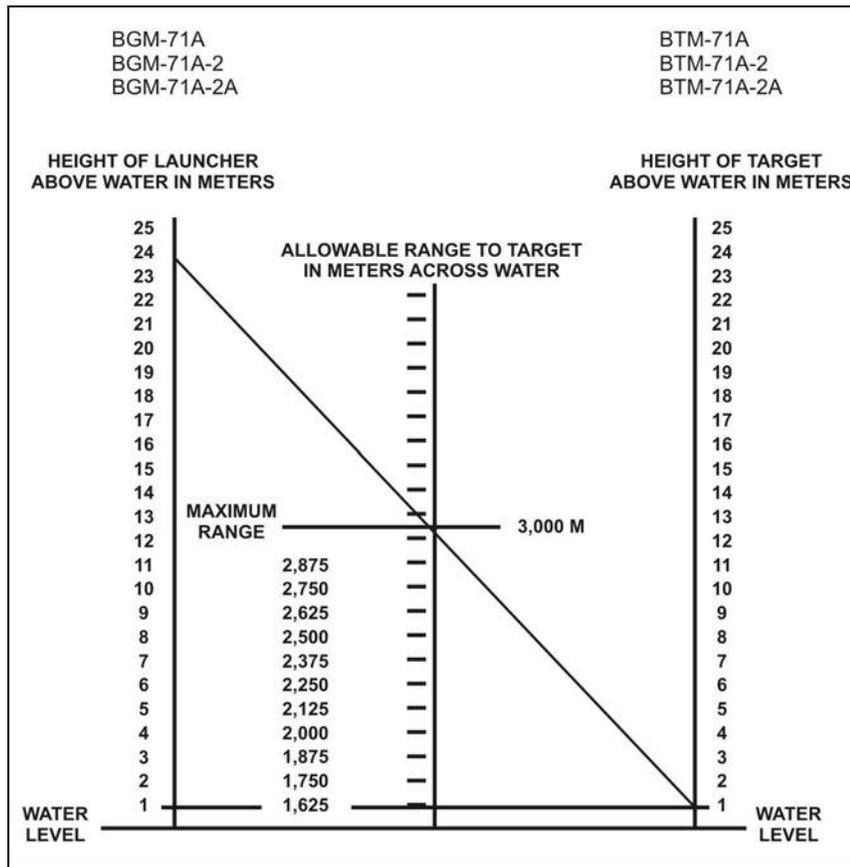


Figure 6-47A. Extended range over water (basic TOW).

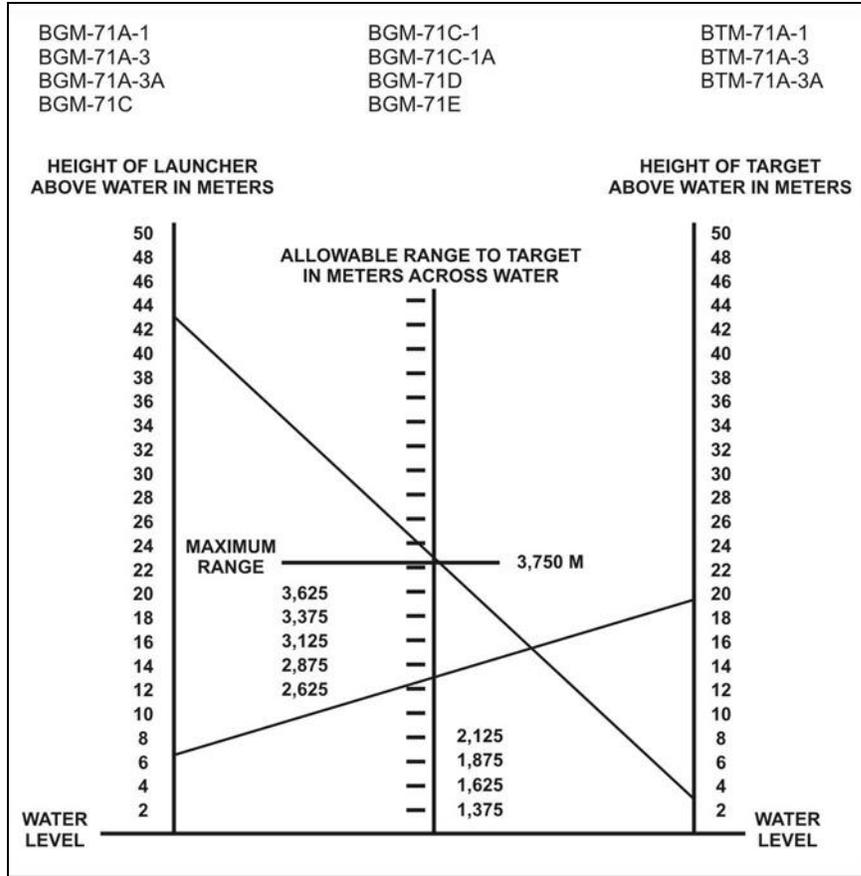


Figure 6-47B. Extended range over water (all TOWs after basic TOW).

AMMO	FIXED WING		HELICOPTER		
	SLOW	FAST	ARMORED	UNARMORED	PARATROOPER
COAX	YES	YES	NO	YES	YES
HEI-T	YES	YES*	YES	YES	YES
APDS-T	YES	YES*	YES	YES	NO
APFSDS-T	YES	YES*	YES	YES	NO
TOW	YES	NO	YES	YES	NO

*Secondary sources for use in case the coax MG is unavailable or target is beyond coax range.

Table 6-5. Ammunition employed against aerial targets.

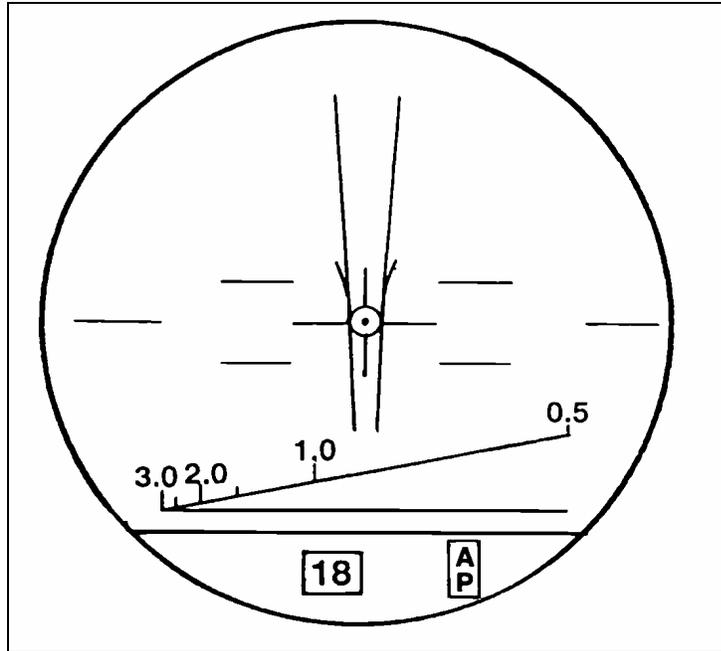


Figure 6-48. Air-defense reticle.

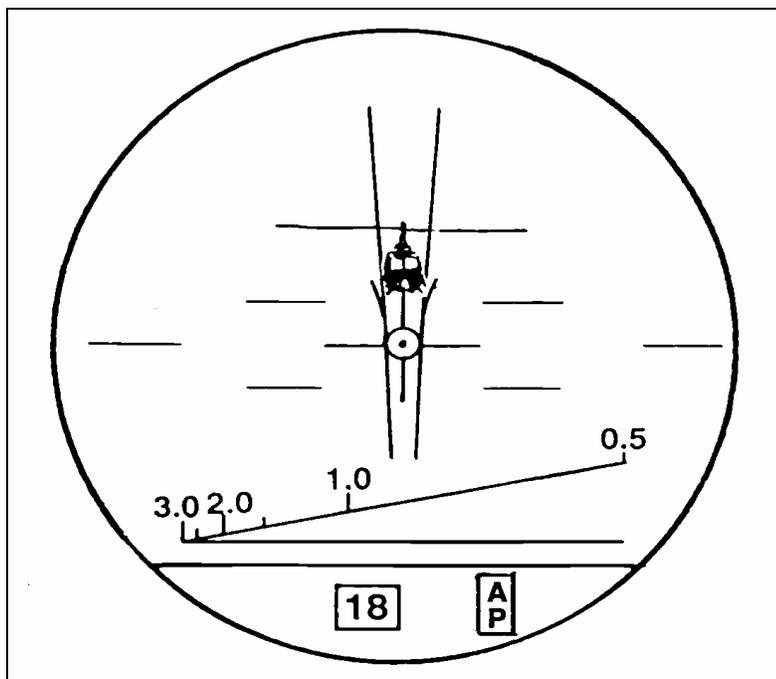


Figure 6-49. Choking a helicopter with the ADR.

b. The crew uses the coaxial machine gun against fixed-wing aircraft, unarmored helicopters, and airborne troops. It is ineffective against heavily armored helicopters such as the Hind. When used, the coax machine gun must fire a continuous burst (50 to 100 rounds) at the aiming point, and the BC must use TOT to bring the rounds on target. Just as in ground engagements, the maximum effective range of the coax is 900 meters.

c. Beyond 1,700 meters, the 25-mm uses too much ammunition for each kill. Thus, the crew uses the TOW weapon system against stationary, slow moving (up to 50 MPH) aerial targets between 1,700 and 2,000 meters. Nevertheless, the gunner should use the TOW against helicopters only when necessary.

d. Ideally, when the BFV must engage high-speed aircraft, mounted and infantry rifle elements fire small-arms weapons fire and controlled coaxial machine gun fire on a designated point. The platoon leader or platoon sergeant can initiate this type of fire by issuing a predetermined command or by firing tracers to indicate the target. He applies a 200-meter lead (the length of two football fields) on the approaching aircraft, so that the aircraft will fly through the platoon's cone of fire. Gunners must not try to track high-speed aircraft--they fly too fast (Figure 6-50).

(1) If the aircraft flies directly at the vehicle, the Bradley gunner fires a controlled burst of 50 to 100 rounds. He selects an aiming point slightly above the nose of the aircraft, so that the aircraft will fly into the cone of fire.

(2) Fixed-wing aircraft operate in pairs or in groups of three. Rotary-wing aircraft operate in platoon-sized elements.

(3) To engage high-speed aircraft, the BC chooses one or more reference points (Figure 6-51). For example, the platoon leader alerts the platoon. Then, as the aircraft nears a reference point, the platoon leader orders ENEMY AIR, REFERENCE POINT TWO, then FIRE. The Bradley and rifle infantry soldiers fire all weapons at a 45-degree angle above the reference point.

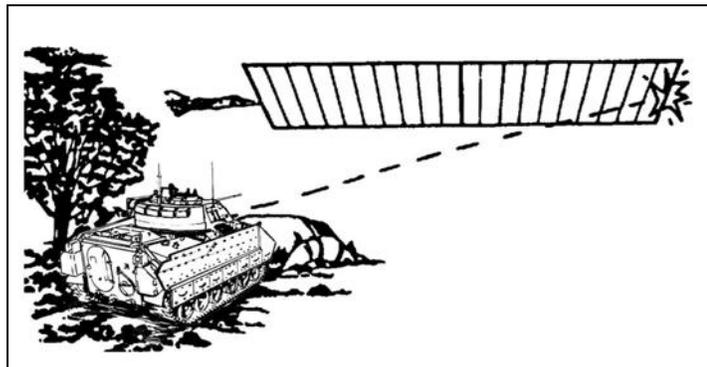


Figure 6-50. Football-field technique.

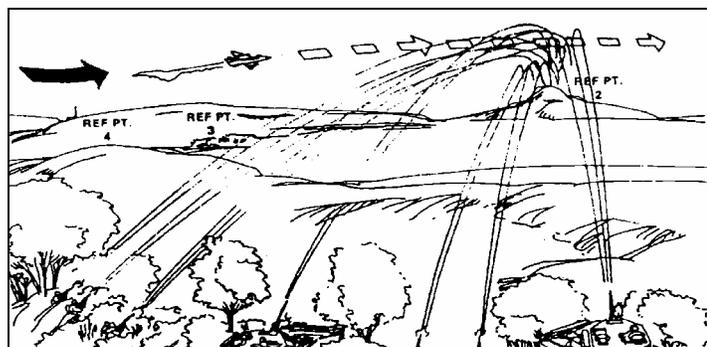


Figure 6-51. Reference-point technique.

e. The paratrooper's rapid rate of fall makes engaging him difficult (Figure 6-52). To do so, the gunner must—

- (1) Use the ISU or IBAS as the primary sight.
- (2) Use the coax machine gun at ranges under 900 meters.
- (3) Use the 25-mm (HEI-T) at ranges beyond 900 meters.

(4) Fire a burst with a lead of two man-heights beneath the dropping paratrooper. If he sights troop-carrying helicopters, he engages these rather than the parachuting or rappelling troops, because they present the greater danger.

(5) The helicopter is a better target than soldiers. Also, as to engaging personnel exiting or who have exited from damaged aircraft, the Geneva Convention says—

- (a) *Aircraft Crews*--Engagement prohibited.
- (b) *Paratroopers*--Engagement allowed.

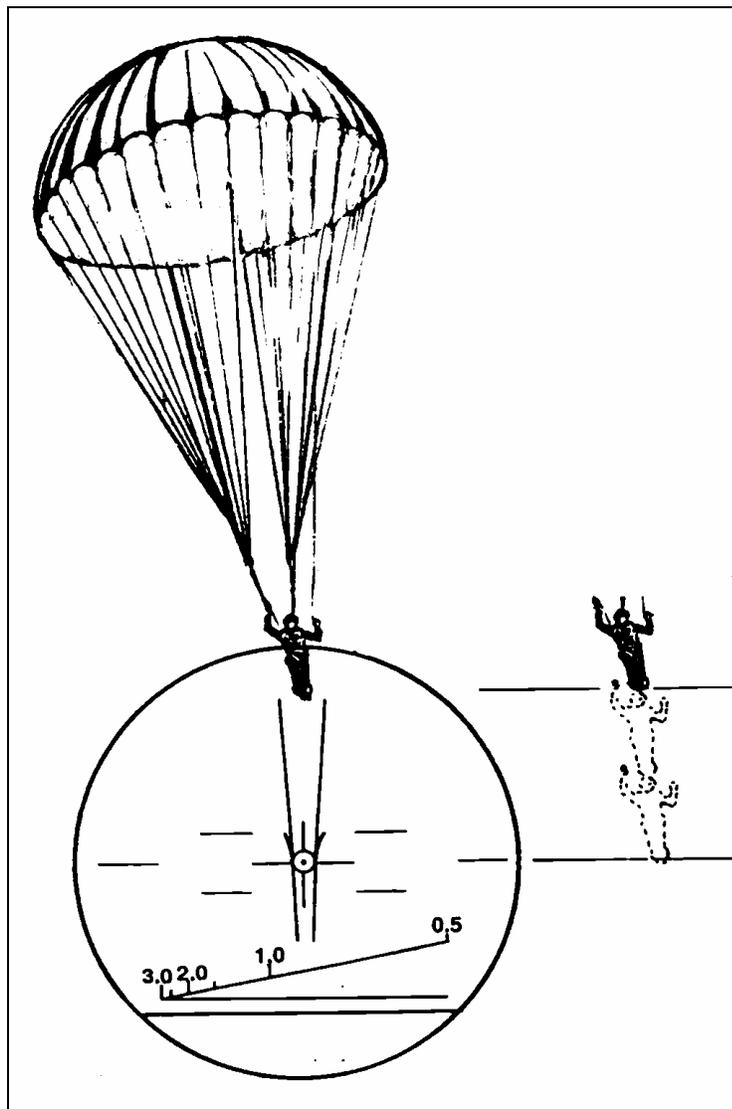


Figure 6-52. Engaging paratroopers.

f. When using the 25-mm, the Bradley A3 crew can select ADR using the CTD. In normal mode, the gunner should keep the IBAS reticle on the center mass of the target. Kinematic lead still applies for aerial engagements (Figure 6-53).

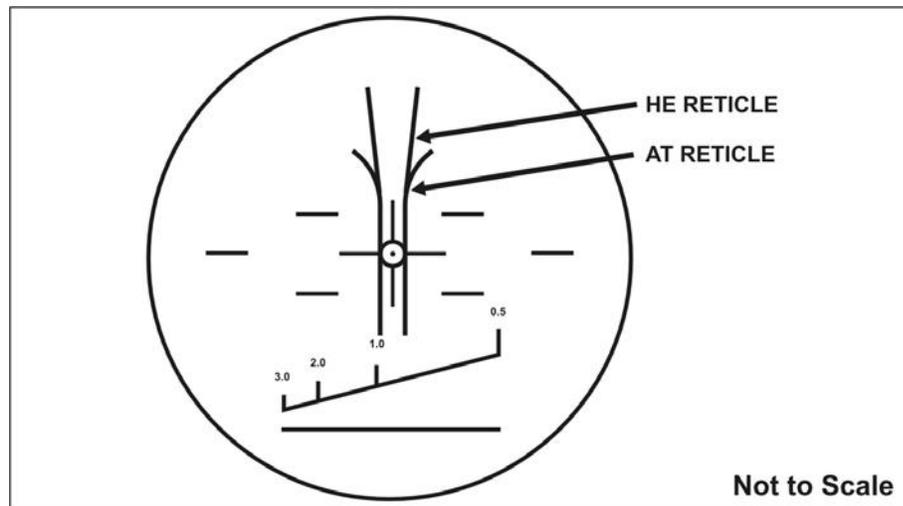


Figure 6-53. Bradley A3 air-defense reticle.

6-30. PROBLEM AREAS

When a Bradley crew misses a target, the BC should ask--

- Did they boresight and zero correctly?
OR
- (Basic Bradley and A2 models) Did they move the boresight knobs?
AND
- Did they get confused trying to engage?
- Did they get confused during the engagement?
- Did they disperse ammunition erratically?
- What range did they index?
- On target engagements requiring lead, did they use too little? Too much?
- Did they know how to use BOT?
- Did they know how to use engagement techniques?
- For normal operations, did the thermal display prove adequate? Or insufficient?
- Did they range the target using ELRF?
- Did they adjust the IBAS and CIV sights correctly?
- Did they confuse IBAS with CIV sight display?
- Did they release the palm switch after designating a target?
- Before engagement, did they perform TAS align? Null the system?
- Did they enter environmental parameter data correctly?

6-31. BRADLEY A3 AIDED-TARGET-TRACKER MODE

The aided target tracker (ATT) in the IBAS lets the BC and gunner track two targets at once. However, they can only track targets embedded in the thermal image on the IBAS (from the FLIR sensor). Both the gunner and BC can control ATT functions from their respective stations.

a. The ATT generates symbols such as blinking or solid track boxes that overlay the IBAS image. The boxes indicate ATT status.

b. With the Day TV image selected for display, even though the ATT only tracks targets in the FLIR image, the BC or gunner can still select the autotrack or autopoint capability. They can do so because the Day TV and FLIR sensors display the same scene.

c. With Day TV selected, ATT symbols overlay the video image (Figure 6-54). The BC or gunner uses the autopoint functions only with the 25-mm gun selected.

(1) To use track boxes with Day TV, leave both IBAS ballistic covers open.

(2) For targets beyond 3,000 meters, size gates in 2X and 4X zoom.

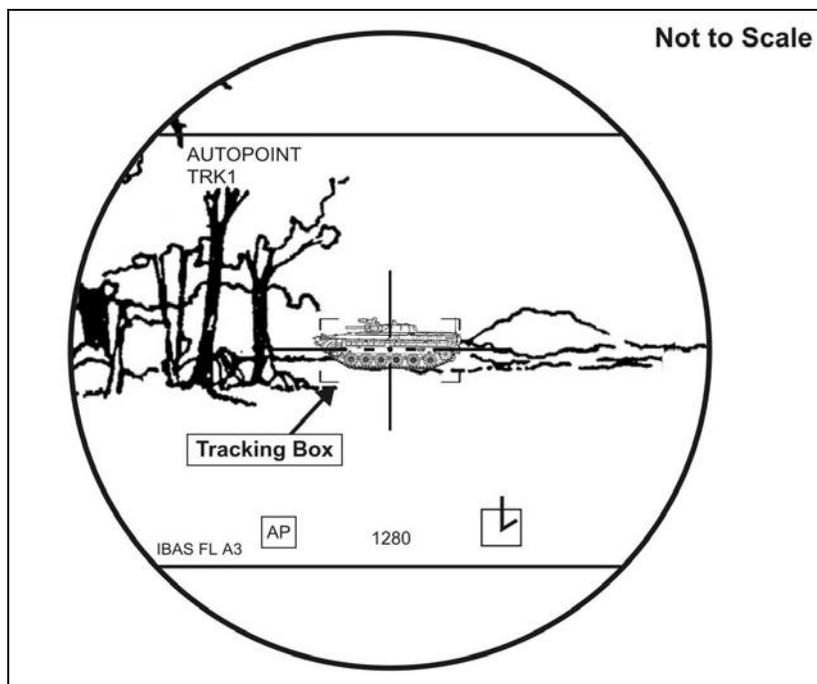


Figure 6-54. Bradley A3-aided target tracker.

6-32. TERMINATION OF ENGAGEMENT

The BC determines when to cease fire against a target, when to shift fire against multiple targets, and when to shift from one firing position to another. Target effect might be unclear. If so, the BC must decide when to shift fire based on target effects indicators.

6-33. KILL STANDARDS

Kill standard classifications include--

a. **Mobility Kills.** A mobility kill prevents a vehicle from moving under its own power.

b. **Firepower Kills.** A firepower kill prevents a vehicle from using its weapon systems.

c. **Catastrophic Kills.** A catastrophic kill is a total loss of weapons systems, vehicle mobility, and all on-board equipment.

6-34. ARMORED VEHICLES

Standards and indicators for armored vehicles follow:

a. **Kill Standard.** Based on the ammunition and time required to achieve destruction, the crew must achieve at least a mobility or firepower kill.

b. **Kill Indicators.** During an engagement, certain indicators cue the gunner or BC to cease or shift fire to a different target.

- The vehicle stops moving.
- The vehicle stops firing.
- The vehicle smokes from what appears to be internal damage.
- The vehicle explodes with immense smoke and flames.
- The crew abandons the vehicle.

c. **Impact Indicator.** When a 25-mm round (AP or HE) or a TOW missile hits an armored vehicle, an observable explosion with flash occurs. This is the effect of the round impacting on the target. It does not necessarily indicate damage to the target.

6-35. UNARMORED VEHICLES

Types and standards for unarmored vehicle kills follow:

a. **Kill Standard.** Threat unarmored vehicles have extra wheels, which allows them to continue operating with one or more tires punctured. With an unarmored vehicle, the crew must cause a mobility kill or force the driver and crew to abandon the vehicle.

b. **Kill Indicators.** One or more of the following indicators can cue the gunner or BC to cease fire or shift to a different target:

- The vehicle stops moving.
- The vehicle is smoking.
- The vehicle explodes.
- The crew abandons the vehicle.

6-36. INFANTRY RIFLE SQUADS AND ANTIARMOR SYSTEMS

Kill types and standards for infantry rifle squad and antiarmor system follow:

a. **Kill Standard.** Destruction of infantry riflemen point and area targets is difficult to measure. The goal is to neutralize the threat infantry rifle squad and the target's antiarmor firepower capability, by either destroying, damaging, or suppressing it.

b. **Kill Indicators.** When engaging threat point or area targets consisting of infantry rifle squad or antiarmor, the BC may cease or shift fire if he observes certain indicators.

- (1) The threat infantry rifle squad stops maneuvering.
- (2) The threat antiarmor fire covering threat rifle squads stops covering the squads effectively or altogether.
- (3) The Bradley's 25-mm rounds hit the threat rifle squad and antiarmor systems.
- (4) The BC or the gunner observes that the rifle squad takes casualties.

c. **Duration of Suppression.** The BC decides how long to continue firing suppressive fire depending on METT-TC. Also, he maintains suppression as long as the unit gains a tactical advantage by doing so, or until another element can close with the target and destroy it.

Section IV. FIRE COMMANDS

Fire commands are the language of gunnery. Using incorrect language in a fire command causes confusion and misunderstanding. Every direct-fire engagement begins with a fire command. It alerts the crew to initiate actions. Subsequent fire commands direct the fires of the selected weapon. They also sustain and control the engagement until the crew destroys the target or receives the command to terminate fire. Though fire commands vary in form, each must include the seven basic elements. During preliminary and intermediate Bradley tables, the BC initiates fire commands only after target presentation.

6-37. ELEMENTS

The sequence and elements of a fire command are *alert, weapon and ammunition, description, direction, range, execution, and termination*.

a. **Alert.** In this first element, the BC alerts the crew to an immediate engagement and tells them who must conduct it.

b. **Weapon and Ammunition.** In this second element, the BC tells the crew what weapon or ammunition to use.

c. **Description.** In this third element, the BC identifies the target. For multiple targets, he also tells the crew which to engage first.

d. **Direction (Optional).** In this fourth element, in case the BC cannot lay the weapon for direction or elevation himself, the BC guides the gunner.

e. **Range (Optional).** In the fifth element, the BC tells the gunner what range to select. When the ELRF on the Bradley ODS or A3 reports errors, the BC gives this element himself.

f. **Execution.** After the crew responds to the first five elements, the BC reconfirms that the target is hostile, then tells the gunner to execute.

g. **Termination.** In this element, the BC tells the gunner to stop firing or, in a multiple engagement, to shift fires to another target.

6-38. TERMS

During direct-fire engagements, the BC uses the following terms. These terms are common to all fire commands:

a. **Alert Terms.** These terms identify who conducts the engagement, that is, who fires:

(1) **Turret Weapons.** The BC says, "*Gunner.*"

(2) **Firing Port Weapons.** The BC says, *REAR BANK.*

(3) **Basic (M2, M3, M2A1, or M3A1) Bradleys.** The BC then says--

- *REAR BANK.*
- *LEFT BANK.*
- *RIGHT BANK.*

b. **Weapon and Ammunition Terms.** Figure 6-55 shows the terms that the BC uses to identify each weapon and type of ammunition.

WEAPON and AMMUNITION	ANNOUNCED AS (TERM)—
25-mm HEI-T	"HE" (Pronounced "Aitch-E")
25-mm APDS-T, APFSDS-T	"SABOT" (Pronounced "Say-Bo")
25-mm TP-T	"HE" or "SABOT" (Whatever type of ammunition the TP-T is simulating)
M240C Coax	"COAX"
TOW	"MISSILE"
SVML (ADA)	"MISSILE"

Figure 6-55. Ammunition designations.

c. **Descriptive Terms.** Figure 6-56, page 6-54, shows the terms that the BC uses to designate most targets. He uses the term "PC" to refer to most lightly armored targets. For example, he uses it to identify self-propelled artillery, self-propelled antiaircraft systems, command-and-control vehicles, and self-propelled ATGMs. He can identify combination targets, such as truck-mounted ATGM systems, by combining terms. In this example, he would say, *TRUCK, ANTITANK*. He could also add the term *MOVING* as part of the descriptive element.

d. **Directional Terms.** The BC uses directional terms to guide the gunner's aim to the target area.

(1) **TRAVERSE.** He uses this term when targets are located outside of the gunner's FOV and the when the BC either cannot, or chooses not to, lay the gun for direction. In this case, he commands, *TRAVERSE RIGHT* (or *TRAVERSE LEFT*). The gunner then traverses rapidly in the direction commanded. As the gunner's aim nears the target, the BC commands *STEADY*, and the gunner slows the traverse. As soon as the gunner lays on the target, the BC announces *ON*. By now, the target should fall within the gunner's FOV, so he stops traversing. If the target is still outside of his FOV, the gunner searches the target area either until he identifies the target or until the BC corrects the direction.

(2) **SHIFT.** The BC uses this term when he sees two or more targets through the ISU or IBAS at the same time. He commands *SHIFT LEFT* (or *SHIFT RIGHT*) then *PC*. The gunner shifts quickly to the target given in this last command, and engages.

(3) **DESIGNATE.** The commander uses this term to inform the gunner that he (the commander) will hand off a target to him. He can use this term either before or during a fire command.

(4) **REFERENCE POINT and DEFLECTION.** The gunner must be able to recognize the reference point easily. So, the BC uses binoculars to measure the deflection from the reference point to the target, then he announces how much and toward which direction the gunner must shift. For example, he might command *REFERENCE POINT, BRIDGE, RIGHT THREE ZERO*. The gunner lays the sight reticle on the reference point, estimates and traverses 30 mils to the right, then tries to identify the target.

TYPE OF TARGET	ANNOUNCED AS (TERM)—
Tank or tank-like target	"TANK"
Infantry fighting vehicle or armored personnel carrier	"PC"
Unarmored vehicle	"TRUCK"
Helicopter	"CHOPPER"
Fixed-wing aircraft	"PLANE," "JET," or "UAV" (ADA)
Personnel	"TROOPS"
Machine gun	"MACHINE GUN"
Antitank gun or missile	"ANTITANK"
Any other target	(Briefest term possible)

Figure 6-56. Target designations.

(5) **Range Card Data.** During limited visibility conditions, the BC might not be able to see the target. When this happens, he gets the deflection, elevation, and range from the range card (Chapter 7) and commands *DEFLECTION*. The gunner lays the turret for direction using the turret azimuth ring. He repeats the deflection reading back to the BC, who then reads the elevation from the range card and commands *ELEVATION*. The gunner uses the gun elevation indicator and pointer to lay the weapon for elevation. He repeats the elevation reading back to the BC. The BC gets the range setting from the range card and commands *RANGE*. The gunner indexes the range and repeats it back to the BC.

e. **Range Terms.** The BC announces range in 200-meter increments, which correspond to the settings on the RANGE-SELECT knob. He rounds odd numbers down to the next lower hundred-meter range. This simplifies identification of short rounds. Figure 6-57 shows examples of announced ranges.

(1) As long as the crew understands the terminology, the BC can use any of the examples shown in Figure 6-57.

(2) On Bradley ODS and A3 vehicles, if the gunner can determine the range using ELRF, the BC need not announce the range.

RANGE TO TARGET	ANNOUNCED AS (TERM)—
800 Meters	"EIGHT HUNDRED" or "EIGHT"
1,200 Meters	"ONE TWO HUNDRED," "TWELVE," or "TWELVE HUNDRED"
3,040 Meters	"THREE THOUSAND" or "THIRTY"

Figure 6-57. Announced range designations.

f. **Execution Terms.** The BC uses one of three terms to command the gunner to execute the fire command:

(1) **FIRE.** The command *FIRE* tells the gunner to fire the weapon after he has completed his crew duties (Section V).

(2) **AT MY COMMAND.** The BC uses this command to delay firing. Specifically, he says *AT MY COMMAND* when he wants the gunner to kill a target at a specific location, or when the platoon leader wants more than one gunner to shoot at the same time. For example, the BC might use this command when the commander's METT-TC determines that killing a BMP on a bridge would halt an enemy column. He might also use it when the platoon leader would like to surprise the enemy with cross, depth, or frontal fire.

(3) **FROM MY POSITION.** Normally, the gunner engages all main gun targets. If the gunner is unable to identify or engage the desired target, the BC will do it. He says, *FROM MY POSITION*, makes the final gun lay, then *ON THE WAY*, and fires. As soon as the gunner can resume his duties, the BC returns control to the him. Then, the BC commands the gunner, *FIRE*.

g. **Termination Terms.** To terminate an engagement, the BC commands--

(1) **CEASE FIRE.** This stops the gunner from firing.

(2) **CEASE TRACKING.** This terminates firing of a TOW missile.

h. **Response Terms.** The gunner can respond to the fire command in various ways:

(1) **"Identified."** The gunner says this to confirm that he has located the target(s). Saying *"Identified"* by itself tells the BC that the gunner has confirmed the target as stated in the description. If appropriate, the gunner adds, *"Friendly," "Neutral,"* or *"Doubtful."*

(2) **"Cannot Identify."** The gunner uses this term to inform the BC that he (the gunner) cannot find the target. The BC must either re-lay the weapon or engage the target himself.

(3) **"Cannot Engage."** The gunner uses this term to inform the BC that he (the gunner) can identify the target but, for some reason, cannot engage it.

(4) **"On the way."** The gunner uses this term to inform all crewmembers that he has fired a weapon, and alerts crewmembers to observe the round.

(5) **"Target destroyed."** The gunner uses this term to inform the commander that he has destroyed the target. The commander confirms this.

i. **Repeat Terms.** When any crewmember misses part of the fire command, he names the element that he missed. For example, if he says *"Ammo,"* the BC repeats only the ammunition or weapon element.

j. **Correction Terms.** To correct an error in a fire command, the BC says *CORRECTION* and corrects only the element in error. For example, *GUNNER, HE, TRUCK, ONE SIX HUNDRED. CORRECTION, ONE EIGHT HUNDRED, FIRE.*

6-39. METHODS

Fire commands fall into two basic categories. Battlesight fire commands are the faster of the two and all Bradleys use them. However, precision fire commands allow greater accuracy in determining range.

a. **Battlesight Fire Command.** The BC (A2 and below) uses battlesight fire commands during offensive operations that require speed and accuracy. In the fire command, he says *BATTLESIGHT* instead of the ammunition-weapon and range elements. The target description identifies which battlecarry ammunition and range he wants the gunner to use. For example, the BC might say, *GUNNER, BATTLESIGHT, PC*; or *GUNNER, BATTLESIGHT, TROOPS*. When the gunner uses the auxiliary sight, the range-line aiming point is the same as the battlecarry range in the ISU. When the gunner uses the auxiliary sight, the range-line aiming point is the same as the battlecarry range in the ISU. Figure 6-58 shows example battlesight fire commands for the Bradley A2; Figure 6-59 shows examples for the ODS and A3 in which the crew uses a battlesight fire command only when the ELRF fails.

Bradley A2					
EXAMPLE 1			EXAMPLE 2		
ELEMENT	BRADLEY CDR	GUNNER	ELEMENT	BRADLEY CDR	GUNNER
ALERT	<i>GUNNER</i>		ALERT	<i>GUNNER</i>	
WPN AND AMMO	<i>BATTLESIGHT</i>		WPN AND AMMO	<i>BATTLESIGHT</i>	
DESCRIPTION	<i>PC</i>		DESCRIPTION	<i>TROOPS AND PC, TROOPS</i>	
DIRECTION (OPTIONAL)	<i>TRAVERSE RIGHT</i>		DIRECTION (OPTIONAL)		
RANGE		<i>"Identified"</i>	RANGE		<i>"Identified"</i>
EXECUTION	<i>FIRE</i>		EXECUTION	<i>FIRE</i>	
		<i>"On the way"</i>			<i>"On the way"</i>
		<i>"Target destroyed"</i>			<i>"Target destroyed"</i>
TERMINATION	<i>CEASE FIRE</i>		TRANSITION	<i>CEASE FIRE</i>	
			DIRECTION		
			WPN AND AMMO		
			DESCRIPTION	<i>RIGHT PC</i>	
			RANGE		<i>"Identified"</i>
			EXECUTION	<i>FIRE</i>	
					<i>"On the way"</i>
					<i>"Target destroyed"</i>
			TERMINATION	<i>CEASE FIRE</i>	

Figure 6-58. Example battlesight fire commands for the Bradley A2.

Bradley A2 ODS and A3					
EXAMPLE 1			EXAMPLE 2		
ELEMENT	BRADLEY CDR	GUNNER	ELEMENT	BRADLEY CDR	GUNNER
ALERT	<i>GUNNER</i>		ALERT	<i>GUNNER</i>	
WPN AND AMMO	<i>BATTLESIGHT</i>		WPN AND AMMO	<i>BATTLESIGHT</i>	
DESCRIPTION	<i>PC</i>		DESCRIPTION	<i>TWO PCs, LEFT PC</i>	
DIRECTION (OPTIONAL)			DIRECTION (OPTIONAL)		
RANGE (OPTIONAL)		<i>"Identified"</i>	RANGE (OPTIONAL)		<i>"Identified"</i>
EXECUTION	<i>FIRE</i>		EXECUTION	<i>FIRE</i>	
		<i>"On the way"</i>			<i>"On the way"</i>
OBSERVATION		<i>"Target destroyed"</i>	OBSERVATION		<i>"Target destroyed"</i>
TERMINATION	<i>CEASE FIRE</i>		TRANSITION		
			DIRECTION	<i>SHIFT or DESIGNATE</i>	
			WPN AND AMMO		
			DESCRIPTION	<i>RIGHT PC</i>	
			RANGE		<i>"Identified"</i>
			EXECUTION	<i>FIRE</i>	
					<i>"On The way"</i>
			OBSERVATION		<i>"Target destroyed"</i>
			TERMINATION	<i>CEASE FIRE</i>	

Figure 6-59. Example battlesight fire commands for the ODS and A3.

b. **Precision Fire Command.** The BC (Bradley A2 and below) uses precision fire commands in defensive engagements when he has the advantages of time and distance. He uses the time to lay the turret weapons on target, to determine range, to issue a fire command (except for the execution and termination elements), and to adjust the fire-control system. On Bradley ODS and A3 vehicles, the gunner, rather than the BC, determines the range to the target.

(1) **BC Determines Range.** After he determines range to the target, the BC gives the gunner a precision fire command. (Figure 6-60, page 6-58, shows one example.) The gunner then indexes the announced range.

(2) **Gunner Determines Range.** If the BC wants the gunner to determine the range, he commands, RANGE.

(a) **BFV A2.** As soon as the gunner detects the target, he also determines the range using the horizontal ranging stadia. Once he has done so, he says, "*Identified [range].*" The BC issues a precision fire command (Figure 6-61, page 6-59). The gunner indexes the range, then announces "*On the way.*"

Bradley A2 and Below		
ELEMENT	BRADLEY CDR	GUNNER
ALERT	<i>GUNNER</i>	
WPN AND AMMO	<i>SABOT</i>	
DESCRIPTION	<i>PC</i>	
DIRECTION (OPTIONAL)		
RANGE	<i>ONE SIX HUNDRED</i>	<i>"Identified"</i>
EXECUTION	<i>FIRE</i>	<i>"On the way"</i>
		<i>"Target destroyed"</i>
TERMINATION	<i>CEASE FIRE</i>	

Figure 6-60. Example precision fire commands when BC determines range.

(b) *BFV ODS or A3*. If the ELRF returns an error code or receives a multiple return, the gunner lases the target again. If he still gets a multiple return, he discriminates between the returns using his first and last return switches. If this does not eliminate the problem, he announces "*Range*." This requires either the BC or gunner to apply range-determination procedures, and the gunner to induce range manually into the fire-control system (Figure 6-62, page 6-59).

c. **Subsequent Fire Command.** Based on his observations, the BC formulates subsequent fire commands to adjust the gunner's firing or to instruct the gunner to reengage a previous target. The commands must include at least the alert and execution elements. For reengagement, the BC includes a description element. He announces range and deflection elements as necessary to direct the gunner.

(1) **Alert.** The BC announces his range observation as the alert (for example, *SHORT*). This also notifies the gunner that a subsequent fire command follows. If reengaging a previous target, the BC commands, *REENGAGE*.

(2) **Description.** When reengaging, the BC identifies target type.

(3) **Range Correction.** If the round goes over the target, the BC subtracts range; if short, he adds range. A correction greater than 200 meters might require the gunner to index a different range in the ISU or auxiliary sight. The gunner should adjust range errors of less than 20 meters by target form.

(4) **Deflection Correction.** The deflection correction derives from the BC's deflection observation. For example, if the round goes to the left of the target, the BC's correction tells the gunner how far to the right to shift. The BC can correct deflection in mils or in target forms.

Bradley A2			Bradley A2 ODS and A3, Example 1		
ELEMENT	BRADLEY CDR	GUNNER	ELEMENT	BRADLEY CDR	GUNNER
ALERT	"GUNNER"		ALERT	GUNNER	
WPN AND AMMO	"H-E" (high explosive)		WPN AND AMMO	SABOT	
DESCRIPTION	"TRUCK"		DESCRIPTION	PC	
DIRECTION (OPTIONAL)			DIRECTION (OPTIONAL)		
RANGE	"RANGE"		RANGE		Lases and announces "Range" "Identified"
EXECUTION	"FIRE"	"One four hundred" "On the way" "Target destroyed"	EXECUTION	FIRE	"On the way" "Target destroyed"
TERMINATION	"CEASE FIRE"		TERMINATION	CEASE FIRE	

Figure 6-61. Example precision fire commands when gunner determines range.

Bradley A2 ODS and A3, Example 2		
ELEMENT	BRADLEY CDR	GUNNER
ALERT	GUNNER	
WPN AND AMMO	SABOT	
DESCRIPTION	PC	
DIRECTION (OPTIONAL)		
RANGE		"Range" "One two hundred" "Identified"
EXECUTION	FIRE	"On the way" "Target destroyed"
TERMINATION	CEASE FIRE	

Figure 6-62. Example precision fire commands for ODS and below when gunner determines range.

(5) **Execution.** The BC completes the subsequent fire command with the element of execution, *FIRE*.

d. **Reduced Fire Command.** If more than two targets are presented during an engagement, the BC can issue a reduced fire command to supplement the process. However, the BC must first issue a correct precision fire command. Crews have to engage targets quickly, so the BC might decide to omit one or more elements of the fire command. If so, he must ensure that the crew understands the command. Regardless, he always issues the description and execution elements.

- (1) **Alert.** Optional.
- (2) **Ammunition/Weapon.** Optional.
- (3) **Description.** Required.
- (4) **Direction.** Optional.
- (5) **Range.** Optional.
- (6) **Execution.** Required.
- (7) **Termination.** Required.

e. **Stinger Fire Command.** The BC uses the Stinger fire command to engage enemy aerial targets. The Linebacker gunner engages targets from a protected position or on the move. Figure 6-63, left, shows an example Stinger fire command.

f. **TOW Fire Command.** The BC uses the TOW fire command to engage enemy tanks and other targets beyond the range of the 25-mm gun. The Bradley fires from the enfilade position. The BC always uses the word "*MISSILE*" for the AMMO element, and he need not include a range element. Figure 6-63, right, shows an example TOW fire command. The only term that might change is DESCRIPTION. You can use any other appropriate term for that such as *PC*, *CHOPPER*, or *BUNKER*.

g. **Firing Port Weapon Fire Command (M2 Only).** The basic Bradley has six firing port weapons on three separate banks. The BF A2 ODS and A3 have only two firing port weapons, which are located on the ramp. In either case, the BC or FPW gunner identifies a target and issues a firing port weapon fire command (Figure 6-64).

h. **Multiple Target Engagement.** In combat, Bradley crews must engage multiple targets (Figure 6-65, page 6-63). They must engage quickly and accurately in order to suppress or destroy all targets. The BC prioritizes targets by threat level. The gunner identifies all targets before the engagement begins.

(1) **BFV A2.** Moving to a battle position, the BC acquires two BMPs to the front. While laying the turret for direction, he issues a fire command. To complete the engagement, he describes the target and gives the commands to execute and terminate the engagement.

(2) **BFV A2 ODS and A3.** In the battle position, the BC acquires one tank and one BMP to the front. While laying the turret for direction, he issues a fire command. To complete the engagement, he announces the weapon and ammunition, describes the target, and announces the range. He commands the crew to execute, then end the engagement.

(3) **Reduced Fire Command.** If more than two targets are presented during an engagement, the BC can issue a reduced fire command to supplement the process. However, the BC must first issue a correct precision fire command.

Stinger			TOW		
ELEMENT	BRADLEY CDR	GUNNER	ELEMENT	BRADLEY CDR	GUNNER
ALERT	GUNNER		ALERT	GUNNER	
AMMO	MISSILE		WEAPON	MISSILE	
DESCRIPTION	[PLANE, JET, CHOPPER, or UAV] INTERROGATE		DESCRIPTION	TANK	
RANGE		"Identified"	RANGE		"Identified"
EXECUTION	FIRE		EXECUTION	FIRE"	
TERMINATION	CEASE FIRE				"On the way" "Target destroyed"
		"On The way"	TERMINATION	CEASE TRACKING	

Figure 6-63. Example Stinger and TOW fire commands.

ELEMENT	BRADLEY CDR	FPW GUNNER
ALERT	LEFT BANK (LEFT REAR or RIGHT REAR)	
WEAPON OR AMMO		
DESCRIPTION	TROOPS	
DIRECTION (OPTIONAL)		
RANGE	TWO HUNDRED	
EXECUTION	FIRE	"Identified"
		"On the way" "Target destroyed"
TERMINATION	CEASE FIRE	

Figure 6-64. Example fire command for firing port weapon.

i. **Infantry Platoon and Scout Section Fire Commands.** The platoon leader uses *platoon fire commands* to control the Bradley platoon's fires. He decides how to control fires based on the situation and on how much time is available to plan and prepare.

(1) **Limited Time Available to Plan and Prepare.** In a meeting engagement or in a movement to contact, when planning and preparation time is limited, he initiates fires with a fire command. During the fight, he controls fires using fire patterns specified in the platoon SOP. He transmits fire patterns orally or digitally unless otherwise specified.

(2) **Time Available to Plan and Prepare.** In a prepared defense, with several days to plan and prepare, the platoon leader initiates the fight with a fire command or an event such as "Fire when the enemy crosses the [specified] trigger line." During the fight, he distributes fires IAW his carefully made, detailed fire distribution plans and preparations. The object of the planning phase is to anticipate events and coordinate fires before the fight starts. During execution, a well-planned defense requires little platoon radio-net

traffic, because the platoon leader has already designated termination and trigger points, priority engagements, and targets. The use of fire commands depends on knowledge of the enemy and the amount of time available to plan, prepare, and rehearse.

(3) **Standardized Fire Commands.** Unit SOP establishes standardized platoon fire commands. Platoon leaders and platoon sergeants must practice these commands to proficiency. Using a standard format for platoon fire commands allows for the quickest possible delivery of essential information and control measures. Even during adverse conditions, using a standard format causes the unit to react positively. Brevity and clarity are essential. Abbreviated methods for identifying target locations are encouraged; however, everyone must know the meanings of the abbreviations.

(4) **Elements of Platoon Fire Command.** A standard platoon fire command may include as many as eight elements in the following order: alert, weapon and ammunition, description, location, range, control, execution, and termination (Figure 6-66, page 6-64). The battlefield situation or platoon SOP dictates the number of elements used in a fire command.

(5) **Additional Information.** The platoon leader may give coordinating instructions or additional information to individual BCs, but this extra information is not part of the platoon fire command. When a BC sends a contact or spot report, which he believes that all of the other BCs in the platoon have received, the platoon leader only adds the new or changed elements needed to complete the fire command (Figure 6-67, page 6-64).

NOTE: In all cases, if under an immediate threat, a crew may engage a target without waiting for a platoon fire command.

Bradley A2			Bradley A2 ODS or A3		
ELEMENT	BRADLEY CDR	GUNNER	ELEMENT	BRADLEY CDR	GUNNER
ALERT	<i>GUNNER</i>		ALERT	<i>GUNNER</i>	
WPN AND AMMO	<i>BATTLESIGHT</i>		WPN AND AMMO	<i>MISSILE</i>	
DESCRIPTION	<i>TWO PCs, LEFT PC</i>			<i>TANK AND PC, TANK</i>	
DIRECTION (OPTIONAL)			DIRECTION (OPTIONAL)	<i>DESIGNATE</i>	
RANGE		<i>"Identified"</i>	RANGE		<i>"Identified"</i>
EXECUTION	<i>FIRE</i>		EXECUTION	<i>FIRE</i>	
		<i>"On the way" "Target destroyed"</i>			<i>"On the way" "Target destroyed"</i>
TERMINATION	<i>CEASE FIRE</i>		TERMINATION	<i>CEASE TRACKING</i>	
DIRECTION (OPTIONAL)	<i>SHIFT RIGHT</i>		DIRECTION	<i>SHIFT or DESIGNATE</i>	
DESCRIPTION	<i>PC</i>		WPN AND AMMO	<i>SABOT</i>	
EXECUTION	<i>FIRE</i>		DESCRIPTION	<i>PC</i>	
		<i>"On the way" "Target destroyed"</i>	RANGE		<i>"identified"</i>
TERMINATION	<i>CEASE FIRE</i>		EXECUTION	<i>FIRE</i>	
				<i>"On the way" "Target destroyed"</i>	
			TERMINATION	<i>CEASE FIRE</i>	

Figure 6-65. Example multiple target fire commands for BFV A2 only and for the BFV A2 ODS and A3.

1.	ALERT	<i>RED, THIS IS RED SIX</i>
2.	WEAPON AND AMMO (OPTIONAL)	<i>TOW or SABOT</i>
3.	DESCRIPTION	<i>FOUR TANKS AND THREE BMPs</i>
4.	LOCATION (OPTIONAL)	<i>EAST OF TRP ZERO-ZERO-FOUR</i>
5.	RANGE (OPTIONAL)	<i>TWO-FOUR-HUNDRED</i>
6.	CONTROL (OPTIONAL)	<i>DEPTH, AT MY COMMAND</i>
7.	EXECUTION	<i>FIRE</i>
8.	TERMINATION	<i>CEASE FIRE</i>

Figure 6-66. Eight possible elements of standard platoon fire command.

WINGMAN	"Red Six, this is Red Two. Identified two PCs east of TRP zero-zero-four, one two hundred meters, over."
PLATOON LEADER	"Red Two, this is Red Six, fire."

Figure 6-67. Example of a standard platoon Spot Report.

Section V. CREW DUTIES IN AN ENGAGEMENT

This section provides examples of crew duties for single and multiple, offensive and defensive engagements.

6-40. DEFENSIVE ENGAGEMENTS

Table 6-6 shows the crew’s duties during a single engagement in the defense; Table 6-7, page 6-67, shows multiple engagements in the defense.

ELEMENT	BRADLEY COMMANDER	GUNNER	DRIVER
Pre-mission	<p>Conduct pre-mission and prefire checks</p> <p>Ensure RBD is in the correct position (IBAS or CIV) *</p> <p>Check CTD for advisories *</p> <p>Clean plenum chamber</p>	<p>Conduct pre-mission and prefire checks</p> <p>Ensure that the IBAS has no faults *</p> <p>Select battlecarry</p> <p>Ensure 25-mm gun BPI is in sear and that SCB/WCB sear light is on</p> <p>Ensure weapon system is set to electrical safe</p> <p>Ensure IBAS or ISU is set to low magnification (no zoom applied) *</p> <p>Ensure TOW launcher is up</p>	<p>Conduct pre-mission and PMCS</p> <p>Check instrument panel for status</p> <p>Ensure vehicle is in neutral</p> <p>Release handbrake</p> <p>Ensure viewer operates</p>
Crew reports	<p>Report "<i>CREW REPORT</i>"</p> <p>Report "<i>BC Up</i>"</p> <p>Report "<i>Set</i>" to higher</p>	<p>Ensure all annunciator warning lights are off</p> <p>Report "<i>Gunner up</i>"</p>	<p>Report "<i>Driver up</i>"</p>
Beginning of engagement	<p>Announce "<i>Crew scan</i>"</p> <p>Acquire target(s)</p> <p>Identify target</p> <p>Classify target</p> <p>Discriminate target</p>	<p>Begin sector scan</p> <p>Report acquisition of target, for example, "<i>PC flank</i>"</p>	<p>Begin sector scan</p> <p>Report acquisition of target</p>
Alert	<p>Announce "<i>Gunner</i>"; if desired, lay gunner on target by directional means</p>	<p>Respond to alert</p>	<p>Respond to alert</p>
Weapon and ammo	<p>Announce weapon and ammunition</p>	<p>Select weapon and ammunition; arm weapon</p>	<p>Ensure vehicle is in gear</p>
Description	<p>Describe target</p>	<p>Ensure weapon is ready and set to low magnification; assume correct posture</p>	
Direction (optional)	<p>Confirm target</p>	<p>Report "<i>Identified</i>"; this cues the BC that you have the correct target</p>	
<p>* A3-specific information.</p>			

Table 6-6. Crew duties, single engagement in the defense.

ELEMENT	BRADLEY COMMANDER	GUNNER	DRIVER
Direction (optional, continued)	Implement directional techniques or take command of the turret	Report " <i>Cannot identify</i> "; this cues the BC to place the gunner on the target Ensure that you have the correct sight picture, weapon, and ammunition Select high magnification (2x, 4x) and choose the laser *	
Range	Ensure gunner has the correct range; if not, tell him to re-lase it or determine it manually Verify correct sight picture Verify correct range Verify correct ammo Ensure that crew has the ready-to-fire box *	Announce range For a TOW engagement, select TOW	Move forward Stop
Execution	Announce command of execution Observe rounds and either issues subsequent fire commands, select CIV and scan battlefield, or both *	Verify reticle lay Announce " <i>On the way</i> " Fire weapon system Announce observation; adjust rounds as needed	Place the drive-select lever in reverse; keep check on time for the crew (optional) Count rounds (optional) Observe sector for additional targets and impact of rounds
Observation and response (optional)	Select IBAS and ensure that the target is destroyed * Scan and ensure that all targets engaged have been destroyed	Announce " <i>Target destroyed</i> "	
Termination	Announce " <i>CEASE FIRE</i> " Announce " <i>DRIVER BACK</i> "	Cease fire	Move the vehicle to a hull defilade position
Consolidation	Ensure RBD switch is in the correct position * Check CTD for advisories *	Ensure that the IBAS has no faults * Select battlecarry	Check instrument panel for status Ensure vehicle is in neutral
* A3-specific information.			

Table 6-6. Crew duties, single engagement in the defense (continued).

ELEMENT	BRADLEY COMMANDER	GUNNER	DRIVER
Consolidation (continued)	Clean plenum chamber	Ensure 25-mm gun BPI is in sear and that SCB/WCB sear light is on Ensure weapon system is set to electrical safe Ensure IBAS or ISU is set to low magnification (no zoom applied) * Ensure TOW launcher is up	Release handbrake Ensure viewer operates
Crew reports	Report " <i>CREW REPORT</i> " Report " <i>BC up</i> " Report ' <i>Set</i> ' to higher	Ensure all annunciator warning lights are off Report " <i>Gunner up</i> "	Report " <i>Driver up</i> "
* A3-specific information.			

Table 6-6. Crew duties, single engagement in the defense (continued).

ELEMENT	BRADLEY COMMANDER	GUNNER	DRIVER
Pre-mission	Conduct pre-mission and prefire checks Ensure RBD is in the correct position * Check CTD for advisories * Clean plenum chamber	Conduct pre-mission and prefire checks Ensure that the IBAS has no faults * Select AP (battlecarry) Ensure 25-mm gun BPI is in sear and that SCB/WCB sear light is on Ensure weapon system is set to electrical safe Ensure IBAS or ISU is set to low magnification (no zoom applied) * Ensure TOW launcher is up	Conduct pre-mission and PMCS Check instrument panel for status Ensure vehicle is in neutral Release handbrake Ensure viewer operates
Crew reports	Report " <i>CREW REPORT</i> " Report " <i>BC up</i> " Report " <i>Set</i> " to higher	Ensure all warning annunciator warning lights are off Report " <i>Gunner up</i> "	Report " <i>Driver up</i> "
Beginning of engagement	Announce " <i>CREW SCAN</i> " Acquire target(s) Identify target Classify target Discriminate target	Begin sector scan Report acquisition of target	Begin sector scan Report acquisition of target
Alert	Announce " <i>GUNNER</i> "; lay gunner on target by directional means, if desired	Respond to alert	Respond to alert
Weapon and ammo	Announce weapon and ammunition	Select weapon and ammunition; arm weapon	Ensure vehicle is in gear
Description	Describe target	Ensure weapon is ready and set to low magnification; assume correct posture	
* A3-specific information.			

Table 6-7. Crew duties, multiple engagements in the defense.

ELEMENT	BRADLEY COMMANDER	GUNNER	DRIVER
Direction (optional)	<p>Confirm target</p> <p>Implement directional techniques or take command of the turret</p>	<p>Announce "<i>Identified</i>"; ensure that you have identified the correct target</p> <p>Announce "<i>Cannot identify</i>"; alert BC to place you on target</p> <p>Ensure correct sight picture, weapon, and ammunition</p> <p>Select high magnification (2x, 4x) and lase *</p>	
Range	<p>Ensure gunner has the correct range; if not, tell him to re-lase or to manually induce range</p> <p>Verify correct sight picture, range, and ammo; ensure that the crew has the ready-to-fire box *</p> <p>Announce "<i>DRIVER UP</i>"</p> <p>Announce "<i>DRIVER STOP</i>"</p>	<p>Announce range</p> <p>select TOW</p>	<p>Move forward</p> <p>Stop</p>
Execution	<p>Announce command of execution</p> <p>Watch rounds and announce adjustments; select CIV and scan battlefield *</p>	<p>Verify reticle lay</p> <p>Announce "<i>On the way</i>"</p> <p>Fire weapon system</p> <p>Announce observations; adjust rounds as needed</p>	<p>Place the drive-select lever in reverse; keep check on time for the crew (optional)</p> <p>Count rounds (optional)</p> <p>Observe sector for additional targets and impact of rounds</p>
Observation or response (optional)	<p>Announce "<i>CEASE FIRE</i>"</p> <p>Announce "<i>DRIVER BACK</i>"</p>	<p>Announce "<i>Target destroyed</i>"</p> <p>Cease fire</p>	<p>Pull back to hull defilade position</p>
Direction (optional)	<p>Implement directional techniques or take command of the turret</p>		<p>Place gear selector in drive, prepare to move forward again</p>
Weapon and ammo	<p>Announce weapon and ammunition (if changed)</p>	<p>If changed, select weapon and ammunition; arm weapon</p>	<p>Ensure vehicle is in gear</p>
* A3-specific information.			

Table 6-7. Crew duties, multiple engagements in the defense (continued).

ELEMENT	BRADLEY COMMANDER	GUNNER	DRIVER
Description	Describe target Confirm target Implement directional techniques or take command of the turret	Ensure weapon is ready and set to low magnification; assume correct posture Announce " <i>Identified</i> "; ensure that you have identified the correct target Announce " <i>Cannot identify</i> "; alert BC to place you on target Ensure correct sight picture, weapon, and ammunition	
Range	Ensure gunner has the correct range; if not, tell gunner to re-lase or to manually induce range Verify correct sight picture, correct range, correct ammo Ensure that crew has the ready-to-fire box * Announce " <i>DRIVER UP</i> " Announce " <i>DRIVER STOP</i> "	Announce range For a TOW engagement, Select TOW	Move forward Stop
Execution	Announce command of execution Watch rounds and announce adjustments; select CIV and scan battlefield *	Verify reticle lay Announce " <i>On the way</i> " Fire weapon system Announce observations; adjust rounds as needed	Place the drive-select lever in reverse; keep check on time for the crew (optional) Count rounds (optional) Observe sector for additional targets and impact of rounds
Observations, response (optional)	Scan and ensure that all targets engaged have been destroyed	Announce " <i>Target destroyed</i> "	
* A3-specific information.			

Table 6-7. Crew duties, multiple engagements in the defense (continued).

ELEMENT	BRADLEY COMMANDER	GUNNER	DRIVER
Termination	Announce " <i>CEASE FIRE</i> " Announce " <i>DRIVER BACK</i> "	Cease fire	Move vehicle to hull defilade position
Consolidation	Ensure RBD is in the correct position * Check CTD for advisories * Clean plenum chamber	Ensure that the IBAS has no faults * Select battlecarry Ensure 25-mm gun BPI is in sear and that SCB/WCB sear light is on Ensure weapon system is set to electrical safe Ensure IBAS or ISU is set to low magnification (no zoom applied) * Ensure TOW launcher is up	Check instrument panel for status Ensure vehicle is in neutral Release handbrake Ensure viewer operates
Crew reports	Report " <i>CREW REPORT</i> " Report " <i>BC Up</i> " Report " <i>Set</i> " to higher	Ensure all annunciator warning lights are off Report " <i>Gunner Up</i> "	Report " <i>Driver up</i> "
* A3-specific information.			

Table 6-7. Crew duties, multiple engagements in the defense (continued).

6-41. OFFENSIVE ENGAGEMENTS

Table 6-8 shows multiple engagements in the offense.

ELEMENT	BRADLEY COMMANDER	GUNNER	DRIVER
Pre-mission	Conduct pre-mission and prefire checks Ensure RBD is in the correct position * Check CTD for advisories * Clean plenum chamber	Conduct pre-mission and prefire checks Ensure that there are no faults in the IBAS * Select battlecarry Ensure 25-mm gun BPI is in sear and that SCB/WCB sear light is on Ensure weapon system is set to electrical safe Ensure IBAS or ISU is set to low magnification (no zoom applied) Ensure TOW launcher is stowed	Conduct pre-mission and PMCS Check instrument panel for status Ensure vehicle is in drive Release handbrake Ensure viewer operates
Crew reports	Report " <i>CREW REPORT</i> " Report " <i>BC Up</i> " Report " <i>Se</i> " to higher Report " <i>DRIVER MOVE OUT</i> ," gunner scan	Ensure all annunciator warning lights are off Report " <i>Gunner Up</i> " Starts scanning	Report " <i>Driver up</i> " Move out and sets steady platform
Beginning of engagement	Begin target scan Acquire target(s) Identify target Classify target Discriminate target	Report acquisition of target	Begin target scan Report acquisition of target
Alert	Announce " <i>GUNNER</i> " Lays gunner on target by directional means if desired	Respond to alert	Respond to alert
Weapon and ammunition	Announce battlesight. Announce weapon and ammunition	Select weapon and ammunition; arm weapon	
Description	Describe target	Ensure weapon is ready and set to low magnification; assume correct posture	
Direction (optional)	Confirm target	Announce " <i>Identified</i> "; Ensure he has identified the correct target	
* A3-specific information.			

Table 6-8. Crew duties, multiple engagements in the offense.

ELEMENT	BRADLEY COMMANDER	GUNNER	DRIVER
Direction (optional, continued)	Implement directional techniques or take command of the turret If target designate is used, see Chapter 2 *	Announce " <i>Cannot identify</i> "; cue commander to place you on target Ensure correct sight picture, weapon, and ammunition	
Range	Ensure gunner has the correct range. If not, tell him to re-lase or to manually induce range Verify correct sight picture, correct range, correct ammo Ensure that crew has the ready-to-fire box *	Select high magnification (2x, 4x) and lases * Announce range	
Execution	Announce command of execution Watch rounds and announce adjustments; select CIV and scan battlefield for additional targets *	Verify reticle lay Announce " <i>On the way</i> " Fire Announce observations; adjust rounds as needed	Count rounds (optional) Observe sector for additional targets and impact of rounds
Observation or response (optional)	Announce " <i>CEASE FIRE</i> "	Announce " <i>Target destroyed</i> "	
Direction (optional)	Implement directional techniques or take command of the turret	Cease fire	
Weapon and ammunition	Announce weapon and ammunition if changed Describe target	If changed, select weapon and ammunition; arm weapon Ensure weapon is ready and set to low magnification; assume correct posture	
* A3-specific information.			

Table 6-8. Crew duties, multiple engagements in the offense (continued).

ELEMENT	BRADLEY COMMANDER	GUNNER	DRIVER
Direction (optional)	<p>Confirm target</p> <p>Implement directional techniques or take command of the turret</p>	<p>Announce "<i>Identified</i>"; ensure that you have identified the correct target</p> <p>Announce "<i>Cannot identify</i>"; cue commander to place you on target</p> <p>Ensure correct sight picture, weapon, and ammunition</p> <p>Select high (2x,4x) and lase *</p>	
Range	<p>Ensure gunner has the correct range; if not, tell gunner to re-lase or to manually induce range</p> <p>Verify correct sight picture, correct range, and correct ammo</p> <p>Ensure that crew has the ready-to-fire box</p>	<p>Announce range</p>	
Execution	<p>Announce command of execution</p> <p>Watch rounds and Announce adjustments; Select CIV and scan battlefield *</p>	<p>Verify reticle lay</p> <p>Announce "<i>On the way</i>"</p> <p>Fire</p> <p>Announce observations; adjust rounds as needed</p>	<p>Count rounds (optional)</p> <p>Observe sector for additional targets and impact of rounds</p>
Observation or response (optional)	<p>Select IBAS and ensure that the target is destroyed *</p> <p>Scan and ensure that all targets engaged have been destroyed</p>	<p>Announce "<i>Target destroyed</i>"</p>	
Termination	<p>Announce "<i>CEASE FIRE</i>"</p> <p>Announce "<i>DRIVER BACK</i>"</p>		
Consolidation	<p>Ensure RBD is in the correct position *</p>	<p>Ensure that the IBAS has no faults *</p>	<p>Check instrument panel for status</p>
* A3-specific information.			

Table 6-8. Crew duties, multiple engagements in the offense (continued).

ELEMENT	BRADLEY COMMANDER	GUNNER	DRIVER
Consolidation (continued)	Check CTD for advisories * Clean plenum chamber	Select battlesight Ensure 25-mm gun BPI is in sear and that SCB/WCB sear light is on Ensure weapon system is set to electrical safe Ensure IBAS or ISU is set to low magnification (no zoom applied) * Ensure TOW launcher is stowed	Ensure viewer operates
Crew reports	Report " <i>CREW REPORT</i> " Report " <i>BC up</i> " Report " <i>Set</i> " to higher	Ensure all annunciator warning lights are off Report " <i>Gunner up</i> "	Report " <i>Driver up</i> "
* A3-specific information.			

Table 6-8. Crew duties, multiple engagements in the offense (continued).

CHAPTER 7

Preliminary Gunnery

Before conducting crew and tactical gunnery, crews, squads, sections, and platoons must develop proficiency in individual and collective tasks. They gain this proficiency by training in specified elementary gunnery tasks and soldier skills. Preliminary gunnery introduces new crewmembers to BFV gunnery and sustains the skills of experienced crewmembers. Commanders conduct it year-round at the home station. It consists of both classroom instruction and hands-on training. Squad training should parallel Bradley preliminary gunnery training.

Section I. BASIC INSTRUCTION

Before crewmembers progress to hands-on training with vehicle systems, they must receive basic classroom instruction. Classroom subjects include BFV basic subjects, gunnery, and platoon training. Figure 7-1 shows BFV basic subjects, gunnery training, and platoon training.

<p>CLASSROOM SUBJECTS</p> <ol style="list-style-type: none">1. Basic capabilities of the 25-mm, 7.62-mm, and TOW.2. BFV range card.3. Gun theory and weapons system functions.4. Boresight and zero procedures.5. Target acquisition and range determination.6. Combat vehicle identification.7. Fire commands.8. Methods of engagement.9. Engagement techniques.10. FBCB2 training. <p>CREW GUNNERY TRAINING</p> <ol style="list-style-type: none">1. Organization of gunnery training.2. Gunnery exercises and standards.3. Training devices.4. Direct-fire adjustment.5. TOW gunnery training. <p>RIFLE INFANTRY PLATOON TRAINING</p> <ol style="list-style-type: none">1. Sector sketches (section and platoon).2. Fire control and distribution.3. Platoon fire commands.4. Crew drills.5. Battle drills. <p>ALL BRADLEY UNITS</p> <ol style="list-style-type: none">1. Infantry.2. Cavalry.3. Air-defense artillery.4. Engineer.5. Bradley fire-support team.
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Figure 7-1. Basic instruction.

7-1. HANDS-ON TRAINING

Hands-on training lets crewmembers apply what they learned during preliminary gunnery instruction. Crewmembers use their vehicles and equipment for hands-on training. (They can use thru-sight video to get more detail for the AAR.)

a. **Introductory Manipulation Training.** During introductory manipulation training, crewmembers learn about the turret-drive systems and the handstation. They learn how the turret responds to their use of the handstation in the power (normal and fast-turret) modes and how it responds in the manual mode. Manipulation combines eye-hand coordination and reinforcement training. The two types of manipulation include gun lay and tracking.

b. **Gun-Lay Exercise.** Gun lay requires the BC to lay the turret weapons systems on the target. This allows the gunner to adjust onto the target. The emphasis is on the speed and accuracy of the lay. The gun-lay exercise develops a BC's skill to use his handstation and to use oral-direction terms for the gunner to lay the gun on the target while issuing a fire command.

(1) **Task.** Lay the BFV's turret weapons systems on a target.

(2) **Conditions.** Given a fully operational BFV and a suitable exercise area with at least ten scaled targets.

(3) **Standards.** The BC must correctly lay the weapons systems on eight of ten targets using the commander's handstation and eight of ten targets using oral-direction terms. The BC must place each target within the gunner's field of view, in high magnification, within five seconds. Bradley A3 crews will conduct gun-lay exercises without the use of the CIV.

(4) **Conduct of the Exercise and Evaluation Procedures.** The gun-lay exercise will work in any area that measures at least 100 meters in depth and 50 meters in width.

(a) Targets must accurately represent an enemy force. The recommended target model size is 1/35-scale; however, if a larger area is available, then larger targets may be used.

(b) The scaled targets are placed at ranges IAW Table 7-1. Targets are numbered and lettered. Numbers must be visible to the naked eye; letters will only be visible in high magnification.

(c) The evaluator announces the target number to the BC. The BC lays the weapon on the target. The gunner says "*Identified*" and the letter of the target in response to fire commands.

(d) The crewmember must complete the gun-lay exercise in the power mode using the primary and auxiliary sights. The exercises progress in difficulty as the BC becomes more proficient.

COMBAT RANGE (METERS)	SCALED RANGES						
	1/2 (METERS)	1/5 (FEET)	1/10 (METERS)	1/20 (FEET)	1/30 (FEET)	1/35 (FEET)	1/60 (FEET)
500	250	330	50	82	55	47	27
600	300	380	60	99	66	56	33
700	350	464	70	115	76	66	38
800	400	470	80	132	87	75	44
900	450	592	90	148	98	84	49
1,000	500	660	100	165	110	94	55
1,100	550	724	110	181	120	103	60
1,200	600	792	120	198	131	113	66
1,300	650	856	130	214	142	122	71
1,400	700	924	140	231	154	132	77
1,500	750	990	150	247	164	141	82
1,600	800	1,060	160	264	176	150	88
1,700	850	1,120	170	280	186	160	93
1,800	900	1,192	180	297	198	169	99
1,900	950	1,256	190	313	208	179	104
2,000	1,000	1,320	200	330	220	188	110
2,100	1,050	1,388	210	346	230	198	115
2,200	1,100	1,450	220	363	242	207	121
2,300	1,150	1,520	230	379	250	216	126
2,400	1,200	1,588	240	396	264	226	132
2,500	1,250	1,650	250	412	274	235	137
2,600	1,300	1,720	260	429	286	245	143
2,700	1,350	1,780	270	445	296	254	148
2,800	1,400	1,850	280	462	308	264	154
2,900	1,450	1,915	290	478	318	273	159
3,000	1,500	1,980	300	495	330	282	165

Table 7-1. Combat and scaled ranges.

c. **Tracking Exercise.** The tracking exercise requires the gunner and BC to move the sight reticle and TOW crosshair along a predetermined path. The BC must track with the CIV along the same predetermined path. This path requires the gunner and BC to make horizontal and vertical changes while tracking. Emphasis is on tracking accuracy. The BC and gunner must track quickly and accurately in the power mode from the BC's and gunner's handstations and in the manual mode from the gunner's position.

(1) **Task.** Manipulate turret.

(2) **Conditions.** Given a fully operational BFV and tracking board (Figure 7-2), placed at the proper tracking line distance IAW Table 7-2 (Bradley-to-target distance).

(3) **Standards.** The BC and gunner must negotiate each tracking line, keeping the 1-mil aiming circle or TOW crosshair between the parallel tracking lines, within the time standards in Figure 7-2. The reticle aiming point or crosshair must not move outside the parallel lines more than three times on each tracking exercise. The exercise is conducted by both the BC and gunner from their handstations and by the gunner in the manual mode using the 25-mm reticle and TOW crosshair.

(4) **Conduct of the Exercise and Evaluation Procedures.** The tracking exercise will work in any area that can meet the Bradley-to-target distance (Table 7-2).

(a) Evaluators assess each crewmember separately. He watches and evaluates the exercise through an available sight such as the commander's sight extension or the gunner's sight. On an A3, the evaluator uses the squad leader's display (SLD).

(b) Figure 7-3, page 7-6, shows an example format for a scoresheet used to record training and individual progress.

(c) After a crewmember's proficiency increases, the evaluator has him use the advanced tracking pattern shown in Figure 7-4, page 7-7. Using this pattern requires the crewmember to manipulate the turret with all combinations of vertical and horizontal axes. Timing is based on the crew's previous performance of negotiating the pattern. This time is used as a standard for improvement.

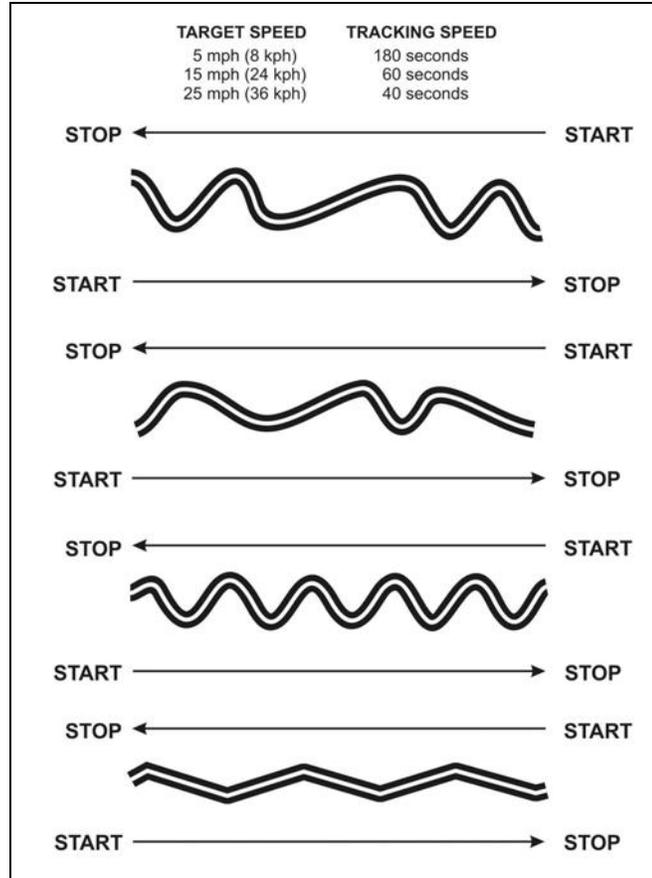


Figure 7-2. Manipulation tracking line (tracking board).

BRADLEY-T0-TRACKING LINE DISTANCE (METERS)	LENGTH OF TARGET LINE (METERS)	WIDTH BETWEEN PARALLEL LINES (MILLIMETERS)
5	1.67	14.7
10	3.33	29.4
15	5.00	44.1
20	6.67	58.8
25	8.33	73.5
30	10.00	88.2
35	11.67	102.9
40	13.33	117.6
45	15.00	132.3
50	16.67	147.0

Table 7-2. Bradley-to-target distance.

RECORD TRAINING AND INDIVIDUAL PROGRESS																			
RUNNING TIME	SECONDS															TOTAL/ TIME	GNR/BC		
	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150			160	170
POWER 180 25MM				X						X					X			173	SPEARS
POWER 180 TOW																		154	ST. JOHN
POWER 50 25MM																			
POWER 50 TOW																			
POWER 40 25MM																			
POWER 40 TOW																			
MANUAL 180 25MM																			
MANUAL 180 TOW																			
MANUAL 50 25MM																			
MANUAL 50 TOW																			
MANUAL 40 25MM																			
MANUAL 40 TOW																			

NOTE: The gunner was tracking a target at 2,200 meters using the 25-mm and turret power ON. "X" indicates time frames when reticle was off target at various points as called out by evaluator/BC.

Figure 7-3. Example format for scoresheet.

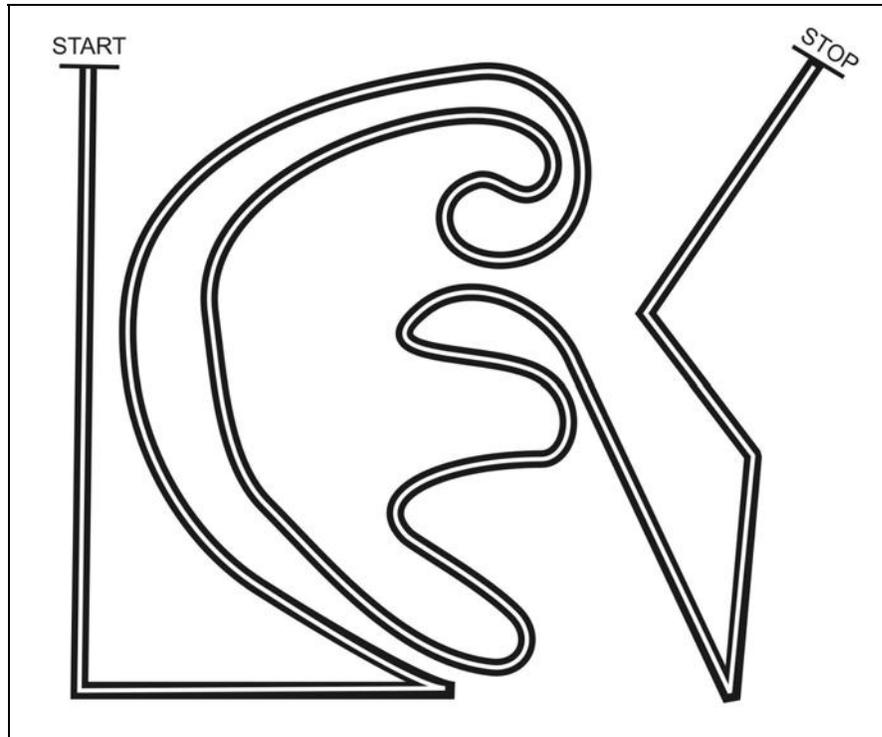


Figure 7-4. Advanced manipulation-tracking line (tracking board).

(5) **Advanced Manipulation and Target-Acquisition Training.** Advanced manipulation and target-acquisition training builds on skills developed during the tracking exercise. For the first time, crews apply the target-acquisition process. The conduct of fire trainer (COFT) incorporates ten special-purpose exercises that help develop and reinforce the crew's ability to detect, identify, and track moving targets. The A3 BATS has four acquisition and manipulation exercises: *search*, *detect*, *locate*, and *identify*. Unlike the COFT, the BATS allows the I/O to input special-purpose conditions, for which the BATS then randomly generates a customized exercise based on the crew's training needs.

7-2. RANGE-DETERMINATION TRAINING

During preliminary gunnery instruction, BCs and gunners learn the various techniques for determining range. During the range-determination exercise, the BC and gunner apply some of these techniques.

- a. **Task.** Determine range using common Bradley equipment.
- b. **Conditions.** Given a fully operational BFV, one set of M22 binoculars, and an exercise area with targets and known distances to the targets.
- c. **Standards.** Determine the range to targets within 100 meters.
 - (1) **Bradley Commander.** Determine the range to four of five targets using M22 binoculars.
 - (2) **Gunner.** Determine range to four of five targets while using the primary sight, and also determined four of five targets while using the auxiliary sight.
- d. **Conduct of the Exercise and Evaluation Procedures.** The range determination exercise can be conducted at the gun-lay exercise site. Targets must accurately represent

the enemy force. The recommended target model size is 1/35-scale; however, if a larger training area is available, then larger targets may be used.

7-3. DIRECT-FIRE-ADJUSTMENT EXERCISES

Direct-fire-adjustment exercises train the assigned BC and gunner in the fundamentals of direct-fire adjustment. These exercises require the gunner and BC to use methods of fire adjustment. An error induced into the fire-control system ensures a first-round miss. Because the exercises are conducted in the COFT, improper range must be indexed before the crew begins the exercise (Figures 7-5, 7-6, 7-7, and 7-8, pages 7-9 thru -12).

a. **Task.** Employ direct-fire adjustment techniques from a stationary and moving BFV against stationary and moving targets.

b. **Conditions.** Given a stationary and moving BFV (through COFT simulation).

c. **Standards.** Adjusted fire from a first-round miss from both the BC's and gunner's positions, using both power and manual modes, and using the primary and auxiliary sights. Used correct adjustment techniques. Hit target with the second round. To qualify on the exercise, crewmember must have first qualified on each task.

d. **Conduct of the Exercise and Evaluation Procedures.** While using predetermined exercises, the I/O must ensure that the crew uses no more than ten rounds for each five-target task (two rounds for each target). The crew cannot offset the boresight knobs in the COFT unless they are actually boresighting (Appendix B). To induce an error into the system, the I/O must either rely on the crewmember setting elevation or deflection or the BC to incorrectly estimate range. For exercises in the defense, and when engaging stationary targets, crews index 600 meters to ensure a first-round miss. For moving BFV and moving target exercises, the crew indexes 1,200 meters.

EXERCISE NUMBER	TASK	CONDITIONS		STANDARDS		
		TARGET, SITUATION	AMMO	HITS	CREW DUTIES	RATING
53211	1. Adjust direct-fire using the gunner's primary or auxiliary sight.	5 stationary targets, day only	10 rounds	3 to 5 0 to 2	SAT UNSAT	Q U
41211	2. Adjust direct-fire using the CSE.	5 stationary targets, day only	10 rounds	3 to 5 0 to 2	SAT UNSAT	Q U
53311	3. Adjust direct-fire using the gunner's primary or auxiliary sight.	5 moving targets, day only	10 rounds	3 to 5 0 to 2	SAT UNSAT	Q U
41311	4. Adjust direct-fire using the CSE.	5 moving targets, day only	10 rounds	3 to 5 0 to 2	SAT UNSAT	Q U
53221	5. Adjust direct-fire using the gunner's primary sight.	5 stationary targets, night only	10 rounds	3 to 5 0 to 2	SAT UNSAT	Q U
41221	6. Adjust direct-fire using the CSE.	5 stationary targets, night only.	10 rounds	3 to 5 0 to 2	SAT UNSAT	Q U
53321	7. Adjust direct-fire using the gunner's primary sight.	5 moving targets, night only	10 rounds	3 to 5 0 to 2	SAT UNSAT	Q U
41321	8. Adjust direct-fire using the CSE.	5 moving targets, night only	10 rounds	3 to 5 0 to 2	SAT UNSAT	Q U

Figure 7-5. Direct-fire adjustment exercise, Group 1.

EXERCISE NUMBER	TASK	CONDITIONS		STANDARDS		
		TARGET, SITUATION	AMMO	HITS	CREW DUTIES	RATING
53251	1. Adjust direct-fire using the gunner's primary or auxiliary sight.	5 stationary targets, day only	10 rounds	3 to 5 0 to 2	SAT UNSAT	Q U
41231	2. Adjust direct-fire using the CSE.	5 stationary targets, day only	10 rounds	3 to 5 0 to 2	SAT UNSAT	Q U
53351	3. Adjust direct-fire using the gunner's primary or auxiliary sight.	5 moving targets, day only	10 rounds	3 to 5 0 to 2	SAT UNSAT	Q U
41331	4. Adjust direct-fire using the CSE.	5 moving targets, day only	10 rounds	3 to 5 0 to 2	SAT UNSAT	Q U
	5. Adjust direct-fire using the gunner's primary sight.	5 stationary targets, night only	10 rounds	3 to 5 0 to 2	SAT UNSAT	Q U
	6. Adjust direct-fire using the CSE.	5 stationary targets, night only.	10 rounds	3 to 5 0 to 2	SAT UNSAT	Q U
	7. Adjust direct-fire using the gunner's primary sight.	5 moving targets, night only	10 rounds	3 to 5 0 to 2	SAT UNSAT	Q U
	8. Adjust direct-fire using the CSE.	5 moving targets, night only	10 rounds	3 to 5 0 to 2	SAT UNSAT	Q U

Figure 7-6. Direct-fire adjustment exercise, Group 2.

EXERCISE NUMBER	TASK	CONDITIONS		STANDARDS		
		TARGET, SITUATION	AMMO	HITS	CREW DUTIES	RATING
53411	1. Adjust direct-fire using the gunner's primary or auxiliary sight.	5 stationary targets, day only	10 rounds	3 to 5 0 to 2	SAT UNSAT	Q U
41411	2. Adjust direct-fire using the CSE.	5 stationary targets, day only	10 rounds	3 to 5 0 to 2	SAT UNSAT	Q U
53511	3. Adjust direct-fire using the gunner's primary or auxiliary sight.	5 moving targets, day only	10 rounds	3 to 5 0 to 2	SAT UNSAT	Q U
41511	4. Adjust direct-fire using the CSE.	5 moving targets, day only	10 rounds	3 to 5 0 to 2	SAT UNSAT	Q U
53421	5. Adjust direct-fire using the gunner's primary sight.	5 stationary targets, night only	10 rounds	3 to 5 0 to 2	SAT UNSAT	Q U
41421	6. Adjust direct-fire using the CSE.	5 stationary targets, night only.	10 rounds	3 to 5 0 to 2	SAT UNSAT	Q U
53521	7. Adjust direct-fire using the gunner's primary sight.	5 moving targets, night only	10 rounds	3 to 5 0 to 2	SAT UNSAT	Q U
41521	8. Adjust direct-fire using the CSE.	5 moving targets, night only	10 rounds	3 to 5 0 to 2	SAT UNSAT	Q U

Figure 7-7. Direct-fire adjustment exercise, Group 3.

EXERCISE NUMBER	TASK	CONDITIONS		STANDARDS		
		TARGET, SITUATION	AMMO	HITS	CREW DUTIES	RATING
53451	1. Adjust direct-fire using the gunner's primary or auxiliary sight.	5 stationary targets, day only	10 rounds	3 to 5 0 to 2	SAT UNSAT	Q U
41431	2. Adjust direct-fire using the CSE.	5 stationary targets, day only	10 rounds	3 to 5 0 to 2	SAT UNSAT	Q U
53351	3. Adjust direct-fire using the gunner's primary or auxiliary sight.	5 moving targets, day only	10 rounds	3 to 5 0 to 2	SAT UNSAT	Q U
41531	4. Adjust direct-fire using the CSE.	5 moving targets, day only	10 rounds	3 to 5 0 to 2	SAT UNSAT	Q U
	5. Adjust direct-fire using the gunner's primary sight.	5 stationary targets, night only	10 rounds	3 to 5 0 to 2	SAT UNSAT	Q U
	6. Adjust direct-fire using the CSE.	5 stationary targets, night only.	10 rounds	3 to 5 0 to 2	SAT UNSAT	Q U
	7. Adjust direct-fire using the gunner's primary sight.	5 moving targets, night only	10 rounds	3 to 5 0 to 2	SAT UNSAT	Q U
	8. Adjust direct-fire using the CSE.	5 moving targets, night only	10 rounds	3 to 5 0 to 2	SAT UNSAT	Q U

Figure 7-8. Direct-fire adjustment exercise, Group 4.

Section II. TOW TRAINING

The TOW training program teaches the crew to engage, track, and destroy armored targets using the TOW missile system. They must complete this training, which consists of basic TOW gunnery tasks; tracking exercises; and specified COFT or BATS exercises within three months (four months for RC) before they fire live TOWs.

7-4. BASIC TASKS

Basic TOW tasks allow crewmembers to train hands-on while on their vehicles. Before firing a live missile, crewmembers must operate, prepare to load, load, fire, perform immediate action on, remove a misfired round from, and manually raise the launcher.

7-5. OPERATION IN POWER MODE

To operate the TOW launcher power mode--

- a. **Task.** Raise, elevate, depress, and lower the TOW launcher in the power mode.
- b. **Conditions.** Given an operational Bradley.
- c. **Standards.** Within three minutes, crewmember raised, elevated, depressed, and lowered the TOW launcher.
- d. **Performance Measures.** Completed the performance measures within three minutes.
 - (1) Raised the TOW launcher.
 - (a) Moved turret-traverse drive-select lever to POWER position.
 - (b) Moved LAUNCHER UP-DN switch to UP.
 - (c) Squeezed palm switches until launcher stopped moving and LAUNCHER UP indicator light came on.
 - (d) Released palm switches.
 - (e) Pressed TOW button.
 - (2) Elevated TOW launcher.
 - (a) Squeezed and held palm switches.
 - (b) Rotated gunner's control handles toward you until launcher reached desired position or stopped.
 - (c) Centered gunner's control handles and released palm switches.
 - (3) Depressed TOW launcher.
 - (a) Squeezed and held palm switches.
 - (b) Rotated gunner's control handles away from you until launcher reached desired position or stopped.
 - (c) Centered gunner's control handles and released palm switches.
 - (4) Lowered the TOW launcher.
 - (a) Moved LAUNCHER UP-DN switch to DN.
 - (b) Squeezed palm switches until LAUNCHER UP indicator light went out and launcher stowed against turret.
 - (c) Released palm switches.

7-6. PREPARATION FOR LOADING

To prepare the TOW launcher for loading--

- a. **Task.** Perform the procedures for preparing the TOW launcher for loading.
- b. **Conditions.** Given an operational Bradley with the TOW launcher stowed.
- c. **Standards.** Within one minute, prepared the TOW launcher for loading.
- d. **Performance Measures.** Prepared the TOW launcher for loading. Completed performance measures within one minute.
 - (1) Turned the turret power on.
 - (2) Turned the turret drive on.
 - (3) Raised TOW launcher.
 - (4) Traversed to TOW LOAD position (5950 mils).
 - (5) Elevated the launcher to 500 mils.
 - (6) Set the turret travel lock.
 - (7) Moved the turret drive switch to OFF.

7-7. LOADING PROCEDURES

To load the TOW launcher--

- a. **Task.** Perform the procedures for loading the TOW launcher on a BFV.
- b. **Conditions.** Given an operational Bradley with the TOW launcher prepared for loading and dummy TOW rounds mounted in the vertical racks.
- c. **Standards.** Within four minutes, the crewmember will load the TOW launcher.
- d. **Performance Measures.** Load the TOW launcher. Complete performance measures within four minutes.
 - (1) Opened the cargo hatch cover to the second position.
 - (2) Removed the dust cover from the launcher.
 - (3) Pushed and held lock handles to the left; pulled down loading handles.
 - (4) Removed any obstruction from the tubes.
 - (5) Ensured the umbilical connectors did not extend down into the launch tubes.
 - (6) Unstowed the TOW missiles from vertical stowage.
 - (7) Removed the forward ring from the nose end.
 - (8) Removed the electrical connector cover.
 - (9) Inspected front and rear diaphragms for damage and humidity indicator color.
 - (10) Loaded two TOW missiles into the launcher.
 - (11) Ensured that the loading handles were locked.
 - (12) Closed the cargo hatch; told the gunner that loading was complete.

7-8. FIRE AND IMMEDIATE ACTION

To fire and apply immediate action on a TOW--

- a. **Task.** Fire and apply immediate action on a TOW.
- b. **Conditions.** Given an operational Bradley with the TOW launcher erect.
- c. **Standards.** Within two minutes, the crewmember--
 - (1) Prepared the TOW system for firing.
 - (2) Fired a TOW missile.
 - (3) Applied immediate action for a TOW misfire.
- d. **Performance Measures.** Fired a TOW missile.
 - (1) Completed performance measures within two minutes.
 - (a) Turned on turret power and turret drive.
 - (b) Moved magnification switch to HIGH MAG.
 - (c) Checked slope indicator to ensure it was within 10-degree tolerance.
 - (d) Pressed the TOW button.
 - (e) Checked TOW and TOW test indicator lights.
 - (f) Checked to ensure that the lights on the annunciator box and on the TOW control box were off.
 - (g) Pressed either the Number 1 or 2 button on the missile tube.
 - (h) Moved ARM-SAFE-RESET switch to ARM.
 - (i) Squeezed trigger and palm switches. Released trigger and held palm switches for five seconds.

NOTE: Evaluator says, "*Your missile has failed to fire.*"

- (2) Applied immediate action on the TOW system.
 - (a) Announced "*Misfire TOW missile, attempting to fire again.*"
 - (b) Resqueezed the trigger and palm switches; release trigger; held palm switches for 5 seconds. (If misfire still exists, continue with misfire procedures.)
 - (c) Moved ARM-SAFE-RESET switch to RESET, then to SAFE.
 - (d) Reselected TOW by pressing TOW button.
 - (e) Checked TOW and missile indicators.
 - (f) Reselected misfired TOW missile.
 - (g) Checked that annunciator lights on the annunciator box and the TOW control box were off.
 - (h) Moved ARM-SAFE-RESET switch to ARM.
 - (i) Refired the misfired TOW missile.

7-9. REMOVAL OF MISFIRED MISSILE

To remove a misfired TOW missile from the launcher--

- a. **Task.** Perform the procedures for removing a misfired missile from a TOW launcher.
- b. **Conditions.** Given an operational Bradley, TOW launcher erected, dummy TOW round inserted into Tube No. 1, and a yellow flag.
- c. **Standards.** Within ten minutes, the crew prepared the vehicle, removed the misfired missile, and followed all safety procedures.
- d. **Performance Measures.** Completed the performance measures within ten minutes.
 - (1) Removed the misfired TOW missile.
 - (2) Moved the ARM-SAFE-RESET switch to RESET, then to SAFE.
 - (3) Ensured ramp was raised and hatches were closed.
 - (4) Pivoted hull to 1,600 or 4800 mils while turret stabilization was on.
 - (5) Elevated the TOW launcher to maximum elevation.
 - (6) Moved the turret power switch to OFF.
 - (7) Climbed on top of the hull.
 - (8) Unlocked the TOW launcher.
 - (9) Removed the misfired missile from the launcher.
 - (10) Held the TOW missile by the rear flange.
 - (11) Carefully pulled the TOW missile straight out of the launcher.
 - (12) Handed the TOW missile to the helper (driver).
 - (13) Had the helper move the misfired TOW missile to a safe place, 200 meters away; marked the position with a stake and yellow flag.
 - (14) Notified the chain of command of the location of the missile.

7-10. MANUAL PROCEDURE FOR RAISING LAUNCHER

To raise the TOW launcher in manual mode--

- a. **Task.** Perform the procedures for raising the TOW launcher in the manual mode.
- b. **Conditions.** Given an operational Bradley with basic issue items.
- c. **Standards.** Within ten minutes, the crewmember manually erected the TOW launcher.

- d. **Performance Measures.** Completed performance measures within ten minutes.
 - (1) Erected the TOW launcher using the manual mode.
 - (2) Moved the gun-elevation drive-select lever to the POWER position.
 - (3) Moved the TOW elevation drive select lever to the MANUAL position.
 - (4) Removed the spring from the handle.
 - (5) Manually depressed the TOW launcher to clear the stow pin from the saddle.
 - (6) Manually raised the TOW launcher to the firing position.

7-11. TRACKING

The crew executed the TOW tracking exercise in conjunction with the 25-mm and 7.62-mm tracking exercises. Evaluators assessed crewmembers on their ability to move the TOW crosshair along a predetermined path. They evaluated this exercise the same way they did the 25-mm and 7.62-mm tracking exercises.

7-12. COFT TRAINING

TOW COFT training allows crews to apply what they have learned during preliminary gunnery training. Crews must acquire, engage, track, and destroy threat-armored targets within the simulated environment of the COFT. The task, conditions, and standards for these exercises are in the HB 23-1 series of instructor handbooks for the Bradley COFT.

7-13. BATS TRAINING

The BATS trains and sustains the crew's ability to perform critical M2A3/M3A3 direct-fire-engagement tasks. The BATS training program is based on gunnery doctrine. For realistic training and evaluation, the BATS simulates gunnery and combat environments. The commander can structure BATS training around the unit's METL. Together, these factors make BATS simulated fire seem identical to real live fire. To design an exercise based on the crew's training needs, the I/O selects "Special-Purpose Exercise Matrix," then "Exercise by Content."

Section III. STINGER VEHICLE-MOUNTED LAUNCHER

The SVML tasks teach Linebacker crewmen the skills they need to operate the Stinger subsystem and engage and destroy aerial targets. The crew must complete SVML training within three months of gunnery training.

7-14. RAISE THE STINGER LAUNCHER

To raise the STINGER launcher--

- a. **Task.** Raise the Stinger launcher.
- b. **Conditions.** Given training materials and a fully operational M6 vehicle, with the following actions already completed:
 - (1) Turret in POWER mode.
 - (2) Stinger system in POWER mode.
- c. **Standards.** Raised the Stinger launcher within two minutes.
- d. **Performance Measures.**
 - (1) Rotated SCB MODE switch to LAUNCHER UP position.

- (2) Squeezed and held gunner's palm switches until launcher raised and locked in up position.
- (3) Released gunner's palm switches.
- (4) Verified that CDT displayed LAUNCHER UP mode, SVM displayed Stinger symbols, and SCB displayed no faults.

7-15. LOWER THE STINGER LAUNCHER

To lower the Stinger launcher--

- a. **Task.** Lower the Stinger launcher.
- b. **Conditions.** Given training materials and a fully operational M6 vehicle, with the following actions already completed:
 - (1) Turret in POWER mode.
 - (2) Stinger system in POWER mode.
- c. **Standards.** Lowered the Stinger launcher within two minutes.
- d. **Performance Measures.**
 - (1) Rotated SCB MODE switch from LAUNCHER UP to the ON position.
 - (2) Squeezed and held gunner's palm switches until launcher lowered to the stowed position.
 - (3) Released gunner's palm switches.
 - (4) Verified that the CDT displayed the ON mode, that the SVM displayed Stinger symbols, and that the SCB displayed no faults.

7-16. LOAD STINGER MISSILES

To load the Stinger launcher--

- a. **Task.** Load the Stinger launcher.
- b. **Conditions.** Given training materials and a fully operational M6 vehicle, with the following actions already completed:
 - (1) Launcher in launcher up position.
 - (2) ARM switch on SCB set on SAFE with cover closed.
 - (3) ARM-SAFE-RESET switch on weapons-control box (WCB) moved to RESET, then to SAFE.
 - (4) Turret traversed to 4600 mils.
 - (5) Missile circuit breaker on Stinger distribution unit (SDU) pulled out.
 - (6) Travel lock pushed into locked position.
 - (7) Cargo hatch opened to the upright position.
 - (8) MODE switch on SCB rotated to ON; CDT display reads ON MODE, HATCH.
 - (9) INTERFERENCE and SCB FLT lights ON.
 - (10) CARGO HATCH OVERRIDE switch lifted and held.
 - (11) SCB FLT light out; CDT not displaying HATCH INTERFERENCE in the OVERRIDE position.
 - (12) Gunner's palm switch and stow launcher depressed. Gunner's palm switch released after launcher stows.
 - (13) CARGO HATCH OVERRIDE switch released.
 - (14) TDS switch on OFF.
- c. **Standards.** Loaded Stinger missiles into the SVML within four minutes.

d. **Performance Measures.**

- (1) Checked pressure gauges on both coolant bottle to ensure they read at least 3,500 PSI.
- (2) Unstowed Stinger missiles from the missile stowage rack.
- (3) Performed the first eight of the thirteen critical checks on Stinger missiles.
- (4) Opened Stinger launcher access doors.
- (5) Removed lower SVML access door.
- (6) Inspected SVML.
- (7) Loaded Stinger missiles into SVML.
- (8) Installed lower SVML access door.
- (9) Closed upper and lower SVML access doors.
- (10) Closed Stinger launcher's armored access doors.
- (11) Raised launcher to launcher up position.

7-17. UNLOAD STINGER MISSILES

To unload the Stinger--

a. **Task.** Unload the Stinger launcher.

b. **Conditions.** Given a fully operational M6 Linebacker with Number One and Number Two missiles loaded, and with the following actions also already completed:

- (1) Launcher in launcher up position.
 - (2) ARM switch on SCB set on SAFE with cover closed.
 - (3) WCB ARM-SAFE-RESET switch moved to RESET, then to SAFE.
 - (4) Turret traversed to 4600 mils.
 - (5) Missile circuit breaker on SDU pulled out.
 - (6) Travel lock in the LOCKED position.
 - (7) Cargo hatch opened to the upright position.
 - (8) MODE switch on SCB rotated to ON; CDT displayed ON MODE, HATCH.
 - (9) Verified that INTERFERENCE and SCB FLT lights were ON.
 - (10) CARGO HATCH OVERRIDE switch lifted and held.
 - (11) SCB FLT light out; CDT does not display HATCH INTERFERENCE in the OVERRIDE position.
 - (12) Gunner's palm switch depressed and launcher stowed. Gunner's palm switch released after launcher stowed.
 - (13) Released CARGO HATCH OVERRIDE switch.
 - (14) Moved TDS switch to OFF.
- c. **Standards.** Unloaded the Stinger launcher.
- d. **Performance Measures.**
- (1) Opened Stinger launcher access doors.
 - (2) Removed lower SVML access door.
 - (3) Unloaded Stinger missiles from launcher.
 - (4) Installed protective covers on coolant bottle ports and automated connectors in SVML.
 - (5) Installed lower SVML access door.
 - (6) Closed upper and lower SVML access doors.

- (7) Closed the Stinger launcher's armored access doors.
- (8) Raised launcher to launcher up position.

7-18. OPERATE THE LINEBACKER IN THE ENGAGE MODE

To operate the Linebacker in the ENGAGE mode--

- a. **Task.** Operate the Linebacker in the ENGAGE mode.
- b. **Conditions.** Given a fully operational M6 Linebacker with one captive-flight trainer loaded, and with the following actions already completed:
 - (1) ARM-SAFE-RESET switch on WCB moved to RESET position, then to SAFE.
 - (2) ARM-SAFE-RESET switch on WCB moved to ARM position.
 - (3) ISU range-control knob "00" setting verified.
 - (4) Magnification switch moved to LOW MAG position.
- c. **Standards.** Operated the Linebacker in ENGAGE mode and fired the missile within 20 seconds.
- d. **Performance Measures.**
 - (1) Rotated SCB MODE switch to ENGAGE mode position.
 - (2) Verified that the SCB displayed missile-present (MSL PRESENT) lights for each missile loaded.
 - (3) Squeezed gunner's palm switches to slave launcher to gun in elevation, then released palm switches.
 - (4) Verified that the SVM displays the Stinger missile reticle and that the fault did not display.
 - (5) Verified SCB status as follows:
 - Auto uncage light was illuminated.
 - Missile (MSL) AUTO TRACK light was off.
 - GO light was illuminated.
 - FLT (fault) light was off.
 - MSL ARM light was off.
 - MSL PRESENT lights was illuminated for each missile loaded.
 - (6) Lifted ARM cover on the SCB and moved ARM toggle switch to ARM.
 - (7) Verified that the SCB ARM light was on.
 - (8) Moved ISU MAG switch to HIGH MAG position.
 - (9) Interrogated.
 - (10) Activated.
 - (11) Uncaged.
 - (12) Fired Stinger missile.

7-19. PERFORM IMMEDIATE ACTION FOR STINGER MISFIRE

To perform immediate action for the Stinger missile--

- a. **Task.** Perform immediate action for the Stinger missile.
- b. **Conditions.** Given a fully operational M6 Linebacker with two captive-flight trainers loaded, with the following actions already completed:
 - (1) Stinger system operation verified.
 - (2) Turret operating in POWER mode.
 - (3) Stinger system operating in ENGAGE mode.

- (4) Stinger launcher boresighted.
- (5) Daysight and nightsight covers open.
- (6) Gunner's hatch cover closed.
- (7) Driver's hatch cover closed.
- (8) Cargo hatch cover closed.
- (9) Ramp raised.
- (10) Stinger missiles loaded.
- c. **Standards.** Performed immediate action for Stinger misfire within 10 seconds.
- d. **Performance Measures.**
 - (1) Tried to fire missile a second time.
 - (2) Released the lower thumb switch and trigger on the gunner's handstation.
 - (3) Ensured that the missile uncaged; verified that the symbol in SVM went off.
 - (4) Pressed the SEQ push-button on the SCB to select another missile.
 - (5) Verified that the MSL light flashed to identify that the missiles were active.
 - (6) Uncaged.
 - (7) Fired the missile.

7-20. REMOVE A MISFIRED STINGER MISSILE FROM THE LAUNCHER

To remove a misfired Stinger missile--

- a. **Task.** Remove a misfired Stinger missile from the launcher--
- b. **Conditions.** Given training materials and a fully operational M6 vehicle, with the following actions already completed:
 - (1) Hull traversed to 4800 mils.
 - (2) Launcher elevated to 20 degrees.
 - (3) Turret power off.
 - (4) Vehicle master power off.
- c. **Standards.** Removed a misfired Stinger missile from launcher within 5 minutes.
- d. **Performance Measures.**
 - (1) [Assistant gunner] Exited vehicle through ramp access door.
 - (2) [Gunner] Exited turret through gunner's hatch.
 - (3) Opened the armored access door on the side of the misfired missile.
 - (4) Opened the SVML access door.
 - (5) Removed misfired missile.
 - (6) Handed down misfired missile to assistant gunner on ground.
 - (7) Transported misfired missile at least 10 meters downrange of vehicle.
 - (8) Closed SVML access door.
 - (9) Closed launcher armored door.
 - (10) Marked location of missile and notified EOD.
 - (11) [Crew] Reentered vehicle.
 - (12) Moved vehicle at least 205 meters away to a safe position.

Section IV. BRADLEY RANGE CARD

A range card is a sketch or diagram of the terrain that a direct-fire weapon covers by fire. The range card (drawn on DA Form 5517-R, *Standard Range Card*) shows possible

target areas and terrain features plotted in relation to a firing position. The information on a range card is used to plan and control fire, to rapidly detect and engage targets, and to orient replacement personnel or units.

7-21. DESCRIPTION

The Bradley gunner normally prepares range cards for his vehicle. He prepares one for each primary, alternate, and supplemental position designated in the defense. He also prepares one for any static position when enemy contact is possible, for example, a position in an assembly area. A range card helps leaders plan and control fires, and it helps the crew acquire targets during limited visibility. It also helps replacement personnel or platoons or squads to move into position and to orient on their sector. During good visibility, the gunner should have no problem maintaining orientation within his sector. During poor visibility, however, he may not be able to detect lateral limits. If he becomes disoriented and cannot find or locate reference points or sector limit markers, he can use the range card data to locate the limits. As he makes the range cards, he learns the terrain in his sector. He should continually assess the sector and, if needed, update the range cards. To prepare them, he must know the sectors of fire, target reference points, dead spaces, maximum engagement lines, and weapons reference points. FM 7-8 prescribes DA Form 5517-R and provides a blank reproducible copy of it after the index for easy local reproduction on standard 8 1/2- by 11-inch paper.

a. **Sectors of Fire.** A sector of fire is a piece of the battlefield for which a leader is responsible. He may have both primary and secondary sectors of fire. Leaders use sectors of fire to distribute fires across their area of responsibility.

(1) The leader assigns a sector of fire to cover possible enemy avenues of approach. He should overlap sectors to provide the best use of overlapping fire and to cover areas that a single weapon system could not engage alone.

(2) The leader assigns left and right limits of a sector using prominent terrain features or easily recognizable objects such as rocks, telephone poles, fences, or emplaced stakes.

(3) To find the left and right limits, the gunner should index the TOW into the ISU, because that reticle position does not induce superelevation into the fire-control system. When the leader selects ammunition, and the range changes, superelevation changes the fields of view between APDS-T, HEI-T, and coax. Using the TOW reticle allows the gunner to scan his sector without changing ammunition and range settings while scanning.

(4) The turret-position and azimuth indicators (Figures 7-9 and 7-10, page 7-22) also help in determining sectors of fire. The platoon leader designates ammunition for each TRP and reference point as prescribed by the platoon SOP or METT-TC.

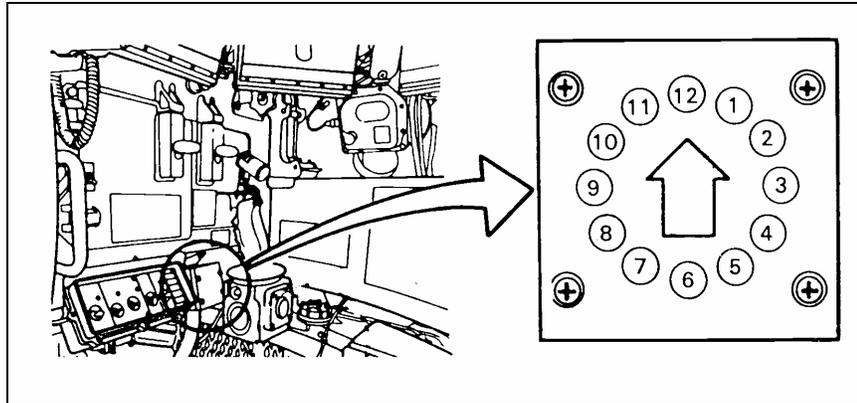


Figure 7-9. Turret position indicator.

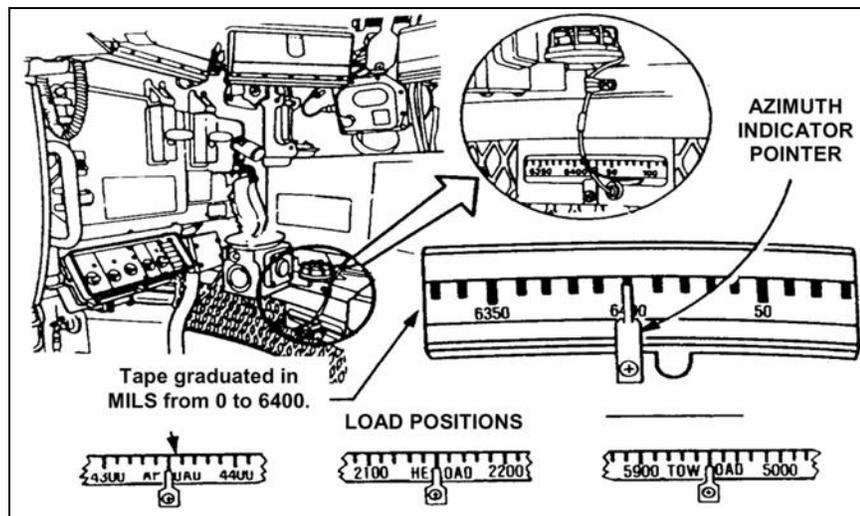


Figure 7-10. Azimuth indicator.

b. **Target Reference Points.** Leaders designate natural or manmade terrain features as reference points. The gunner uses these reference points to acquire targets and to determine range during limited visibility. Predesignated TRPs must be visible to be useful as TRPs or indirect-fire targets. The leader should always designate at least one TRP that the gunner can see on low magnification.

(1) The commander or platoon leader designates indirect-fire targets used as TRPs so that he can assign them target numbers. If TRPs fall within the sector of fire, the BC points them out and gives the gunner their designated reference numbers. Leaders should select heated objects to use as TRPs so that the crew can acquire them with thermal sights.

(2) Each gunner has at least one but no more than four TRPs. Because the information on a range card quickly gets crowded, it should only include pertinent data for reference points and TRPs.

c. **Dead Space.** Dead space is any area that the crew cannot observe or cover by direct-fire systems within the sector of fire. Leaders must identify all dead spaces within the sector of fire, so the BC and platoon leader can plan how to use fires, such as mortars

and artillery, to cover those areas. Vehicle crews walk the engagement area to help gunners identify the dead spaces through the ISUs.

d. **Maximum Engagement Line.** The depth of the sector seldom exceeds the maximum effective engagement range of the vehicle's weapons systems. It can be less, however, if objects prevent the gunner from engaging targets at that range. To help determine the distance to each MEL, the gunner or BC should use a map to make sure that he shows the MELs correctly on the range card. MEL identification helps reduce the amount of ammunition used in an engagement.

e. **Weapon Reference Point.** The WRP is easy to recognize on the map. This terrain feature helps leaders plot the vehicle's position, and it helps replacement personnel find the vehicle.

7-22. PREPARATION

The gunner prepares two copies of the range card. If the leader assigns alternate and supplementary firing positions, he must make two copies of each of these as well. He keeps one copy of each range card with the vehicle, and gives the other copies to the section leader for his sketch.

a. Draw the weapon symbol in the center of the small circle. Draw two lines from the position of the BFV extending left and right to show the limits of the sector (Figure 7-11, page 7-25).

b. Determine the diameter of each circle by finding the farthest terrain feature that is still within the weapon system's effective range. Determine the distance in meters to the terrain feature. Round off the distance to the next higher hundred, if necessary. Determine the greatest number of circles that will divide evenly into the distance (rounded to the nearest 50 meters). The result is the diameter of each circle. Draw the terrain feature on the appropriate circle on the range card. Clearly mark the increment for each circle across the area where DATA SECTION is written. For example, Figure 7-12, page 7-26, shows a hilltop at 3,145 meters. The distance rounds up to 3,200 meters which, divided by 8 equals 400. Thus, each circle has a diameter of 400 meters.

(1) Figure 7-13, page 7-27, shows a farmhouse at 2,000 meters on the left limit. The wood line at 2,600 meters marks the right limit. Determine the distance to these features by using a map; an ELRF (on ODS and M2A3 vehicles only); or a miniature, eye-safe-laser, infrared observation set (MELIOS). Note how the circle markings can help you position the other features on the range card.

(2) Draw all TRPs and reference points in the sector. Mark each of these with a circled number, starting with 1. Figure 7-14, page 7-28, shows the hilltop as RP 1, one road junction as RP 2, and a second road junction as RP 3. Sometimes a TRP and reference point are the same point, for example, RP 2 and RP 3. This occurs when you use a TRP both to acquire targets and to determine range. Mark the TRP with the first designated number in the upper right quadrant; mark the reference point in the lower left quadrant of the cross. Determine the range to the junction, draw the junction, and then draw the connecting roads from the road junction.

(3) Show dead space as an irregularly shaped area with diagonal lines drawn inside (Figure 7-15, page 7-29). For any object that prohibits observation or coverage with direct fire, extend the circle and diagonal lines to the farthest maximum engagement line. If the

area beyond the dead space is engageable, close the circle. For example, you would close the dead space outline in an area of lower elevation, because you could not engage the area beyond it.

(4) Figure 7-16, page 7-30 shows how to draw and identify each MEL. Draw it along the weapon's maximum effective engagement range, except where dead space limits range. In these cases, draw the MEL along the front (near) edge of the dead space. For an example of an exception to this guidance, note how Figure 7-15, page 7-29, shows the MEL for HE extending beyond the dead space. This indicates a higher elevation where HE area suppression is possible. MELs are not drawn through dead spaces. The maximum effective ranges for Bradley weapon systems are--

- Coax -- 900 meters (tracer burnout)
- APDS-T -- 2,000 meters (tracer burnout)
- APFSDS-T -- 2,500 meters (tracer burnout)
- HEI-T -- 3,000 meters (self destruct)
- Basic TOW -- 3,000 meters (impact)
- TOW 2 -- 3,750 meters (impact)

(5) Figure 7-17, page 7-31, shows the WRP as a line with a series of arrows extending from a known terrain feature, pointing toward the Bradley symbol. Number that terrain feature last. Mark the WRP location's six-digit grid coordinates. When no terrain feature is designated as the WRP, use the range card's REMARKS block to show the vehicle's location as an eight-digit grid coordinate. (In Figure 7-16, page 7-30, the WRP is number 4.)

NOTE: When the vehicle's location prevents you from drawing the WRP precisely on the sketch, then draw it to the left or right of the vehicle and nearest the actual direction.

STANDARD RANGE CARD
For use of this form see FM 7-7J. The proponent agency is TRADOC.

SQD _____
PLT _____
CO _____

May be used for all types of direct fire weapons.

MAGNETIC NORTH

DATA SECTION

POSITION IDENTIFICATION _____ DATE _____

WEAPON _____ EACH CIRCLE EQUALS 400 METERS

NO.	DIRECTION/DEFLECTION	ELEVATION	RANGE	AMMO	DESCRIPTION

REMARKS: _____

DA FORM 5517-R FEB 86

Figure 7-12. Example of circle value.

STANDARD RANGE CARD
For use of this form see FM 7-7J. The proponent agency is TRADOC.

SQD _____
PLT _____
CO _____

May be used for all types of direct fire weapons.

MAGNETIC NORTH

DATA SECTION

POSITION IDENTIFICATION _____ DATE _____

WEAPON _____ EACH CIRCLE EQUALS 400 METERS

NO.	DIRECTION/DEFLECTION	ELEVATION	RANGE	AMMO	DESCRIPTION

REMARKS: _____

DA FORM 5517-R FEB 86

Figure 7-13. Example of terrain features for left and rights limits.

STANDARD RANGE CARD

For use of this form see FM 7-7J. The proponent agency is TRADOC.

SQUAD _____	May be used for all types of direct fire weapons.	MAGNETIC NORTH			
PLATOON _____					
COMPANY _____					
POSITION IDENTIFICATION		DATE			
WEAPON		EACH CIRCLE EQUALS <u>400</u> METERS			
NO.	DIRECTION/DEFLECTION	ELEVATION	RANGE	AMMO	DESCRIPTION
REMARKS:					

DA FORM 5517-R FEB 86

Figure 7-14. Example of reference points and target reference points.

STANDARD RANGE CARD
For use of this form see FM 7-7J. The proponent agency is TRADOC

SQD _____
PLT _____
CO _____

May be used for all types of direct fire weapons.

MAGNETIC NORTH

DATA SECTION

POSITION IDENTIFICATION _____ DATE _____

WEAPON _____ EACH CIRCLE EQUALS 400 METERS

NO.	DIRECTION/DEFLECTION	ELEVATION	RANGE	AMMO	DESCRIPTION

REMARKS: _____

DA FORM 5517-R FEB 86

Figure 7-15. Examples of dead spaces.

STANDARD RANGE CARD
For use of this form see FM 7-7J The proponent agency is TRADOC

SQD _____
PLT _____
CO _____

May be used for all types of direct fire weapons.

MAGNETIC NORTH

32 28 24 20 16 12 8 DATA SECTION 8 12 16 20 24 28 32

POSITION IDENTIFICATION _____ DATE _____

WEAPON _____ EACH CIRCLE EQUALS 400 METERS

NO.	DIRECTION/DEFLECTION	ELEVATION	RANGE	AMMO	DESCRIPTION

REMARKS: _____

DA FORM 6517-R FEB 86

Figure 7-16. Example of maximum engagement line.

STANDARD RANGE CARD
For use of this form see FM 7-7J The proponent agency is TRADOC

SQD _____
PLT _____
CO _____

May be used for all types of direct fire weapons.

MAGNETIC NORTH

DATA SECTION

POSITION IDENTIFICATION _____ DATE _____

WEAPON _____ EACH CIRCLE EQUALS 400 METERS

NO.	DIRECTION/DEFLECTION	ELEVATION	RANGE	AMMO	DESCRIPTION

REMARKS:

DA FORM 6517-R FEB 88

Figure 7-17. Example of weapon reference point.

c. Complete the data section (Figure 7-18, page 7-33).

(1) **Position Identification**. Clearly mark each kind of position as to whether it is primary, alternate, or supplementary.

(2) **Date**. Enter the date and time the range card was completed. Because range cards, like fighting positions, must be updated constantly, the date and time are vital in determining current data.

(3) **Weapon**. Enter "M2" and the vehicle's bumper number.

(4) **Each Circle Equals _____ Meters**. Write in the distance, in meters, between circles.

(5) **NO (Number)**. Start with left (L) and right (R) limits, then list TRPs and RPs in numerical order.

NOTE: The platoon leader may dedicate a vehicle as an AP, HEI-T, or TOW target IAW platoon SOP or METT-TC.

STANDARD RANGE CARD
For use of this form see FM 7-7J The proponent agency is TRADOC

SQD 1
PLT 2
CO C

May be used for all types of direct fire weapons

MAGNETIC NORTH

POSITION IDENTIFICATION PRIMARY DATE 3 MAR 89 / 1140 HRS

WEAPON M2 C-21 EACH CIRCLE EQUALS 400 METERS

NO.	DIRECTION/DEFLECTION	ELEVATION	RANGE	AMMO	DESCRIPTION
L	350° / 5800 m	0 m	2000 m	TOW 2	FARM HOUSE
R	105° / 920 m	+10 m	2600 m	TOW 2	R/SIDE WOODLINE
1	6400 m	+30 m	3200 m	TOW 2	RP - HILLTOP
2	5910 m	+10 m	2700 m	TOW 2	TRP - AB002 RJ
3	60 m	-10 m	1800 m	TOW 2	TRP - AB003 RJ

REMARKS:
4 WRP - RJ AT LN 13629411, 100° AT 320 M

DA FORM 5517-R FEB 88

Figure 7-18. Example completed DA Form 5517-R, Standard Range Card.

(6) **Direction/Deflection.** Use a lensatic compass to determine the direction in degrees. The most accurate technique is to have the gunner aim at the terrain feature, then to have the driver dismount and align himself with the gun barrel and the terrain feature to measure the azimuth. To determine the correct deflection and elevation readings for the

terrain feature, select TOW. Obtain the deflection reading from the BFV's azimuth indicator, in the deflection block next to the magnetic azimuth

(7) **Elevation.** Show the gun elevation reading in tens or hundreds of mils (Figure 7-19). The smallest increment of measure on the elevation scale is tens of mils. Precede any number other than zero with a plus (+) or minus (-) sign to show whether the gun needs to be elevated (+) or depressed (-). Index ammunition and range to obtain an accurate elevation reading.

(8) **Range.** Record the distances, in meters, from the vehicle position to the left limit, to the right limit, and to each TRP and RP.

(9) **Ammo.** List types of ammunition used.

(10) **Description.** Enter the name of the object such as farmhouse, wood line, or hilltop.

(11) **Remarks.** Enter the WRP data. As a minimum, describe the WRP, give a six-digit or eight-digit grid coordinate of the WRP, identify the magnetic azimuth, and state the distance from the WRP to the vehicle position.

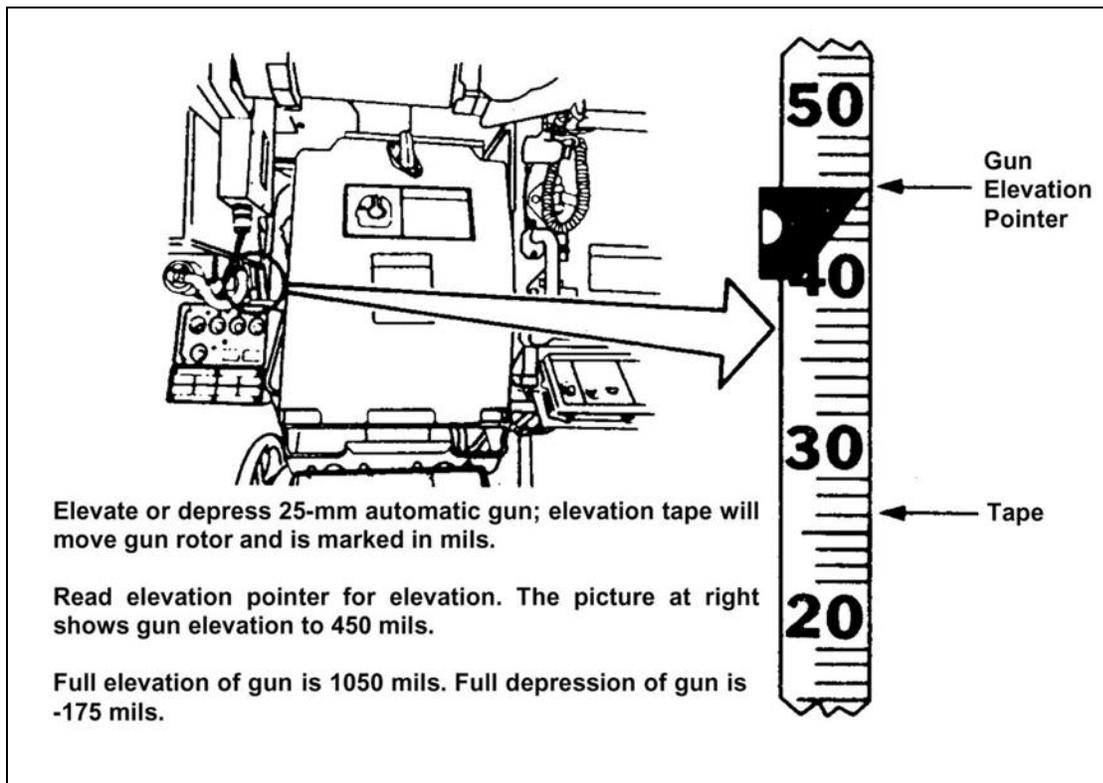


Figure 7-19. Gun elevation pointer.

d. Complete the marginal information at the top of the card (Figure 7-18, page 7-33).

(a) **Unit Description.** Include the bumper number, platoon, and company. Never identify a unit higher than company.

(b) **Magnetic North.** Orient the range card with the terrain and draw the magnetic north arrow pointed in the appropriate direction.

7-23. DIGITAL RANGE CARD OVERLAY

With the aid of the appliqué armor and the IC3, which are found in the M2A2 ODS and M2A3 Bradleys, the standard range card can be shown on a digital overlay. However, the digital overlay should complement, not replace, the standard range card.

a. You can create a digital map and overlay. On this digital map, use the mouse or keyboard to draw lines to represent the left and right limits for both primary and secondary sectors of fire (Figure 7-20). You can then add digital icons for maximum engagement lines and target reference points (Figures 7-21 and 7-22, page 7-36), reference points, and weapon reference points.

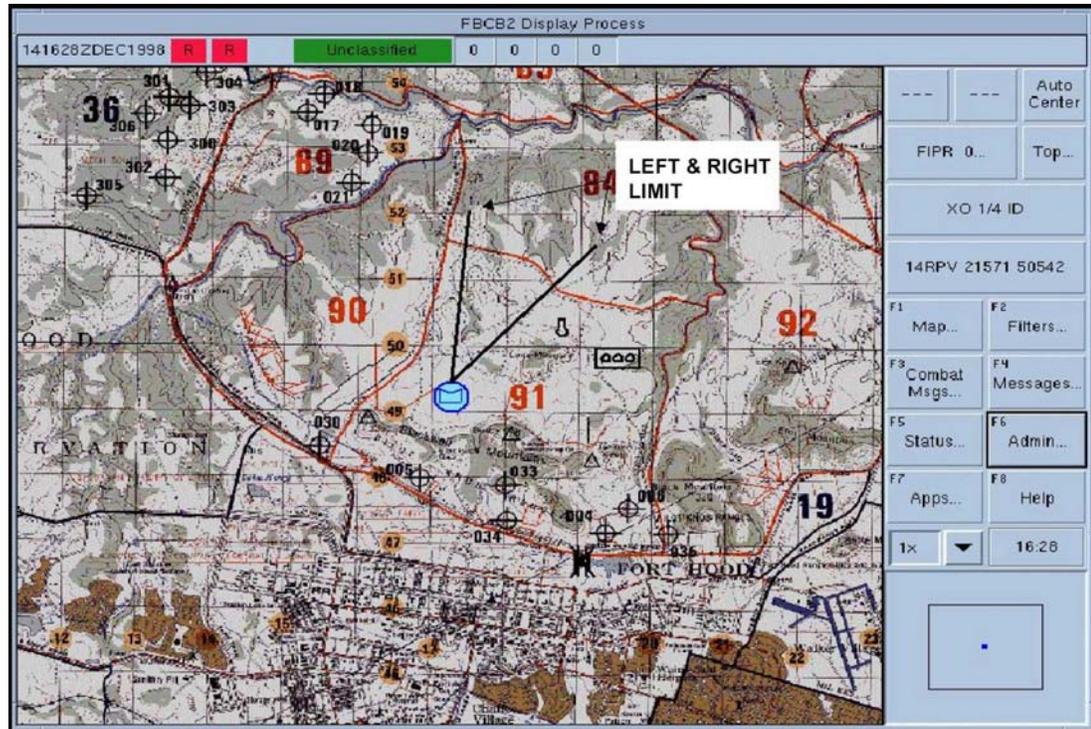


Figure 7-20. Example of digital range card showing left and right sector limits.

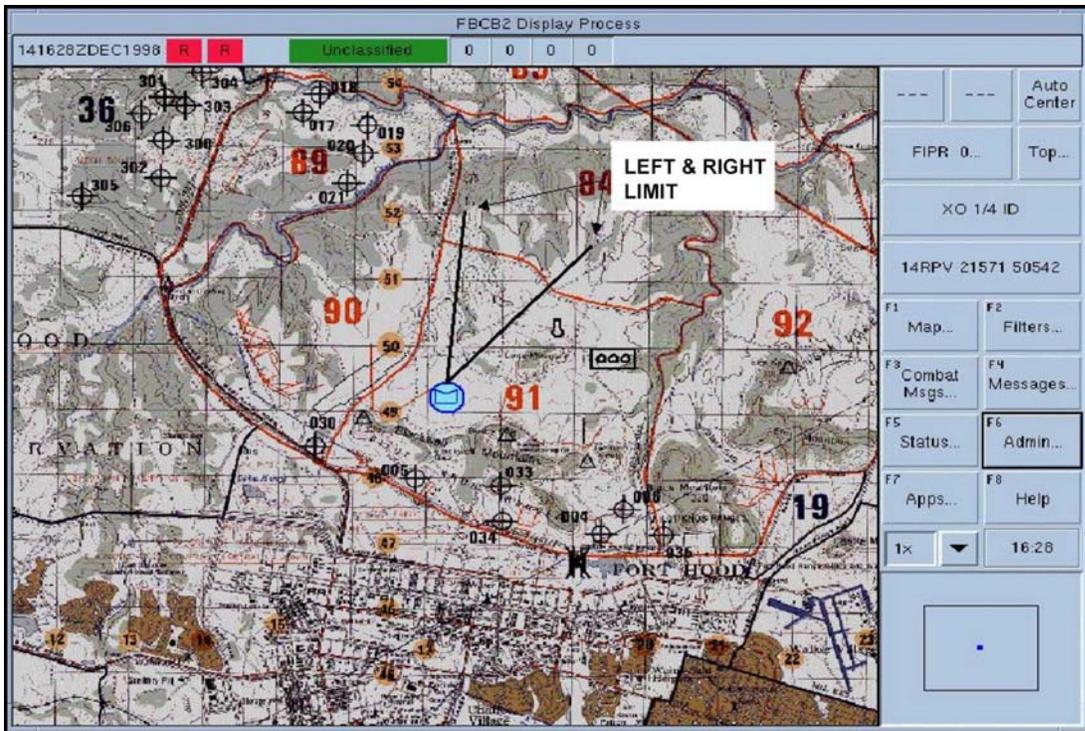


Figure 7-21. Example of digital range card showing maximum engagement lines.

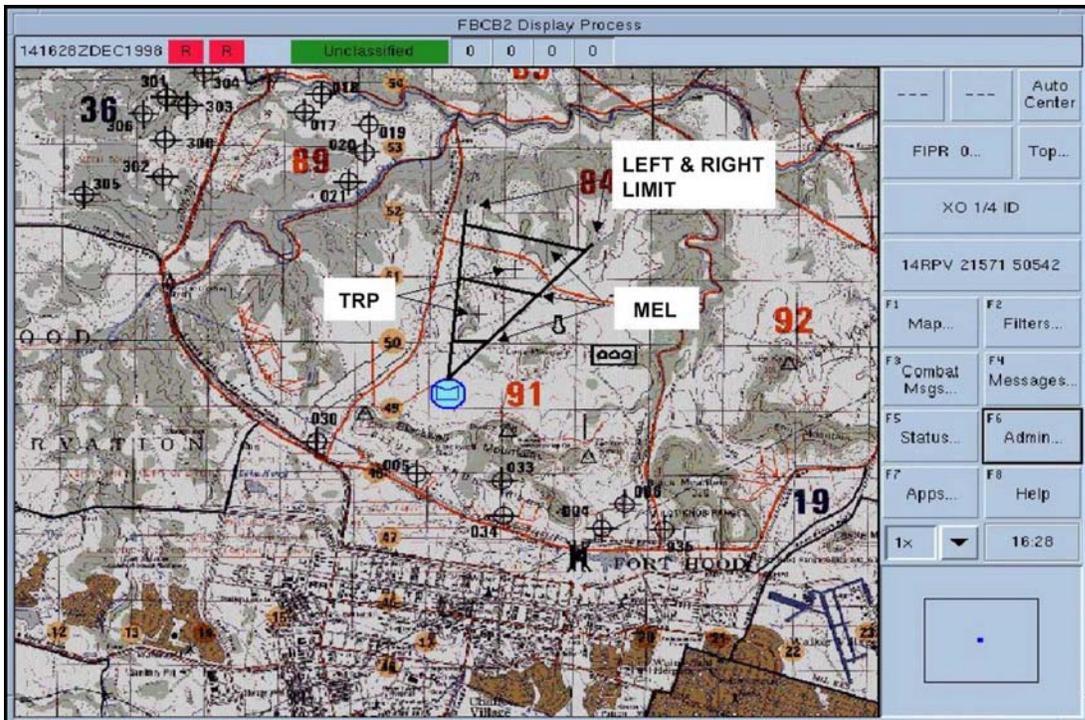


Figure 7-22. Example of digital range card showing TRPs.

b. Send the range card's data section information along with an overlay. To do this, use the free-text data box on the overlay message. You can obtain some digital information by clicking on the icon shown on the overlay.

c. Address and electronically send the overlay to the platoon leader. He can change the overlays to overlap sectors of fire. He then electronically sends back the overlays to each vehicle or squad so they can adjust their overlays accordingly. From the range card overlays, the platoon leader creates his platoon sector sketch, which he then sends electronically to the company commander.

NOTE: Keep one copy of the standard range card with the vehicle. Send the other copy, along with the digital range card, to the platoon leader.

7-24. FIRING POSITION

After a range card has been completed, the position should be marked with ground stakes. This enables the Bradley (or a replacement Bradley) to reoccupy the position and use the range card data.

a. **Stake the Position.** Before the driver moves the Bradley, stake the position. Three stakes are required to mark the position effectively (Figure 7-23).

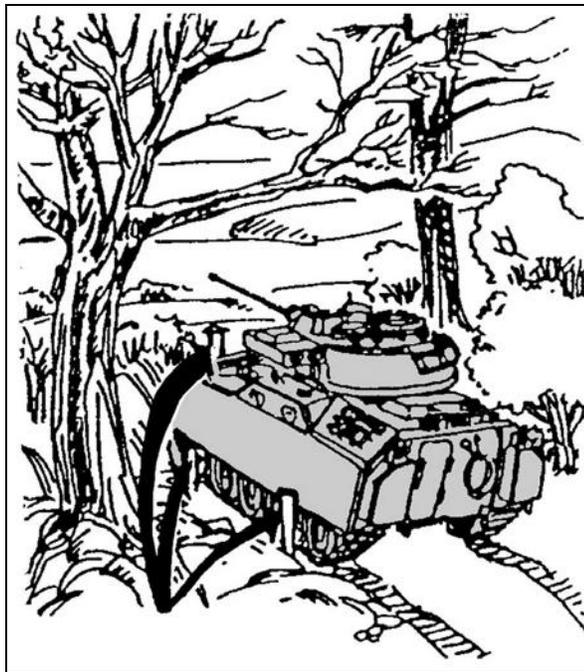


Figure 7-23. Staked position.

(1) Place one stake in front of the Bradley. Center it on the driver's station, just touching the hull. Use a stake long enough for the driver to see it when the vehicle is in position. Place the other two stakes parallel to the left track. Line up one stake with the hub on the front wheel and line up the other with the rear wheel. Place the stakes close to the Bradley, leaving only enough clearance to move the Bradley into position.

(2) Drive the stakes firmly into the ground. Place engineer tape or luminous tape on the friendly side of the stakes so that the driver can see them. Place a rock at each of the

front two corners of the vehicle. This will help the driver reoccupy the position if the stakes are lost.

(2) ***Move into the Position.*** If the situation permits, have a ground guide assist the driver.

(a) If you cannot use a ground guide due to enemy fire, the driver moves the Bradley in, parallel to the side stakes, with the front stake centered on his station.

(b) Once the Bradley is in position, the gunner indexes the range and azimuth for one of the TRPs on the range card. If the sight is aligned on the TRP, the Bradley is correctly positioned. If the sight is not aligned on the TRP, the gunner should tell the driver which way to move the vehicle to align the sight on the target. You should only have to make minor adjustments.

(c) If the stakes are lost and the position is not otherwise marked, the vehicle is moved to the approximate location. The BC or gunner can use a compass to find the left and right limits. If time allows, the driver then moves the vehicle until it is within 6 to 8 inches of the exact position.

7-25. TASK

Figure 7-24 shows the Bradley range card task.

PREPARE A BRADLEY RANGE CARD

CONDITIONS

Given a fully operational Bradley, sector of fire, compass, paper, pencil, map (1:50,000), three marking stakes, and DA Form 5517-R, *Standard Range Card*.

STANDARDS

Within 15 minutes, the crew prepared a range card that showed the target area, to include--

1. Weapon symbol.
2. Circle value.
3. Sectors of fire.
4. Target reference points or reference points.
5. Dead space.
6. Weapon reference point.
7. Magnetic north.
8. Identification data.
9. Target or sector data.

EVALUATION PROCEDURES

1. **Administrative Process.** At this task, the evaluator logs information about each crewmember on a roster. He supplies the crewmember with all required materials and equipment, displaying them IAW this manual. He uses the performance measures to record the crewmember's performance. Afterward, he tells the crewmember how well the crewmember performed on this task and directs him to the next task or to further training. One evaluator can test one--and only one--crewmember at a time.

2. **Procedures Used When Personnel Receive a NO GO.** If a crewmember fails to achieve the standards on the performance measures, he earns a NO GO. When this happens, the evaluator explains to the crewmember what he did wrong and how to correct his mistakes. Then, he retests the crewmember IAW local SOP.

PERSONNEL, EQUIPMENT, AND MATERIAL REQUIRED

- Qualified 11B, 12B, 13F, 14R, or 19D, sergeant or above.
- Operational M2, M2A2, M2A2 ODS, M2A3 or M3, M3A2, M3A2 ODS, or M3A3 with BII.
- FM 3-22.1.
- Stopwatch.
- Compass.
- Clipboard with pen.

Figure 7-24. Range card task.

- Three stakes per vehicle.
- One helper, qualified 11B, 12B, 13F, 14R, or 19D, sergeant or below.

PRETEST PREPARATION

1. Ensure equipment is operational.
2. Ensure turret is positioned at 6400 mils.
3. Ensure travel lock is engaged.

PRETEST CONDITIONS FOR EACH EXAMINEE

1. Issue a blank range card.
2. Issue a pencil and a compass.
3. Turn on turret power and drives.
4. Point out left and right limits and reference point.

TEST PLANNING TIME

Administration	5 minutes
Test	15 minutes
Total	20 minutes

INSTRUCTIONS TO EXAMINEE

The evaluator will read the following instructions aloud to the examinee:

"Let me have your attention. At this task, you will be tested on your ability to prepare a Bradley range card. Do you understand these instructions?"

Pause for 5 seconds, then say—

"You will have fifteen minutes to complete each test."

Pause, then say--

"Begin."

Begin timing as soon as you give the command "BEGIN." If the examinee has not completed each task after the allowed time, say loudly enough for the examinee to hear--

"Stop."

If at any time you think that the examinee is going to damage the equipment or injure himself, say--

"Stop."

PERFORMANCE MEASURES

1. Completed performance measures within 15 minutes.
2. Prepared a Bradley range card.

Figure 7-24. Range card task (continued).

- a. Indicated identification data.
 - (1) Indicated unit identification.
 - (2) Indicated magnetic north.
- b. Filled in sketch portion.
 - (1) Indicated weapon position by proper symbol.
 - (2) Indicated left and right limits.
 - (3) Indicated circle value.
 - (4) Indicated TRPs or RPs.
 - (5) Indicated dead space.
 - (6) Indicated maximum engagement lines.
 - (7) Indicated weapon reference point.
- c. Filled in data section.
 - (1) Indicated position identification.
 - (2) Indicated vehicle type or bumper number.
 - (3) Indicated circle value in meters.
- d. Indicated target information.
 - (1) Indicated left and right limits.
 - (2) Indicated TRPs.
 - (3) Indicated RPs.
 - (4) Indicated WRPs.
- e. Indicated date and time.

Figure 7-24. Range card task (continued).

CHAPTER 8

Crew Gunnery

Crew gunnery leads to section and platoon qualification. This training consists of progressive tables to develop crew gunnery skills, which include engaging and destroying single and multiple targets from a stationary or moving BFV in a wide variety of conditions.

The tables and their evaluations focus on the individual crew's collective ability to operate the BFV in all of its configurations, that is, with all of its common and specialized systems and capabilities. Crew gunnery focuses on tasks that occur inside the turret (Figure 8-1).

Commanders can tailor the events based on their contingency AO and METL. Their options extend to target type and target engagement ranges.

Guidelines and procedures supplement the crew gunnery tables and tasks to aid the commander in executing and evaluating crew gunnery.

Bradley Crew Gunnery Tables	Application	Page
BT I, Crew Defense		
Figure 8-13	All crews	8-25
BT II, Crew Proficiency Course		
Figure 8-14A	ODS and below	8-27
Figure 8-14B	ADA Linebacker	8-28
Figure 8-14C	A3	8-29
Figure 8-14D	BFIST	8-30
BT V, Crew Practice 1		
Figure 8-15	All crews	8-35
BT VI, Crew Practice 2		
Figure 8-16A	ODS and below	8-37
Figure 8-16B	ADA Linebacker	8-38
Figure 8-16C	A3	8-39
Figure 8-16D	BFIST	8-40
BT VII, Crew Practice 3		
Figure 8-17A	ODS and below	8-41
Figure 8-17B	ADA Linebacker	8-42
Figure 8-17C	A3	8-43
Figure 8-17D	BFIST	8-44
BT VIII, Crew Qualification		
Figure 8-18A	ODS and below	8-45
Figure 8-18B	ADA Linebacker	8-46
Figure 8-18C	A3	8-47
Figure 8-18D	BFIST	8-48

Figure 8-1. Bradley crew gunnery tables.

Section I. EVALUATION

Evaluators need clear standards to measure the crew's proficiency in Bradley gunnery. FM 3-90.1 requires leaders to evaluate collective training in the TPU format, so this section follows that doctrine. The evaluator observes each crew's teamwork, specifically in the areas of coordination, weapons system proficiency, and marksmanship. He evaluates the crew as "T" (trained), "P" (needs practice), or "U" (untrained), based on the GOs and NO GOs they receive.

8-1. ENGAGEMENT STANDARDS

Engagement standards consist of task and subtask standards. The crew must meet task standards to succeed in the engagement. Each task standard comprises a combination of critical, leader, and noncritical subtask standards. Critical subtasks must be accomplished to meet the engagement task standards. Leader and noncritical subtasks support the engagement task. The task standards apply to every engagement. Figure 8-2 shows engagement evaluation criteria for crew gunnery.

T	GO	On all task standards On all critical subtask standards On all leader subtask standards
	NO GO	No more than one NO GO on a noncritical subtask standard.
P	GO	On all task standards On all critical subtask standards
	NO GO	On one or more leader subtask standards
		OR On two or more noncritical subtask standards.
U	NO GO	On one or more task standards OR On one or more critical subtask standards.

Figure 8-2. Criteria for evaluating crew gunnery engagements.

8-2. TASK STANDARDS

Engagement task standards require the crew to hit a given target with an appropriate number and type of rounds without exposing the BFV beyond the given target's threat time to engage the Bradley. Crews will receive full or no credit for an engagement. To receive credit for the overall engagement, the crew must kill all targets in an engagement IAW the appropriate engagement standards.

a. **Target Kill Standards.** Figure 8-3 shows crew-gunnery kill standards. Crews receive a "U" (untrained) rating if they fail to achieve a kill IAW Figure 8-3, or if they use ammunition other than that designated for destroying the target IAW Figure 8-4. Some ammunition types can destroy other types of targets, and some are effective at greater ranges than those shown in Figure 8-4; however, this table identifies the ammunition standard for Bradley gunnery.

TARGET	TARGET TYPE	STANDARDS
TOW Target	Armor	Hit with at least 1 round
25-mm Point Target	Vehicle	Hit with at least 3 rounds
	ATGM	Hit with at least 1 round
25-mm Aerial Target	Helicopter	Hit with at least 5 rounds
25-mm Area Target	Troop	Suppress 75% of target area
Coax Point Target	Troop	Hit 1 target with 1 round
	Truck	Hit with at least 3 rounds
Coax Area Target	Troop	Hit 1 troop target with 1 round
Stinger Target	Fixed-wing aircraft	Hit with at least 1 round

Figure 8-3. Target-kill-standards chart.

TARGETS	DESIGNATED AMMUNITION AND ENGAGEMENT RANGES (IN METERS)				
	STINGER	TOW	AP	HE	COAX
Armored		3,750			
Light-armored		2,500	2,500		
Unarmored			901 to 2,500	901 to 3,000	900
Aerial	5,000		1,201 to 2,500	1,200	
Troops				901 to 3,000	900

Figure 8-4. Target ammunition requirements.

b. **BFV Exposure Matrixes.** BFV exposure matrixes determine the BFV crew's allowable exposure time to a given target. This methodology depends on various threat weapon systems' capabilities. Once the BCE knows the target category, conditions, and range, he refers to the applicable exposure matrix. When using an exposure matrix, the BCE looks at the left-hand column for the target range. He follows that row to the right until it intersects with the number of conditions that apply to that target. The number in the corresponding box is the maximum allowable BFV exposure time for that target. For targets that fall between the 100-meter increments, the BCE rounds the range up or down to the nearest 100 meters. For example, he rounds down 1,550 meters to 1,500 meters; and he rounds up 1,651 meters to 1,700 meters. When he must use alternate targets, such as when he must substitute a stationary target for a moving one, the BCE uses the conditions for the alternate target. The four matrixes include--

(1) **Armored Targets.** This matrix (Figure 8-5) is not based on actual threat capabilities. It is derived from a standard target-acquisition time-plus-the-time-of-flight of the TOW missile. The armored target-timing matrix is based on the Bradley in a turret-defilade position--in either day or night defense.

(2) **Lightly Armored or Unarmored Targets.** This matrix is based on the time a threat target takes to hit a Bradley, BFIST, or Linebacker (Figure 8-6).

(3) ***Aerial Targets***. This matrix is based on the time a threat target takes to hit a Bradley or BFIST (Figure 8-7), or Linebacker (Figure 8-8).

(4) ***Troop Targets***. This matrix is based on the time a threat target takes to hit a Bradley, BFIST, or Linebacker (Figure 8-9).

c. **Matrix Condition**. Times in the lightly armored or unarmored, aerial, and troop matrixes are based on the worst-case threat targets in each category. Three conditions apply to the threat target: NBC environment, moving BFV, and moving threat target. Each condition gives the BFV crew additional time to engage the target, because the threat needs more time to engage the BFV. NBC environments affect the threat's ability to rapidly engage a BFV. When the matrix conditions exist, the threat needs more time to place a hit on the BFV than under normal conditions. And, he finds hitting a BFV more difficult and time-consuming than he would otherwise. The threat on the move needs more time to place effective fire on a BFV. To determine the allowable exposure time to a given target, the BCE must know--

(1) ***Target Category***.

- Armored.
- Lightly armored or unarmored.
- Aerial.
- Dismounted troops.

(2) ***Number of Target Conditions***.

- Normal conditions.
- One, two, or three additional conditions.

(3) ***Target Range***.

BFV			
EXPOSURE MATRIX--ARMORED TARGETS			
RANGE (Meters)	DEFENSE (Seconds)	RANGE (Meters)	DEFENSE (Seconds)
500	24	2,200	32
600	24	2,300	32
700	24	2,400	33
800	25	2,500	33
900	25	2,600	34
1,000	25	2,700	34
1,100	26	2,800	35
1,200	27	2,900	35
1,300	27	3,000	36
1,400	27	3,100	36
1,500	28	3,200	37
1,600	28	3,300	38
1,700	29	3,400	39
1,800	29	3,500	39
1,900	30	3,600	40
2,000	30	3,700	41
2,100	31	3,800	42

Figure 8-5.
BFV exposure matrix for armored targets.

BFV EXPOSURE MATRIX LIGHTLY ARMORED AND UNARMORED TARGETS				
RANGE (Meters)	NORMAL (Seconds)	ONE CONDITION (Seconds)	TWO CONDITIONS (Seconds)	THREE CONDITIONS (Seconds)
400	11	12	16	17
500	12	13	17	18
600	13	14	18	19
700	14	15	19	20
800	14	17	20	21
900	15	18	21	22
1,000	16	19	22	24
1,100	17	20	23	25
1,200	18	21	24	26
1,300	18	22	26	28
1,400	19	23	27	29
1,500	20	24	28	30
1,600	21	25	29	32
1,700	22	26	30	33
1,800	22	28	31	35
1,900	23	29	32	36
2,000	24	30	33	37
2,100	25	31	34	38
2,200	26	32	36	40
2,300	26	33	37	41
2,400	27	34	38	42
2,500	28	35	39	43

NOTE: Beyond 2,000 meters, use the M910E1 round.

**Figure 8-6.
BFV exposure matrix for lightly armored and unarmored targets.**

BFV				
EXPOSURE MATRIX--AERIAL TARGETS				
RANGE (Meters)	NORMAL (Seconds)	ONE CONDITION (Seconds)	TWO CONDITIONS (Seconds)	THREE CONDITIONS (Seconds)
400	9	10	12	16
500	10	11	12	16
600	10	11	13	17
700	10	11	13	17
800	10	11	13	18
900	10	12	14	18
1,000	11	12	14	19
1,100	11	12	14	19
1,200	11	13	15	19
1,300	11	13	15	20
1,400	11	13	15	20
1,500	12	13	15	21
1,600	12	14	15	21
1,700	12	14	16	21
1,800	12	14	16	22
1,900	13	14	16	22
2,000	13	14	16	23
2,100	13	15	16	23
2,200	13	15	17	23
2,300	14	15	17	24
2,400	14	15	17	24
2,500	14	16	17	24

NOTE: For Linebacker or BSFV, use matrix only IAW allowable variation No. 7.

Figure 8-7.
BFV exposure matrix for aerial targets.

Linebacker			
EXPOSURE MATRIX--AERIAL TARGETS			
ROTARY-WING		FIXED-WING	
Range	Time	Range	Time
1,000 M	20 seconds	2,000 M	30 seconds
1,500 M	25 seconds	2,500 M	35 seconds
2,000 M	30 seconds	3,000 M	40 seconds
2,500 M	35 seconds	3,500 M	45 seconds
3,000 M	40 seconds	4,000 M	50 seconds
NOTE: Use this table only with RPVTS.			

Figure 8-8.
Linebacker exposure matrix for aerial targets.

BFV EXPOSURE MATRIX DISMOUNTED TROOP TARGETS			
RANGE (Meters)	NORMAL (Seconds)	ONE CONDITION (Seconds)	TWO CONDITIONS (Seconds)
300	8	10	13
400	9	10	14
500	9	11	14
600	9	11	15
700	10	12	16
800	10	12	16
900	11	13	16
1,000	11	13	16
1,100	12	14	17
1,200	12	14	17
1,300	12	15	18
1,400	12	15	19
1,500	13	16	19
1,600	13	17	20
1,700	14	17	20
1,800	14	18	21
1,900	15	18	22
2,000	15	19	23
2,100	16	19	23
2,200	16	20	24
2,300	17	20	25
2,400	17	21	25
2,500	18	21	26

Figure 8-9.
BFV exposure matrix for dismounted troop targets.

d. **Timing Procedures.** The BCE must record BFV exposure times for each task fired, even when using computers. Exposure time measures how long the firing BFV is exposed to any threat target(s). Timing procedures apply for single and multiple target engagements. During multiple target engagements, the BCE times each target separately. He determines timing as described, without variations.

e. **Offensive or Retrograde Engagements.** In an offensive or retrograde engagement, the firing BFV is exposed in the open and on the move. Target exposure (presentation) indicates threat engagement time has begun.

(1) **Time Starts.** Time starts when the target or simultaneous targets are fully exposed (target lock) or when the crew fires the first round, whichever occurs first.

(2) **Time Stops.** Timing stops for each target in an engagement when the target is killed or when its exposure time expires.

f. **Defensive Engagements.** In a defensive engagement, the firing BFV starts in turret defilade, moves into hull defilade to engage target(s), then returns to turret defilade.

(1) **Time Starts.** Time starts when either a crew fires the first round, or when all targets are fully exposed (target lock) and the firing vehicle is stopped in a hull-defilade position.

NOTE: Threat time starts for turret-defilade armored engagements when all targets are fully exposed.

(2) **Time Stops.** Time stops for each individual target if, during an engagement, the firing vehicle begins to move back into a turret-defilade position, the target is killed, or the target exposure time expires.

(3) **Time Resets.** If BFV exposure time has not been exceeded, then time resets when the firing vehicle begins to move back into a turret-defilade position.

g. **Coax Area Engagements.** In a defensive engagement, the firing BFV starts in the turret defilade, then moves into hull defilade to engage coax area targets. For coax area engagements, time stops when one IRETS target is killed.

h. **Linebacker.** In an offensive or defensive engagement, the Linebacker may engage aerial targets from the turret-defilade position or on the move. Linebacker crews use slew-to-cue function on aerial engagements.

(1) **Time Starts.** Time starts when the local air-defense warning "DYNAMITE-DYNAMITE" sounds (aerial engagements only).

(2) **Time Stops Again.** Time stops when the launcher superelevates (Stinger engagement only).

i. **BFV Exposure Standard.** If a crew is exposed to a target longer than the allotted time (IAW Figure 8-5 through Figure 8-9), the crew receives an untrained rating for the engagement.

(1) **Engagement Example 1.** A BFV in the defense, during NBC conditions, during a day engagement, engages a moving BTR-80 at 1,200 meters and an ATGM team at 600 meters (Figure 8-10).

TARGET	POSTURE	RANGE	SIGHT AND CONDITIONS	BFV EXPOSURE TIME (Threat Time to Hit)	TARGET EXPOSURE TIME
BTR-80	Moving, NBC	1,200 M	2 conditions	24 seconds	50 seconds
ATGM	NBC	600 M	1 condition	11 seconds	50 seconds

Figure 8-10. Example 1 conditions and exposure times.

(a) **Description.** The BFV moves from a turret-defilade to a hull-defilade position (time starts for both targets), engages and kills the BTR-80, and returns to the turret-defilade position (time stops for both targets). The BFV was exposed to both the BTR-80 and ATGM team for a total of 12 seconds (time is reset). The BFV then returns to a hull-defilade position (time starts) and engages and kills the ATGM team (time stops). The

BFV was exposed for 8 seconds. The BFV engaged and destroyed the BTR-80 in 12 seconds and had 24 seconds to do so. Although the BFV killed the BTR-80 within the allotted time and killed the ATGM team, the crew receives a NO GO in accordance with the BFV exposure-time matrix (Figure 8-9). Therefore, the crew receives a "U" rating on this engagement.

(b) *Rationale.* When the BFV assumed a hull-defilade position the first time, the BFV became exposed to both the BTR-80 and the ATGM team. The threat time to hit a BFV for an ATGM team at 600 meters with 1 condition is 11 seconds. When the BFV exposed itself for 12 seconds while engaging the BTR-80, this allowed time for the ATGM team to hit the BFV. The crew engaged the least dangerous target first.

(2) **Engagement Example 2.** A BFV in the offense or in retrograde, during a day engagement, engages a moving BTR-80 at 1,200 meters and an ATGM team at 600 meters (Figure 8-11).

TARGET	POSTURE	RANGE	SIGHT AND CONDITIONS	BFV EXPOSURE TIME (Threat Time to Hit)	TARGET EXPOSURE TIME
BTR-80	Moving	1,200 M	2 conditions	24 seconds	24 seconds
ATGM	---	600 M	1 condition	11 seconds	11 seconds

Figure 8-11. Example 2 conditions and exposure times.

(a) *Description.* The BFV is moving in offense or retrograde. Both targets are exposed simultaneously; therefore, the BFV is exposed to both threats (time starts for both targets). The BFV engages the BTR-80 first and kills it in 22 seconds (time for the BTR-80 stops). During the BTR-80 engagement, the ATGM's 11-second exposure time expired (the range computer dropped the target). The BFV cannot achieve a target kill on the ATGM in accordance with Figure 8-2. The crew receives a NO GO in accordance with both the target kill standards in Figure 8-2 and the BFV exposure-to-dismounted-troop target-timing matrix in Figure 8-9. The crew is rated untrained (U) for this engagement.

(b) *Rationale.* When the ATGM and BTR-80 were exposed simultaneously, the BFV was exposed to both targets and target exposure time had begun. Although the BFV killed the BTR-80 before the BTR-80 exposure time expired, the BFV failed to hit the ATGM before the BFV target exposure time had expired. The crew engaged the least dangerous target first.

(c) *Additional Notes.* First, on ranges that do not have defilade positions, markers must be placed in the ground to assist the BCE in determining when the firing vehicle is exposed and when it has returned to a defilade position. The vehicle must move at least one vehicle length when moving into and out of the defilade position. Second, on computer-controlled ranges, scenarios must be adjusted to ensure multiple targets are programmed to lift at the same time, if possible. Third, fire commands are given only after targets are exposed.

8-3. CRITICAL SUBTASK STANDARDS

Critical subtask standards evaluate the crew's ability to engage targets in less than normal operating conditions. If the crew does not meet all the applicable subtask standards, the engagement task standards cannot be met. The crew is assessed an untrained rating on the given engagement task.

a. **Auxiliary Sight.** Crew engages target(s) using the auxiliary sight. Gunner uses the auxiliary sight to engage target(s) and the commander does not view through the commander's sight extension. When conducting the auxiliary sight engagement on the A3, crew executes engagement in GUNPOWER TRACK mode.

b. **NBC Environment.** Crew engages target(s) in an NBC environment.

(1) Vehicle crew must be in MOPP 4 in accordance with STP 21-1-SMCT.

(2) Crewmembers close all vehicle hatches.

(3) All crewmembers must restore intravehicular communication with each other.

(4) Bradley commander must restore radio communication with exercise controllers.

c. **Manual Controls.** Crew engages target(s) using manual controls.

(1) Gunner must place traverse drive select lever in manual position.

(2) Gunner must place the gun elevation drive select lever in manual position.

(3) Gunner must engage target(s) using the traverse and elevation manual handwheels and trigger.

(4) Gunner can use his handstation to switch from low to high magnification and on A3 models.

(5) Gunner can use his handstation to lase on the on A2 ODS and on A3 models during manual engagements. They will still have to use the manual range knob, since the system will not superelevate in the manual configuration.

d. **Commander's Handstation.** Commander engages target(s) using the commander's handstation.

e. **Friendly Targets.** Crew does not engage friendly target(s).

(1) Crew must identify target(s) as friendly.

(2) Crew does not fire on friendly target(s).

(3) Crew reports friendly target(s) in sector to exercise controllers.

f. **Stinger Subsystem (Linebacker Only).** Linebacker crews engage target(s) using the Stinger subsystem.

(1) Gunner's hatch must be closed.

(2) Gunner places Stinger control box in engage mode and arms Stinger system.

(3) Gunner interrogates target.

(4) Gunner activates missile.

(5) Commander and gunner ensure acquisition tone is heard.

(6) Gunner uncages missile.

(7) Commander and gunner ensure missile lock tone is heard.

(8) Gunner fires the system.

8-4. LEADER SUBTASK STANDARDS

The leader subtask evaluates the Bradley commander's ability to control the crew, vehicle, and weapon systems. Without this control, engagements will not be synchronized, and efficiency will suffer.

a. **Fire Commands.** Bradley commander uses proper fire commands for each engagement.

(1) The BC must include the required elements of a precision fire command in sequence during single- or multiple-target defensive engagements. Bradley ODS and A3 commanders must include the required elements of a precision fire command in sequence, but the "range" element is optional.

- Alert.
- Ammunition and weapons.
- Description.
- Range (optional for Bradley ODS and A3 models).
- Execution.
- Termination.

(2) The BC must include the required elements of a battlesight fire command in sequence during single-target offensive or retrograde engagements. Bradley ODS and A3 commanders must use the elements of a precision fire command (as previously discussed) for offensive or retrograde engagements and the elements of a battlesight fire command when in the system degraded mode (ELRF failure). The elements are the same for each:

- Alert.
- Battlesight.
- Description.
- Execution.
- Termination.

(3) If the Bradley commander uses a multiple precision-fire command, he must include the required elements in sequence for multiple-target defensive engagements. If the Bradley ODS or A3 commander uses a multiple precision fire command, he must include the required elements in sequence during multiple-target defensive engagements; "range" element is optional.

- Alert.
- Ammunition, weapon, or both (first target).
- Description (of all targets, after which, first target is described again).
- Range (optional for Bradley ODS and A3 models.)
- Execution.
- Termination (first target).
- Ammunition, weapon, or both (second target).
- Description (second target).
- Range (optional for ODS and A3 models).
- Execution.
- Termination (final target).

(4) If the Bradley commander uses a multiple battlesight fire command during a multiple-target offensive or retrograde engagement, then he must include the required elements in sequence. If the Bradley ODS or A3 commander uses a multiple fire command, then he must include all of the required elements of a precision fire command

for offensive or retrograde engagements. With an ELRF failure, he uses the required elements of a battlesight fire command.

- Alert.
- Battlesight.
- Description (of all targets, after which, first target is described again).
- Execution.
- Termination (first target).
- Description (second target).
- Execution.
- Termination (final target).

(5) The commander must include required elements of Stinger fire command in sequence for both defensive and offensive engagements.

- Alert.
- Ammunition.
- Description.
- Execution.
- Termination.

b. **Most Dangerous First.** The commander ensures the crew engages the most dangerous target first.

c. **Ammunition and Weapon.** The commander ensures that the crew selects the proper ammunition and weapons systems for the target(s) are selected IAW Figure 8-3 and unit-engagement criteria.

d. **Distance Moved.** When going to and from a turret-defilade to a hull-defilade position, the commander ensures the vehicle moves at least one-vehicle length.

e. **Command to Fire.** The commander ensures gunner does not fire before receiving the command to fire.

f. **Digital Systems.** The crew uses the digital system for Linebacker, Bradley ODS, and A3 IC3. The commander must send both a SALT and a situation report upon completion of the day and night phases. In each phase (day and night), the only firing task on which the evaluator scores the use of the digital system is the last engagement.

8-5. NONCRITICAL SUBTASK STANDARDS

Noncritical subtask standards apply to the techniques and procedures crews use for successful engagements. Even if the crew fails to meet these subtask standards, they can still meet the engagement task standards.

a. **Response Terms.** Commander or gunner must use proper response terms in support of the leader subtask standards.

(1) Gunner confirms target by announcing "*Identified.*" (For Bradley ODS and A3 models, see Chapter 6.)

(2) Commander or gunner announces, "*Cannot identify*" when he can not identify the target.

(3) Gunner announces "*Cannot engage*" when he is inhibited from firing and the commander must engage the target(s).

(4) Commander or gunner notifies the crew by announcing "*On the way*" before he fires a weapon system.

(5) When the proper target effect has been determined, the gunner announces, "*Target destroyed.*"

b. **Engagement Techniques.** Commander or gunner uses proper engagement techniques IAW Chapter 6.

(1) Commander or gunner fires a sensing round; two if the ammunition has changed; then fires a 3- to 5-round burst (25-mm point targets).

(2) Commander or gunner fires a 10- to 15-round initial burst; then fires an additional 10- to 15-round burst(s) at point targets until target is destroyed (coax point targets).

(3) Commander or gunner fires a 10- to 15-round initial burst at center mass, then fires an additional 10- to 15-round burst in a suppressive pattern (coax area targets).

(4) Commander or gunner fires a 15- to 20-round burst (25-mm) while adjusting on the target (aerial target).

(5) The Bradley A3 commander or gunner fires a 3- to 5-round burst without a sensing round, except when using the auxiliary sight, or when the ELRF is not operational

c. **Driving Techniques.** Driver uses proper driving techniques:

(1) Returns to the turret-defilade position after a defensive engagement.

(2) Maintains a steady platform while in an offensive or retrograde engagement.

(3) Stays on course roads as briefed in the range safety briefing.

(4) Does not cause damage to the Bradley.

(5) Does not exceed the established range speed limit.

(6) Driver avoids stalling the vehicle.

d. **Defensive Techniques.** Crew uses proper defensive techniques:

(1) Gunner raises TOW launcher (SVML for Linebacker) before first engagement in the defensive position.

(2) Gunner lowers TOW launcher (SVML for Linebacker) before movement from the defensive position. (This standard applies to the last defensive engagement in that position.)

e. **Suppression Techniques.** Commander or gunner uses an effective suppression technique to achieve suppression for coax area targets.

8-6. CREW DEVICE-GUNNERY STANDARDS

Crew device gunnery consists of BT I, *Crew Defense*, and BT II, *Bradley Crew Proficiency Course*.

a. **BT I, Crew Defense.**

(1) **Action.** Engage and destroy stationary and moving targets from a defensive position during the day and night.

(2) **Conditions.** Given a MILES or PGS-equipped BFV in a defensive position, suitable engagement area with LTID-equipped targets, during the day and night.

(3) **Standards.**

(a) During the day, the crew must achieve a minimum of a "P" rating on seven of the ten engagements, with one of the seven being an NBC engagement.

(b) During the night, the crew must achieve a minimum of a "P" rating on seven of the ten engagements, with one of the seven being an NBC engagement.

b. **BT II, Bradley Crew Proficiency Course.**

(1) **Action.** Engage and destroy stationary and moving targets from a stationary and moving BFV during the day and night.

(2) **Conditions.** Given a MILES or PGS-equipped BFV and suitable maneuver and engagement area with LTID-equipped targets, during the day and night.

(3) **Standards.** The crew must achieve a minimum of a "P" rating on nine of the twelve engagements with one of the nine being an NBC engagement, one of the nine being a TOW engagement, two of the nine being night engagements.

8-7. CREW LIVE-FIRE GUNNERY STANDARDS

Crew live-fire gunnery consists of BTs V through VIII, *Crew Practice and Qualification*:

a. **BT V, Crew Practice 1.**

(1) **Action.** Engage and destroy stationary and moving targets from a stationary and moving Bradley during the day and night.

(2) **Conditions.** Given a Bradley using the coax machine gun-authorized allocation of ammunition, suitable live-fire range with targets, during the day and night.

(3) **Standards.** The crew must achieve a minimum of a "P" rating on seven of ten engagements, with one of the seven being an NBC engagement, two of the seven being night engagements.

b. **BT VI, Crew Practice 2.**

(1) **Action.** Engage and destroy stationary and moving targets from a stationary Bradley during the day and night.

(2) **Conditions.** Given a Bradley, authorized allocation of ammunition, suitable live-fire range with targets during the day and night.

(3) **Standards.** The crew for ODS and below must achieve a minimum of a "P" rating on five of seven engagements (six of eight for all others) with one of the five (six) being an NBC engagement, one of the five (six) being a night engagement.

c. **BT VII, Crew Practice 3.**

(1) **Action.** Engage and destroy stationary and moving targets from a stationary and moving Bradley during the day and night.

(2) **Conditions.** Given a Bradley, authorized allocation of ammunition, suitable live-fire range with targets during the day and night.

(3) **Standards.** The crew must achieve a minimum of a "P" rating on seven of nine engagements with one of the seven being an NBC engagement, two of the seven being night engagements.

d. **BT VIII, Crew Qualification.**

(1) **Action.** Engage and destroy stationary and moving targets from a stationary and moving Bradley during the day and night.

(2) **Conditions.** Given a Bradley, authorized allocation of ammunition, suitable live-fire range with targets during the day and night.

(3) **Standards.** The crew receives a distinguished, superior, or qualified rating based on the criteria shown in Figure 8-12.

DISTINGUISHED	Crew scored "T" on at least nine out of ten engagements. <ul style="list-style-type: none"> • Crew earned no more than one "P" score. • Crew received no "U" scores.
SUPERIOR	Crew scored "T" on at least eight out of ten engagements. <ul style="list-style-type: none"> • One of the eight must have been an NBC engagement. • Two of the eight must have been night engagements.
QUALIFIED	Crew scored either "T" or "P" on seven of ten engagements. <ul style="list-style-type: none"> • One of the seven must have been an NBC engagement. • Two of the seven must have been night engagements.
UNQUALIFIED	Crew's scores met one or more of the following conditions: <ul style="list-style-type: none"> • "U" on four or more engagements of any kind • "U" on both NBC engagements • "T" or "P" on only one night engagement.
LEGEND	T — Trained P — Needs practice U — Untrained

Figure 8-12. Scoring criteria.

8-8. QUALIFICATION REFIRES

If a crew fails to qualify, it refires for qualification. The highest rating that a crew can earn when refiring is "Qualified."

- a. A crew refires only the engagements scored "U."
- b. A crew refires only the number of engagements required to obtain a qualified rating.
- c. The highest score the crew may receive when refiring a "U" task is "P."
- d. If a crew refires a failed engagement before it fires all of the engagements in BT VIII, it also receives, at best, a "Qualified" rating.

8-9. ALIBIS

Battalion and squadron commanders are the deciding authority on alibis. The crew refires all alibi engagements. The commander only accepts alibis under the following conditions:

- Range equipment fails.
- Vehicle equipment fails, but not due to crew error.
- Unsafe conditions occur, but not due to crew error.

8-10. CREW SCORESHEET

Evaluators use DA Form 7354-R, *Bradley Crew Scoresheet* (Figure 8-13), to record the results of gunnery engagements. Evaluators must print each entry accurately and legibly. The instructions for completing the scoresheet are on the back of the blank form onto 8 1/2 by 11-inch paper. The blank form is located at the back of this manual (after the Index). If needed, they can download it from the US Army Publishing Directorate (see References).

Section II. EVALUATORS

The unit master gunner is responsible for training Bradley crew evaluators (BCEs).

8-11. DUTIES

The BCE assesses Bradley crew duties for device and crew gunnery (Chapter 6, Section V). He also enforces safety requirements, instructs nonqualification exercises, and evaluates qualification exercises. Finally, he evaluates and rates the crew and conducts an AAR.

a. **Prerequisites.** A soldier must have at least a rank of sergeant (E5) with an MOS of 11B, 12B, 13F, 14R, or 19D, and, before he attends a BCE certification course, he must have prior gunnery experience on the specific system he will evaluate.

b. **Responsibilities.** Master gunners are gunnery subject matter experts. They develop and conduct BCE training.

(1) Division master gunners (enhanced and separate brigade master gunners) are responsible for monitoring the BCE training program and developing certification examinations.

(2) Battalion master gunners are responsible for executing the BCE training program.

8-12. CERTIFICATION

Certification is initial training for BCEs. BCEs must certify within three months of any live-fire exercise (four months for RC). For M2A3 and M3A3 ODS appliqué units, BCEs must be FBCB2 qualified. Certification consists of--

a. Attending a 40-hour BCE training program.

b. Passing a written examination with at least 40 questions with a minimum score of 90 percent. The certification examination must include at least two questions in each of the following areas:

(1) Range safety (AR 385-63 and local range SOPs).

(2) Fire commands (Chapter 6, Section IV).

(3) Engagement procedures (Chapter 6).

(4) Offensive BFV-timing procedures (Section I).

(5) Defensive BFV-timing procedures (Section I).

(6) Multiple target-timing procedures (Section I).

(7) BFV exposure-timing matrixes (Section I).

(8) Scoring procedures for multiple-target engagements (Section I).

(9) After-action review procedures (Section III).

(10) Refires and alibis (Section I).

(11) Scoresheets.

(12) Threat-based, target-exposure-timing matrixes (Section V).

c. A hands-on evaluation requires BCEs to evaluate a crew firing 10 engagements using a videotape or the COFT or BATS. The BCEs must also conduct an AAR in accordance with Section III.

(1) During a COFT or BATS session, BCEs use the briefing monitor to evaluate the firing crew. This does not interfere with the I/O or scheduled training.

(2) The BCEs use the same clocks and scoresheets that they used during live-fire gunnery for the evaluation.

8-13. RECERTIFICATION

Recertification is refresher training for BCEs. Recertification consists of the written examination and the hands-on evaluation. BCEs must recertify within the three months before a live-fire exercise (four months for RC).

NOTE: The division master gunner (enhanced and separate brigade master gunner) develops the exam to certify or recertify BCEs.

8-14. SUSTAINMENT

Sustainment training ensures the BCE knows evaluation procedures. It ensures that the commander can find consistent, effective crew evaluators year-round. The BCE must evaluate four exercises a month, in the COFT or BATS, using the same type of clocks or timing boards and scoresheets used in device and crew gunnery.

Section III. AFTER-ACTION REVIEWS

The senior BCE or commander conducts a formal AAR after all crew gunnery events. In AARs, he combines the feedback received from all participants. AARs identify where a crew, section, or platoon meets--or fails to meet--Army standards. AARs provide commanders, leaders, and training managers with a focus for future training events.

8-15. PLANNING

Successful AARs require planning and resource management. Commanders and training managers--

a. **Select Evaluators.** One of the most challenging tasks during the planning phase is selecting and scheduling qualified evaluators. Whom they select depends on the type of evaluators they need--crew, section, or platoon evaluators; or internal or external evaluators.

(1) **Crew Evaluators.** Evaluators required for crew gunnery events must hold BCE qualifications. All company or troop evaluators must be certified and BCEs.

(2) **Internal or External Evaluators.**

(a) Battalion or squadron or higher organizations normally support internal evaluations. Unit BCEs evaluate crews. Crew device and crew practice are internally evaluated events.

(b) The BCEs from a different battalion, squadron, or higher organization support external evaluations.

b. **Develop Evaluation Records.** The scoresheets, along with the computer printout, give the BCE a record of each engagement for use during the AAR.

c. **Select the AAR Site.** When organizing the training site, the commander and training managers should simultaneously plan the location of the AAR site. They should locate it close enough to the training site to avoid long delays between training and reviewing the training results. However, they should place it far enough from the training area to avoid the distractions of other elements conducting training such as the signatures of vehicles moving or firing. The AAR site should accommodate all participants comfortably and shelter them from the elements.

d. **Select Training Aids.** Training aids give evaluators and participants a means to reenact the training event. They can also encourage discussion. At a minimum, evaluators

should use a range diagram of the area. Training aids to use during AARs include--

(1) **Charts or Drawings.** This should show the scenario, routes, and targets with any operational graphics supporting the AAR. Using charts or drawings lets all participants review actions while they follow the prescribed scenario.

(2) **Sand Tables.** This shows the topographical features of the area. Sand tables should reflect the scale of the area accurately. They should show the scenario, routes, and targets along with any operational control measures that apply to the training. This allows the evaluator to guide the discussions while focusing on the particular place the action occurred.

(3) **Tape Recorders.** These recorders can play back the fire commands and the radio-net traffic. (Recorders allow the crew to hear their commands and review their responses).

(4) **Thru-Sight Videos.** This allows playback of real-time video of live-fire gunnery engagements and fire commands. It (TSV) offers a look at engagement techniques and identifies errors that can be corrected before the next training event.

(5) **Precision Gunnery System AAR Computer.** This is used to review gunnery data during device-based exercises. It allows the evaluator and crewmembers to see the placement of each round in relation to the target and its corresponding data.

8-16. PREPARING

Before conducting an evaluation and an AAR, the evaluator prepares himself and the AAR site.

a. **Review the Scenario.** Before evaluating a crew or platoon, the evaluator must know the scenario and the mission, the collective tasks, and the terrain of the training area. Once he knows the scenario and mission, he must ensure he knows the doctrine that applies.

b. **Observe Training.** The evaluator must place himself in the best position to observe the task being conducted. The evaluator must record his observations.

c. **Collect Information.** After the event, the evaluator must collect information from other observers. During gunnery events, he collects information such as target kill times from the tower observers and BCEs.

d. **Develop a Discussion Outline.** The evaluator must develop an outline he wants to follow during the AAR. He should identify the key areas he wants the participants to discuss. This should include both strong and weak points. During this time, he should decide how he is to accomplish his goal for the AAR. As an example, he should list key questions to ask to give him the results he wants. He must determine what methods or techniques he will suggest to improve efficiency. If required, he should ask master gunners or other experienced personnel to relay helpful tips to the crew or platoon.

e. **Rehearse.** Before participants arrive at the AAR site, the evaluator organizes his training aids, evaluation sheets, and seating arrangements. He should ensure the training aids are functioning and viewable by all participants. At a minimum, evaluators should rehearse the key points to be made.

8-17. CONDUCTING

Crew members usually know how they performed before the AAR, though they may not know why they performed the way they did. The function of the evaluator conducting the

AAR is to encourage members to discuss what they did and to guide them into discovering why. The members then determine how they can do it differently next time. The evaluator aids in these discussions and provides expertise when needed. When conducting AARs, the evaluator should use the following guidelines:

a. **Ensure all Participants are Present.** The evaluator should not begin the AAR until all participants are present. Anyone missing may have witnessed an event and may have something to contribute to the discussion.

b. **Restate the Training Objectives.** The evaluator begins the AAR by restating the training objectives of the training event and its major tasks for the crew (crew gunnery). He begins by stating its title, "*You just completed the day phase of Bradley Table VII.*" He then highlights the major task involved, "*This phase tested your ability to conduct four engagements. The first was a defensive engagement using the auxiliary sight; the second was an offensive engagement; the third was a defensive commander engagement in an NBC environment; and the fourth was a retrograde while returning up range.*"

c. **Generate Discussion.** The evaluator begins the discussion by asking questions about the first event. For crew gunnery, "*Who saw the target first?*" After discussing one event, the evaluator asks questions about the next. He and the evaluated unit discuss events in chronological order.

d. **Orient on Training Objectives.** As discussions move away from the objectives, the evaluator must bring the discussions back on track. The evaluator keeps discussions on topic to make the best use of valuable AAR time.

e. **Seek Maximum Participation.** Evaluators must ensure all participants are heard and not let one person monopolize discussions. If a member has not participated, the evaluator asks him a direct question such as, "*What were you doing during this time?*"

f. **Summarize to Emphasize Key Learning Points.** As weaknesses are discovered and discussed, the evaluator summarizes the result and the solution.

g. **Overview the Event.** The evaluator closes the AAR by reviewing strengths and weaknesses relative to Army standards. For example, "*(Crew), we found that during the fourth engagement, you failed to engage the AP target. This gave him the time to place a killing burst on your BFV. After the discussion we just finished, you now know how to avoid this mistake in the future. In accordance with FM 3-22.1, you received a 'U' for this engagement. You earned a 'T' on each of the other three engagements.*"

Section IV. DEVICE GUNNERY

This section first trains collective device skills such as installing, boresighting (Appendix B), calibrating, aligning, and removing the devices. Then it teaches gunnery skills in BT I, *Crew Defense* and BT II, *Bradley Crew Proficiency Course*. The latter is a prerequisite for full-caliber live fire. All Bradley crews must achieve the standard for BT II as previously described in this chapter. They must do so within three months (four months for RC) before they fire full-caliber ammunition. Device gunnery is conducted in local training areas using MILES or PGS with LTID targetry. The tables train the crew to engage stationary and moving targets using all weapon systems, from both stationary and moving BFVs, day and night. The crew acquires and engages targets using power and manual controls, gunner and commander handstations, integrated sight units, and the auxiliary sights (IBAS and CIV on the Bradley A3). M6 Linebacker crews use captive flight trainers and train in aerial engagements. M7 BFIST crews practice fire-mission tasks.

8-18. GUIDELINES

Device gunnery tables should be conducted on full-scale ranges using PGS. If PGS is unavailable, then MILES can be substituted. However, if PGS and MILES are both unavailable, then the use of a coax single-shot adapter is authorized. The following guidelines apply to crew device gunnery:

- a. Evaluators (BCEs) rate all engagements and exercises as either trained ("T"), needs practice ("P"), or untrained ("U"), in accordance with Section I.
- b. To engage targets in the offense, the BC must give battlesight fire commands. To engage targets in the defense, the crews must give precision fire commands. (Bradley A3 and ODS crews using the ELRF must do so as described in Chapter 6.)
- c. All defensive engagements start with the firing vehicle in turret defilade. The vehicle moves to a hull defilade to engage the target(s). On ranges without correct defilade positions, units can simulate positions. In any of these positions, vehicles must move at least one vehicle length.
- d. Crewmembers fire all offensive and retrograde engagements from a moving BFV using the stabilization system. If the firing vehicle's stabilization system fails, the crew reports this immediately to the control tower or OIC. The engagement terminates, and the vehicle conducts no offensive engagements until the system is corrected.
- e. The BFV exposure time matrixes in Section I prescribe total target-exposure times.
- f. When the target array consists of more than one target, simultaneous target exposure is used. A simultaneous target exposure occurs when all targets for the task are presented at the same time, requiring crews to use proper engagement techniques.

g. If moving targets are unavailable, a stationary frontal target of the same type and at the same range is used. If a stationary target is used, evaluators compensate by omitting one target condition.

h. Scaled targets equipped with LTIDs may be used with PGS and MILES (Chapter 7).

i. Bradley A3, ODS, and other variants with the FBCB2 will fire one day and one night engagement under digital conditions.

j. For M2A3 and M3A3 tables, the delayed hunter-killer target engagements will include--

(1) *Engagements in the Defense*. Use the most-dangerous target for two-target engagements, or the dangerous target for three-target engagements. In two-target engagements, the least dangerous target is presented first; in three-target engagements, the most and least dangerous targets are presented first, and least dangerous are presented last.

(2) *Engagements in the Offense*. Use the least-dangerous target for two- and three-target engagements. In two-target engagements, the most dangerous target is presented first; in three-target engagements, the most dangerous and dangerous targets are presented first.

k. For M2A3 and M3A3 tables, the delayed target for the hunter-killer tasks is presented 15 to 20 seconds after target lock of the initial target(s) for three target engagements. For two target engagements, delay presentation of the second target for 7 to 10 seconds.

8-19. BRADLEY TABLE I, CREW DEFENSE

The crew defense table allows the driver to integrate into the crew's coordination by moving the vehicle to and from firing positions during day and night engagements (Figure 8-14). This table trains the crew to engage targets with training devices. It introduces them to training in a gunnery environment during day and night. Crew defense consists of ten engagements. These ten engagements run during the day and again at night.

BT I CREW DEFENSE				
BFV ¹	CREWMEMBER	SIGHT AND CONDITIONS	TARGET TYPE	POSTURE
Stationary	Gunner	Auxiliary Sight ²	AP	Stationary
Stationary	Gunner	ISU or IBAS in Manual	HE	Stationary
Stationary	Commander	RBD or CSE	AP	Stationary
			Coax	
Stationary	Gunner	ISU or IBAS	AP	Moving
			Coax	
			AP ³	Stationary
Stationary	Gunner	ISU or IBAS in NBC	AP	Moving
			AP	Stationary
Stationary	Gunner	ISU or IBAS	TOW/ Aerial (CFT) ⁴	Moving
			AP	Stationary
Stationary	Gunner	ISU or IBAS	Aerial 25-mm HE ⁴	Moving
Stationary	Commander	RBD or CSE	TOW	Stationary
Stationary	Gunner	ISU or IBAS	HE	Area
Stationary	Commander	RBD or CSE	AP	Moving
			HE	Stationary
¹ M7 BFIST Incorporate one FMT task into the day phase and one into the night phase. ² Night Use ISU or IBAS. ³ A3 BFV Hunter-killer task. ⁴ M6 Substitute a suitable target type.				

**Figure 8-14.
BT I, Crew Defense.**

8-20. BRADLEY TABLE II, *BRADLEY CREW PROFICIENCY COURSE*

The BCPC introduces crews to moving BFV engagements. This table develops the driving skills of the driver, while the crew engages targets on the move. Crews engage moving and stationary targets from a moving and stationary BFV. The BCPC consists of six day engagements and six night engagements.

- Figure 8-15A applies to the ODS and below.
- Figure 8-15B applies to the ADA Linebacker.
- Figure 8-15C applies to the A3.
- Figure 8-15D applies to the BFIST.

BT II--ODS and Below BRADLEY CREW PROFICIENCY COURSE				
DAY ENGAGEMENTS				
BFV	CREWMEMBER	SIGHT AND CONDITIONS	TARGET TYPE	POSTURE
Stationary	Gunner	ISU	TOW	Moving
Defense	Gunner	ISU	AP	Stationary
			Coax	Area
Offense or Retrograde	Gunner	ISU	AP	Moving
			HE	Stationary
Defense	Gunner	Auxiliary Sight	HE	Stationary
			Coax	Point
Offense or Retrograde	Commander	CSE	HE	Stationary
Defense	Gunner	ISU in NBC	AP	Moving
			Coax	Area
NIGHT ENGAGEMENTS				
BFV	CREWMEMBER	SIGHT AND CONDITIONS	TARGET TYPE	POSTURE
Stationary	Gunner	ISU	TOW	Stationary
Defense	Gunner	ISU in Manual	HE	Stationary
Offense or Retrograde	Gunner	ISU in NBC	AP	Moving
			HE	Stationary
Defense	Gunner	ISU	HE	Moving
			Coax	Area
Offense or Retrograde	Commander	CSE	AP	Stationary
			Coax	Point
Defense	Gunner	ISU	AP	Stationary
			Coax	Point

Figure 8-15A.
BT II, Bradley Crew Proficiency Course (ODS and below).

BT II--ADA Linebacker BRADLEY CREW PROFICIENCY COURSE				
DAY ENGAGEMENTS				
BFV	CREWMEMBER	SIGHT AND CONDITIONS	TARGET TYPE	POSTURE
Stationary	Gunner	ISU	CFT	Moving
Defense	Gunner	ISU	CFT	Moving
			AP	Stationary
Offense or Retrograde	Gunner	ISU	HE (20 Rounds)	Stationary
			AP	Moving
Defense	Gunner	Auxiliary Sight	HE	Stationary
			Coax	Point
Offense or Retrograde	Commander	CSE	HE	Stationary
Defense	Gunner	ISU in NBC	CFT	Moving
			Coax	Area
NIGHT ENGAGEMENTS				
BFV	CREWMEMBER	SIGHT AND CONDITIONS	TARGET TYPE	POSTURE
Stationary	Gunner	ISU	CFT	Moving
Defense	Gunner	ISU in Manual	HE	Stationary
Offense or Retrograde	Gunner	ISU in NBC	AP	Moving
			HE	Stationary
Defense	Gunner	ISU	HE (20 Rounds)	Stationary
			Coax	Area
Offense or Retrograde	Commander	CSE	AP	Stationary
			Coax	Point
Defense	Gunner	ISU	AP	Stationary
			CFT	Moving

Figure 8-15B.
BT II, Bradley Crew Proficiency Course (ADA Linebacker).

BT II--A3 BRADLEY CREW PROFICIENCY COURSE				
DAY ENGAGEMENTS				
BFV	CREWMEMBER	SIGHT AND CONDITIONS	TARGET TYPE	POSTURE
Stationary	Gunner	IBAS	TOW	Moving
Defense	Gunner	IBAS/ Hunter-Killer	AP	Stationary
			AP	Moving
			Coax	Area
Offense or Retrograde	Gunner	IBAS	AP	Moving
			HE	Stationary
Defense	Gunner	Auxiliary Sight	HE	Stationary
			Coax	Point
Offense or Retrograde	Commander	RBD	HE	Stationary
Defense	Gunner	IBAS in NBC	AP	Moving
			Coax	Area
NIGHT ENGAGEMENTS				
BFV	CREWMEMBER	SIGHT AND CONDITIONS	TARGET TYPE	POSTURE
Stationary	Gunner	IBAS	TOW	Stationary
Defense	Gunner	IBAS in Manual	HE	Stationary
Offense or Retrograde	Gunner	IBAS in NBC	AP	Moving
			HE	Stationary
Defense	Gunner	IBAS	HE	Moving
			Coax	Area
Offense or Retrograde	Commander	RBD	AP	Stationary
			Coax	Point
Defense	Gunner	IBAS Hunter-Killer	AP	Stationary
			Coax	Point
			Coax	Point

Figure 8-15C.
BT II, Bradley Crew Proficiency Course (A3).

BT II--BFIST				
BRADLEY CREW PROFICIENCY COURSE				
DAY ENGAGEMENTS				
BFV	CREWMEMBER	SIGHT AND CONDITIONS	TARGET TYPE	POSTURE
Stationary	Gunner	ISU (FMT)	TOW	Moving
Defense	Gunner	ISU (FMT > 2,000 M)	AP	Stationary
			Coax	Area
			Tank	Stationary
Offense or Retrograde	Gunner	ISU	AP	Moving
			HE	Stationary
Defense	Gunner	ISU (Auxiliary sight, if equipped)	HE	Stationary
			Coax	Point
Offense or Retrograde	Commander	CSE	HE	Stationary
Defense	Gunner	ISU in NBC	AP	Moving
			Coax	Area
NIGHT ENGAGEMENTS				
BFV	CREWMEMBER	SIGHT AND CONDITIONS	TARGET TYPE	POSTURE
Stationary	Gunner	ISU (FMT)	TOW	Stationary
Defense	Gunner	ISU in Manual	HE	Stationary
Offense or Retrograde	Gunner	ISU in NBC	AP	Moving
			HE	Stationary
Defense	Gunner	ISU	HE	Moving
			Coax	Area
Offense or Retrograde	Commander	CSE	AP	Stationary
			Coax	Point
Defense	Gunner	ISU (FMT >2,000 M)	AP	Stationary
			Coax	Area
			Tank	Stationary

Figure 8-15D.
BT II, Bradley Crew Proficiency Course (BFIST).

Section V. LIVE-FIRE GUNNERY

Crew live-fire gunnery trains and evaluates single vehicle crews' abilities to engage stationary and moving, single and multiple targets with turret-mounted weapon systems. This training is conducted during day and night or other limited visibility conditions, from stationary and moving firing vehicles, and using full-caliber ammunition. Each series of actions and engagements replicate potential battlefield conditions. Assessments of preliminary and device gunnery identify weaknesses to improve during crew gunnery.

NOTE: Before executing each live-fire table, the crew must boresight (Appendix B), zero (Appendix C), or at least confirm the zero of each weapon system.

8-21. DEVELOPMENT OF TABLE

Crew gunnery establishes an Army standard for training and evaluation. At the same time, battalion commanders tailor engagements for their particular contingency missions and training emphasis. Each table has specific engagement tasks, conditions, and standards. Battalion commanders identify specific threat target types and engagement distances or range bands. BFV exposure-timing matrixes (Figures 8-5 through 8-10) provide this flexibility while maintaining a standard throughout the Army. The unit may use a tactical scenario; however, these firing tables are not tactical exercises. An example is "Move from battle position 1 to battle position 2, enemy reported to your front." The tables train and evaluate single vehicle crew proficiency only--wingman techniques are not allowed. Units equipped with the FBCB2 variants will be evaluated on their use of digital communications systems to send SPOTREPs and SITREPs.

a. Crew gunnery evaluation procedures and standards meet the requirements described in this chapter. Crew gunnery tables follow:

- BT V, *Crew Practice 1*.
- BT VI, *Crew Practice 2*.
- BT VII, *Crew Practice 3*.
- BT VIII, *Crew Qualification*.

b. All crews will fire at a minimum BT II and BT VII before BT VIII, which must be fired IAW the standards in this manual.

c. Division commanders will approve the range scenarios for BT VIII, *Crew Qualification*.

d. Battalions specify battlecarry and most dangerous versus least dangerous targets, based on threat analysis or training emphasis.

e. The crew must fire all offensive and retrograde engagements from a moving BFV using its stabilization system.

f. BT VIII, *Crew Qualification*, has four swing tasks: two for day and two for night. Using swing tasks lets the commanders and master gunners adjust the number of tasks fired (day or night) to match available light conditions. For example, during a season with more hours of darkness than daylight, they might use four day tasks and six night tasks. They cannot switch swing tasks. The commanders can only move them between day and night scenarios--they cannot substitute any other task for them.

g. BT VIII crew qualification scenarios must contain at least--

(1) ***M2A2 ODS and Below.***

- One day AP- and one night AP-type target at 800 meters or less.
- One day AP- and one night AP-type target at 1,400 meters and beyond.

(2) ***M2A3 Bradleys.***

- One day AP- and one night AP-type target at 800 meters or less.
- One day AP- and one night AP-type target at 1,600 meters and beyond.

(3) ***Lateral Dispersion for M2A3 or M3A3 Bradleys.*** Each of the following must have at least 14 degrees dispersion between targets, not to include the commander's engagement (rule of thumb, 25 meters dispersion for each 100 meters). This provides at least one target outside the IBAS's WFOV during a multiple-target engagement:

- One-day multiple engagement.
- One-night multiple engagement.
- h. BTs I, II, and V through VIII must each include--
 - One engagement under digital conditions in the day phase.
 - One engagement under digital conditions in the night phase.
- i. All defensive engagements begin with the firing vehicle in the turret-defilade position and then move to a hull-defilade position to engage. This does not apply to Stinger and 25-mm aerial engagements. On ranges that prohibit this, or that have no defilade positions, units use simulated positions. Vehicles must move at least one vehicle length in any of these positions.

8-22. TARGETRY

All gunnery qualification tables must use full-scale targets.

- a. All ranges and targets must comply with TC 25-8.
- b. When a target array includes multiple targets, the trainer exposes them simultaneously to test the crew's mastery of proper engagement techniques. For the A3 hunter-killer engagement, the third target is not read into the scenario. It is presented 15 to 20 seconds after target lock of the initial target(s) (Section IV). The purpose of this task is to have the commander use his CIV to locate and identify targets at the same time that the gunner engages other targets.
- c. For offensive and retrograde engagements, total target-exposure time is set using the BFV exposure-timing matrix (Figures 8-5 through 8-10, pages 8-5 through 8-10). The master gunner uses the individual target's conditions and range to determine that target's exposure time.
- d. Target exposure time begins when the target is fully exposed. Total target-exposure time does not include target lift time.
- e. For defensive engagements, total target exposure time for all targets is 50 seconds. Figure 8-4 helps in establishing the armored engagement exposure time. However, the BFV cannot remain exposed beyond the BFV exposure-timing matrixes in this chapter.
- f. Coax machine gun point-type targets and engagements are defined as--
 - (1) Rocket-propelled grenade (RPG) or ATGM team targets, which include three E-type silhouettes placed on line or in a wedge formation. They must not be more than 5 meters apart or 10 meters deep.

(2) Unarmored targets within 900 meters. However, these targets must have unique designs that the crew can easily identify. For example, they might have a recognizable silhouette or thermal image. This reduces confusion as to the ammunition type to use.

g. For area targets in coaxial machine gun engagements, target arrays consist of seven E-type silhouettes placed on line or in a column or wedge formation. Targets must not be more than 5 meters apart nor extend beyond 30 meters in width or 20 meters in depth.

8-23. AMMUNITION

When crews receive only one type of 25-mm ammunition, they must upload the designated amount of ammunition into the appropriate ready boxes (HE or AP ready box). The scenario target type determines the amount of ammunition the crew must load.

a. **25-mm Gun.**

- 8 rounds of TPDS-T for each AP point target.
- 8 rounds of TP-T for each HE point target.
- 25 rounds of TP-T for each HE area target.
- 20 rounds of TP-T or TPDS-T for aerial targets.

b. **Coaxial Machine Gun.**

- 50 rounds of 7.62-mm for each RPG or ATGM team or unarmored target.
- 100 rounds of 7.62-mm for each area target.

8-24. ALLOWABLE VARIATIONS

Leaders may change their targets and firing tables as follows:

- a. Battalion commanders may add friendly targets to BT VIII, *Crew Qualification*.
- b. Battalion commanders may dictate more engagements on BT VIII using 14 degrees of dispersion between targets, not including the commander's engagement for M2A3 or M3A3 vehicles. Battalion or squadron commanders may also--
 - Modify BT I and BTs V through VII to improve on weak areas.
 - Modify the number of tasks fired on BTs V through VII.
 - Add friendly targets to BTs V through VII.
- c. When moving targets are unavailable, trainers use a stationary frontal target of the same type and at the same range. When they use a stationary target, evaluators compensate by omitting one of the target's conditions.
- d. If the firing vehicle's stabilization system fails, the crew reports it immediately to the control tower or OIC. He terminates the engagement, and the vehicle conducts no more offensive engagements until the system is corrected.
- e. BTs V through VIII list the minimum number of engagements that the crew must fire to achieve training goals. Any engagements added to the firing tables will pertain to unit's METL and depend on ammunition availability.
- f. All firing vehicles on BTs II and V through VIII equipped with FBCB2 systems must start each phase with working digital communications. Only the commander can approve vehicles to continue firing a table after it loses digital capability.

8-25. PREREQUISITES

Crewmembers (11B, 12B, 13F, 14R, and 19D) must meet certain prerequisites before participating in crew gunnery. They must--

- a. Qualify on BGST within the previous three months (four months for RC).
- b. Qualify on BT II within the previous three months (four months for RC).

8-26. BRADLEY TABLE V, CREW PRACTICE 1

Bradley Table V, *Crew Practice 1*, introduces crews to a live-fire gunnery environment (Figure 8-16). This table uses the 7.62-mm coax machine gun, in the single-shot mode, as a subcaliber device replicating main gun engagement. Due to the limited engagement range of the coax, half-scale targets are placed at half the engagement distance; for example, when a 1,200-meter engagement requirement exists, a half-scale target is placed at 600 meters. Gunners must use the actual straight-line distances when engaging targets (600 meters for a replicated 1,200-meter target).

BT V				
CREW PRACTICE 1 ^{1, 2}				
DAY ENGAGEMENTS				
BFV	CREWMEMBER	SIGHT AND CONDITIONS	TARGET TYPE	POSTURE
Defense	Gunner	ISU or IBAS in Manual	HE	Stationary
Offense or Retrograde	Gunner	ISU or IBAS	AP	Moving
			HE ³	Stationary
Defense	Gunner	Auxiliary Sight ⁵	HE	Stationary
Offense or Retrograde	Commander	CSE or RBD	AP	Moving
			HE	Stationary
Defense	Gunner	ISU or IBAS in NBC	AP ⁴	Moving
NIGHT ENGAGEMENTS				
BFV	CREWMEMBER	SIGHT AND CONDITIONS	TARGET TYPE	POSTURE
Defense	Gunner	ISU or IBAS	AP	Stationary
			HE ³	Moving
Offense or Retrograde	Gunner	ISU or IBAS in NBC	AP	Moving
Defense	Commander	CSE or RBD	AP	Stationary
			HE ⁴	Moving
Offense or Retrograde	Commander	CSE or RBD	AP	Moving
			HE	Stationary
Defense	Gunner	ISU or IBAS	AP	Moving
			HE	Stationary
¹ Ammunition Requirement .. 7.62-mm tracer, 160 rounds. ² M7 BFIST Incorporate one FMT task into the day phase and one into the night phase. ³ A3 BFV Hunter-killer task. ⁴ M6 Substitute suitable target type. ⁵ M7 BFIST Substitute the ISU if not equipped with an auxiliary sight.				

Figure 8-16.
BT V, Crew Practice 1.

8-27. BRADLEY TABLE VI, CREW PRACTICE 2

Bradley Table VI, *Crew Practice 2*, is the first table that requires the crew to fire with full-caliber ammunition using the 25-mm gun and the 7.62-mm coax burst techniques (Figures 8-17A through 8-17D). Engagements are fired from a defensive position. BT VI uses combat ranges to train BFV crew 25-mm and 7.62-mm coax engagement techniques during daylight and darkness against stationary and moving targets and against point and area targets.

8-28. BRADLEY TABLE VII, CREW PRACTICE 3

Bradley Table VII, *Crew Practice 3*, requires the BFV crew to conduct offensive and defensive engagements with full-caliber ammunition (Figures 8-18A through 8-18D). BT VII trains the Bradley crew to engage moving and stationary targets during daylight and darkness from a stationary and a moving firing vehicle.

8-29. BRADLEY TABLE VIII, CREW QUALIFICATION

BT VIII, *Crew Qualification*, is a single-vehicle qualification table (Figures 8-19A through 8-19D). It evaluates the crew on the entire engagement process (Chapter 6) in various firing conditions. Units are encouraged to fire on ranges that can accommodate dual scenarios. However, firing vehicles must not help each other acquire targets. Only battalion and company master gunners inspect (reconnoiter) range targetry during crew qualification. Crews may receive a range orientation of the downrange area and limit markers, but no targets are presented. The range briefing does not contain task sequences or describe where the crew will fire particular tasks. If the unit conducts BT VIII on the same range as BT VII, then the range scenarios (target arrays) in BTs VII and VIII must differ.

BT VI--ODS and Below CREW PRACTICE 2				
DAY ENGAGEMENTS				
BFV	CREWMEMBER	SIGHT AND CONDITIONS	TARGET TYPE	POSTURE
Defense	Gunner	ISU in Manual	AP	Stationary
Defense	Gunner	Auxiliary Sight	AP	Stationary
			Coax	Point
Defense	Commander	CSE	AP	Stationary
			Coax	Area
Defense	Gunner	ISU in NBC	AP	Moving
			Coax	Area
NIGHT ENGAGEMENTS				
BFV	CREWMEMBER	SIGHT AND CONDITIONS	TARGET TYPE	POSTURE
Defense	Gunner	ISU	HE	Stationary
			Coax	Area
Defense	Commander	CSE	HE	Moving
Defense	Gunner	ISU in NBC	HE	Stationary
			Coax	Point
Ammunition Requirement: TPDS-T32 rounds TP-T24 rounds 7.62-mm400 rounds				

Figure 8-17A.
BT VI, Crew Practice 2 (ODS and below).

BT VI--ADA Linebacker CREW PRACTICE 2				
DAY ENGAGEMENTS				
BFV	CREWMEMBER	SIGHT AND CONDITIONS	TARGET TYPE	POSTURE
Defense	Gunner	ISU in Manual	AP	Stationary
Defense	Gunner	Auxiliary Sight	AP	Stationary
			Coax	Point
Defense	Commander	CSE	AP	Stationary
			Coax	Area
Defense	Gunner	ISU in NBC	AP	Moving
			CFT	Moving
NIGHT ENGAGEMENTS				
BFV	CREWMEMBER	SIGHT AND CONDITIONS	TARGET TYPE	POSTURE
Defense	Gunner	ISU	HE (20 Rounds)	Stationary
			Coax	Area
Defense	Commander	CSE	HE	Moving
Defense	Gunner	ISU in NBC	HE	Stationary
			Coax	Point
Defense	Gunner	ISU	CFT	Moving
Ammunition Requirement: TPDS-T32 rounds TP-T36 rounds 7.62-mm300 rounds CFT2 rounds				

**Figure 8-17B.
BT VI, Crew Practice 2 (ADA Linebacker).**

BT VI--A3 CREW PRACTICE 2				
DAY ENGAGEMENTS				
BFV	CREWMEMBER	SIGHT AND CONDITIONS	TARGET TYPE	POSTURE
Defense	Gunner	IBAS in Manual	AP	Stationary
Defense	Gunner	Auxiliary Sight	AP	Stationary
			Coax	Point
Defense	Commander	RBD	AP	Stationary
			Coax	Area
Defense	Gunner	IBAS in NBC	AP	Moving
			Coax	Area
NIGHT ENGAGEMENTS				
BFV	CREWMEMBER	SIGHT AND CONDITIONS	TARGET TYPE	POSTURE
Defense	Gunner	IBAS	HE	Stationary
			Coax	Area
Defense	Commander	RBD	HE	Moving
Defense	Gunner	IBAS in NBC	HE	Stationary
			Coax	Point
Defense	Gunner	IBAS Hunter-Killer	HE	Stationary
			Coax	Point
Ammunition Requirement: TPDS-T32 rounds TP-T32 rounds 7.62-mm450 rounds				

**Figure 8-17C.
BT VI, Crew Practice 2 (A3).**

BT VI--BFIST CREW PRACTICE 2				
DAY ENGAGEMENTS				
BFV	CREWMEMBER	SIGHT AND CONDITIONS	TARGET TYPE	POSTURE
Defense	Gunner	ISU in Manual	AP	Stationary
Defense	Gunner	ISU (Auxiliary sight, if equipped)	AP	Stationary
			Coax	Point
Defense	Commander	CSE	AP	Stationary
			Coax	Area
Defense	Gunner	ISU in NBC	AP	Moving
			Coax	Area
NIGHT ENGAGEMENTS				
BFV	CREWMEMBER	SIGHT AND CONDITIONS	TARGET TYPE	POSTURE
Defense	Gunner	ISU	HE	Stationary
			Coax	Area
Defense	Commander	CSE	HE	Moving
Defense	Gunner	ISU in NBC	HE	Stationary
			Coax	Point
Defense	Gunner	ISU (FMT > 2,000 M)	Tank	Stationary
Ammunition Requirement: TPDS-T32 rounds TP-T24 rounds 7.62-mm400 rounds				

**Figure 8-17D.
BT VI, Crew Practice 2 (BFIST).**

BT VII--ODS and Below CREW PRACTICE 3				
DAY ENGAGEMENTS				
BFV	CREWMEMBER	SIGHT AND CONDITIONS	TARGET TYPE	POSTURE
Defense	Gunner	Auxiliary Sight	AP	Moving
			AP	Stationary
Defense	Gunner	ISU in Manual	HE	Stationary
Defense	Gunner	ISU in NBC	HE	Stationary
			Coax	Point
Offense or Retrograde	Commander	CSE	AP	Moving
			HE	Stationary
Offense or Retrograde	Gunner	ISU	HE	Stationary
			Coax	Area
NIGHT ENGAGEMENTS				
BFV	CREWMEMBER	SIGHT AND CONDITIONS	TARGET TYPE	POSTURE
Defense	Gunner	ISU	AP	Moving
			Coax	Point
Offense or Retrograde	Commander	CSE	AP	Stationary
Defense	Gunner	ISU in NBC	AP	Stationary
			Coax	Area
Offense or Retrograde	Gunner	ISU	AP	Moving
			Coax	Area
Ammunition Requirement: TPDS-T56 rounds TP-T32 rounds 7.62-mm400 rounds				

Figure 8-18A.
BT VII, Crew Practice 3 (ODS and below).

BT VII--ADA Linebacker CREW PRACTICE 3				
DAY ENGAGEMENTS				
BFV	CREWMEMBER	SIGHT AND CONDITIONS	TARGET TYPE	POSTURE
Defense	Gunner	Auxiliary Sight	AP	Moving
			AP	Stationary
Defense	Gunner	ISU in Manual Target Delay	HE	Stationary
			CFT	Moving
Defense	Gunner	ISU in NBC	HE (20 Rounds)	Stationary
			Coax	Point
Offense or Retrograde	Gunner	ISU	AP	Moving
			HE	Stationary
Offense or Retrograde	Gunner	ISU	CFT	Moving
			Coax	Area
NIGHT ENGAGEMENTS				
BFV	CREWMEMBER	SIGHT AND CONDITIONS	TARGET TYPE	POSTURE
Defense	Gunner	ISU	HE (20 Rounds)	Stationary
			CFT	Moving
Defense	Commander	CSE	AP	Stationary
Offense or Retrograde	Gunner	ISU in NBC	AP	Stationary
			Coax	Area
Offense or Retrograde	Gunner	ISU	AP	Moving
			Coax	Area
Ammunition Requirement: TPDS-T48 rounds TP-T56 rounds 7.62-mm350 rounds CFT3 rounds				

Figure 8-18B.
BT VII, Crew Practice 3 (ADA Linebacker).

BT VII--A3 CREW PRACTICE 3				
DAY ENGAGEMENTS				
BFV	CREWMEMBER	SIGHT AND CONDITIONS	TARGET TYPE	POSTURE
Defense	Gunner	Auxiliary Sight	AP	Moving
			AP	Stationary
Defense	Gunner	IBAS in Manual	HE	Stationary
Defense	Gunner	IBAS in NBC	HE	Stationary
			Coax	Point
Offense or Retrograde	Commander	RBD	AP	Moving
			HE	Stationary
Offense or Retrograde	Gunner	IBAS Hunter-Killer	AP	Stationary
			HE	Stationary
			Coax	Area
NIGHT ENGAGEMENTS				
BFV	CREWMEMBER	SIGHT AND CONDITIONS	TARGET TYPE	POSTURE
Defense	Gunner	IBAS Hunter-Killer	AP	Moving
			Coax	Point
			Coax	Point
Offense or Retrograde	Commander	RBD	AP	Stationary
Defense	Gunner	IBAS in NBC	AP	Stationary
			Coax	Area
Offense or Retrograde	Gunner	IBAS	AP	Moving
			Coax	Area
Ammunition Requirement: TPDS-T64 rounds TP-T32 rounds 7.62-mm450 rounds				

**Figure 8-18C.
BT VII, Crew Practice 3 (A3).**

BT VII--BFIST CREW PRACTICE 3				
DAY ENGAGEMENTS				
BFV	CREWMEMBER	SIGHT AND CONDITIONS	TARGET TYPE	POSTURE
Defense	Gunner	ISU (Auxiliary sight, if equipped)	AP	Moving
			AP	Stationary
Defense	Gunner	ISU in Manual	HE	Stationary
Defense	Gunner	ISU in NBC	HE	Stationary
			Coax	Point
Offense or Retrograde	Commander	CSE or RBD	AP	Moving
			HE	Stationary
Offense or Retrograde	Gunner	ISU (FMT > 2,000 M)	HE	Stationary
			Coax	Area
			Tank	Stationary
NIGHT ENGAGEMENTS				
BFV	CREWMEMBER	SIGHT AND CONDITIONS	TARGET TYPE	POSTURE
Defense	Gunner	ISU (FMT > 2,000 M)	AP	Moving
			Coax	Point
			Tank	Stationary
Offense or Retrograde	Commander	CSE	AP	Stationary
Defense	Gunner	ISU in NBC	AP	Stationary
			Coax	Area
Offense or Retrograde	Gunner	ISU	AP	Moving
			Coax	Area
Ammunition Requirement: TPDS-T56 rounds TP-T32 rounds 7.62-mm400 rounds				

**Figure 8-18D.
BT VII, Crew Practice 3 (BFIST).**

BT VIII--ODS and Below QUALIFICATION				
DAY ENGAGEMENTS				
BFV	CREWMEMBER	SIGHT AND CONDITIONS	TARGET TYPE	POSTURE
Defense	Gunner	ISU (Swing)	AP	Stationary
			Coax	Area
Offense or Retrograde	Gunner	ISU (Swing)	AP	Moving
			HE	Stationary
Defense	Gunner	Auxiliary Sight	HE	Stationary
			Coax	Point
Offense or Retrograde	Commander	CSE	HE	Stationary
Defense	Gunner	ISU in NBC	AP	Moving
			Coax	Area
NIGHT ENGAGEMENTS				
BFV	CREWMEMBER	SIGHT AND CONDITIONS	TARGET TYPE	POSTURE
Defense	Gunner	ISU in Manual (Swing)	HE	Stationary
Offense or Retrograde	Gunner	ISU in NBC	AP	Moving
			HE	Stationary
Defense	Gunner	ISU (Swing)	HE	Moving
			Coax	Area
Offense or Retrograde	Commander	CSE	AP	Stationary
			Coax	Point
Defense	Gunner	ISU	AP	Stationary
			Coax	Point
Ammunition Requirement: TPDS-T48 rounds TP-T48 rounds 7.62-mm450 rounds				

Figure 8-19A.
BT VIII, Crew Qualification (ODS and below).

BT VIII--ADA Linebacker QUALIFICATION				
DAY ENGAGEMENTS				
BFV	CREWMEMBER	SIGHT AND CONDITIONS	TARGET TYPE	POSTURE
Defense	Gunner	ISU (Swing)	CFT	Moving
			AP	Stationary
Offense or Retrograde	Gunner	ISU (Swing)	HE (20 Rounds)	Stationary
			AP	Moving
Defense	Gunner	Auxiliary Sight	HE	Stationary
			Coax	Point
Offense or Retrograde	Commander	CSE	HE	Stationary
Defense	Gunner	ISU in NBC	CFT	Moving
			Coax	Area
NIGHT ENGAGEMENTS				
BFV	CREWMEMBER	SIGHT AND CONDITIONS	TARGET TYPE	POSTURE
Defense	Gunner	ISU in Manual (Swing)	HE	Stationary
Offense or Retrograde	Gunner	ISU in NBC	AP	Moving
			HE	Stationary
Defense	Gunner	ISU (Swing)	HE (20 Rounds)	Stationary
			Coax	Area
Offense or Retrograde	Commander	CSE	AP	Stationary
			Coax	Point
Defense	Gunner	ISU	AP	Stationary
			CFT	Moving
Ammunition Requirement: TPDS-T40 rounds TP-T72 rounds 7.62-mm300 rounds CFT3 rounds				

Figure 8-19B.
BT VIII, Crew Qualification (ADA Linebacker).

BT VIII--A3 QUALIFICATION				
DAY ENGAGEMENTS				
BFV	CREWMEMBER	SIGHT AND CONDITIONS	TARGET TYPE	POSTURE
Defense	Gunner	IBAS (Swing) Hunter-Killer	AP	Stationary
			AP	Moving
			Coax	Area
Offense or Retrograde	Gunner	IBAS (Swing)	AP	Moving
			HE	Stationary
Defense	Gunner	Auxiliary Sight	HE	Stationary
			Coax	Point
Offense or Retrograde	Commander	RBD	HE	Stationary
Defense	Gunner	IBAS in NBC	AP	Moving
			Coax	Area
NIGHT ENGAGEMENTS				
BFV	CREWMEMBER	SIGHT AND CONDITIONS	TARGET TYPE	POSTURE
Defense	Gunner	IBAS in Manual (Swing)	HE	Stationary
Offense or Retrograde	Gunner	IBAS in NBC	AP	Moving
			HE	Stationary
Defense	Gunner	IBAS (Swing)	HE	Moving
			Coax	Area
Offense or Retrograde	Commander	RBD	AP	Stationary
			Coax	Point
Defense	Gunner	IBAS (Swing) Hunter-Killer	AP	Stationary
			Coax	Point
			Coax	Point
Ammunition Requirement: TPDS-T56 rounds TP-T48 rounds 7.62-mm500 rounds				

Figure 8-19C.
BT VIII, Crew Qualification (A3).

BT VIII--BFIST QUALIFICATION				
DAY ENGAGEMENTS				
BFV	CREWMEMBER	SIGHT AND CONDITIONS	TARGET TYPE	POSTURE
Defense	Gunner	ISU (Swing) (FMT > 2,000 M)	AP	Stationary
			Coax	Area
			Tank	Stationary
Offense or Retrograde	Gunner	ISU (Swing)	AP	Moving
			HE	Stationary
Defense	Gunner	ISU (Auxiliary sight, if equipped)	HE	Stationary
			Coax	Point
Offense or Retrograde	Commander	CSE	HE	Stationary
Defense	Gunner	ISU in NBC	AP	Moving
			Coax	Area
NIGHT ENGAGEMENTS				
BFV	CREWMEMBER	SIGHT AND CONDITIONS	TARGET TYPE	POSTURE
Defense	Gunner	ISU in Manual (Swing)	HE	Stationary
Offense or Retrograde	Gunner	ISU in NBC	AP	Moving
			HE	Stationary
Defense	Gunner	ISU (Swing)	HE	Moving
			Coax	Area
Offense or Retrograde	Commander	CSE	AP	Stationary
			Coax	Point
Defense	Gunner	ISU (Swing) (FMT > 2,000 M)	AP	Stationary
			Coax	Area
			Tank	Stationary
Ammunition Requirement: TPDS-T48 rounds TP-T48 rounds 7.62-mm450 rounds				

Figure 8-19D.
BT VIII, Crew Qualification (BFIST).

CHAPTER 9
Infantry Platoon

FMs 7-0 and 7-1 explain how to plan, resource, and execute training events. ARTEP 7-7J-MTP, FM 3-21.71, and this chapter provide the TTP and standards to conduct and evaluate Bradley platoon gunnery training.

Chapter 3 covers crew training; this chapter covers section and platoon device training as well as platoon practice and qualification (Figure 9-1).

Infantry platoon gunnery integrates vehicle and infantry squad tasks. These tasks support tactical and gunnery scenarios in all conditions using all organic weapons. This trains leaders and subordinates to distribute and control fires.

Bradley Infantry Platoon Gunnery Tables	Page
BT III--Infantry Squad and Section Exercise.....	9-21
BT IV--Infantry Platoon Proficiency Course	9-21
BT XI--Infantry Platoon Practice	9-25
BT XII--Infantry Platoon Qualification	9-26

Figure 9-1. Bradley Tables III, IV, XI, and XII.

Section I. TRAINING PROGRAM

Bradley infantrymen must have the skill and the will to do more than just participate in the close fight: they must be willing and able to *dominate* it. Figure 9-2, page 9-2, shows how concurrent crew and squad gunnery training merge in the Bradley platoon integrated gunnery-training strategy.

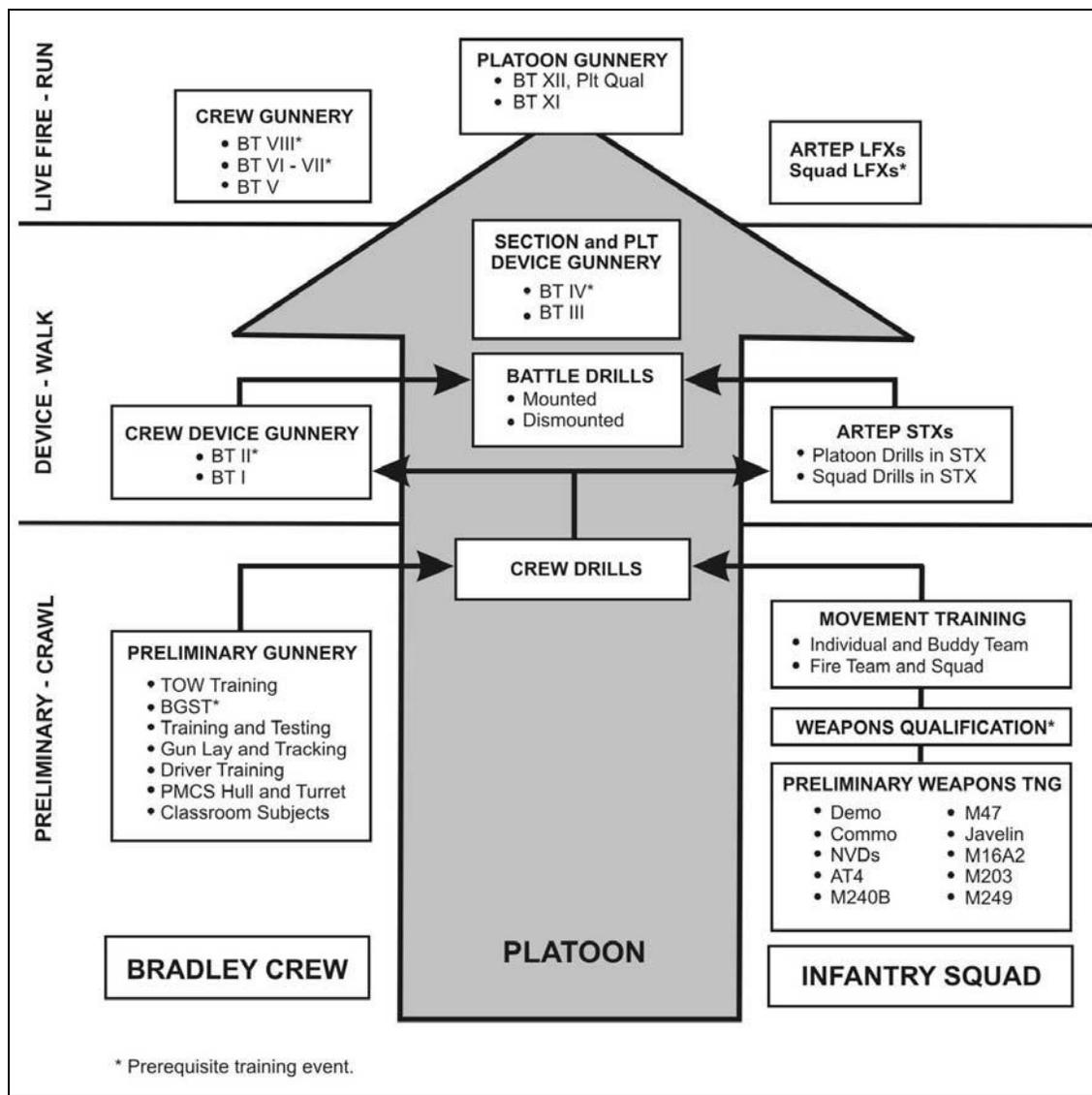


Figure 9-2. Bradley platoon training program.

9-1. INFANTRY SQUAD TRAINING

The goal of infantry squad training is to qualify squads and platoons on live-fire and battle-focused collective tasks that support the unit's METL. Squad training should parallel crew training. This ensures both crew and squad elements are prepared for integrated training on BTs III (ISSE) and IV (IPPC), page 9-21; and BTs XI and XII, pages 9-25 and 12-5. The squad leader is the principal trainer for his soldiers' weapons, equipment, and tactical proficiency. Training plans should include equipment training, weapons qualification, movement drills, STXs, and LFXs (Appendix E). Squad training can be grouped into the following levels:

- a. **Preliminary Training.** This training starts with weapons and equipment training. Soldiers conduct M16A2 advanced rifle marksmanship training to learn the combat fire techniques required for squad operations. Soldiers continue preliminary training by firing the M203 grenade launcher, M240B and M249 machine guns, the AT4,

and the M47 Dragon or Javelin. Squad members should become experts with demolitions, communications equipment, and NVDs. Their proficiency is measured during weapons qualification and hands-on equipment tests. Each soldier learns the individual skills and movement techniques required to survive in close combat. At the end of this training, crew and infantry squad elements are integrated to conduct crew drills.

b. **Device Training.** This consists of squad and crew drills in an STX using PGS or MILES equipment. At the end of this training, crew and infantry squad elements are integrated to conduct battle drills and section or platoon device gunnery.

c. **Live-Fire Training.** This consists of squad and platoon dismounted live-fire exercises. At the end of this training, crews are integrated for Infantry platoon practice and qualification (BTs XI and XII, pages 9-25 and 12-5).

9-2. INTEGRATED TRAINING

Platoon leadership works together to train the collective skills of integrated vehicle teams, sections, and platoon. Section and platoon battle drills are vital to integrating crews and squads. These drills teach routine sets of actions so that each soldier can perform them instinctively. He knows his individual tasks, when to accomplish them, and what to do if he cannot perform them.

a. **Crew Drills.** Crew drills instill instinctive actions that the vehicle team must be able to perform in combat. These drills include uploading ammunition and mounting and dismounting the vehicle.

b. **Crew Battle Drills.** Crew battle drills cover actions that the mounted section and platoon might need in combat. Crew elements must immediately react to contact or ambush or initiate an attack.

c. **Squad Battle Drills.** Squad battle drills cover actions that the squad or platoon might need while dismounted. Squad members must immediately react to contact or ambush or initiate an attack.

d. **Device Gunnery.** Device gunnery integrates vehicle sections and platoons with their Infantry squads on BTs III (ISSE) and IV (IPPC). These exercises develop and evaluate the collective skills of the section and platoon in a realistic tactical scenario using training devices.

e. **Platoon Gunnery.** Platoon gunnery trains and evaluates Infantry platoons using full-caliber ammunition. BT XI and XII (IPP and IPQ) provide platoons with a live-fire exercise in which they can refine collective task execution during a tactical live fire scenario. Platoon leaders must control the platoons, crew, and squad. The platoon practice table should emphasize fire distribution and control.

f. **Combined Arms Live-Fire Exercise.** Platoon training continues after qualification. The platoon is integrated into company CALFEXs and externally evaluated during company or battalion ARTEPs. During these multiechelon training events, the platoon fights as part of the combined arms team.

9-3. REQUIREMENTS

Training requirements for the Infantry platoon are the same as those discussed in Chapter 3 for the Bradley crew, plus the following (Figure 9-3, page 9-4)--

- a. Infantry platoons must have completed BT IV in the six months before BT XII.

- b. Crews that will fire live rounds during infantry platoon qualification must qualify on BT VIII in the six months before BTs XI and XII, pages 9-25 and 12-5.
- c. Squad members must qualify with their individual weapons in the six months before BT XII.
- d. Squads must complete a squad live-fire exercise to ARTEP standards in the six months before BT XII.

PERSONNEL	REQUIREMENTS
• Infantry platoons	Completed BT IV in the six months before Table XII.
• Crew firing of live rounds during qualification for Infantry platoon	Qualified on Table VIII in the six months before Tables XI and XII.
• Each squad member	Qualified with his individual weapon in the six months before Table XII.
• Each squad	Completed a squad live-fire exercise to ARTEP standards in the six months before Table XII.

Figure 9-3. Training requirements.

Section II. FIRE DISTRIBUTION AND CONTROL

As an integral part of the combined arms team, the BFV infantry platoon provides the infantry rifle squads with supporting direct fires at the necessary point on the battlefield. Destroying or suppressing the enemy with direct fires is vital to all combat operations. Leaders control the fires of BFV crews, automatic riflemen, antiarmor gunners, grenadiers, riflemen, and available fire-support assets. They aim to achieve a desired effect on the enemy and to prevent friendly fire. The platoon can only control and distribute fire effectively through planning (unit SOP) and rehearsals.

9-4. PRINCIPLES

To maximize the platoon's ability to engage the enemy, leaders must synchronize the fires of all direct-fire weapons and indirect-fire assets. The mechanized infantry platoon controls and distributes fires by making fire plans. When developing and executing these plans, leaders apply the following eight principles from FM 3-21.71:

- a. **Task Organize.** The "3 by 9" platoon configuration has four Bradley fighting vehicles, which are divided into two sections. The platoon also has three infantry squads. When determining task organization, leaders consider the capabilities and limitations of individual soldiers and crews. In the offense and defense, both the platoon leader and platoon sergeant position themselves where they can best command and control the platoon.
- b. **Destroy the Greatest Threat First.** The platoon engages targets from most to least dangerous. If two or more equally threatening targets appear, the platoon engages the nearest one first. Leaders determine specific threat conditions from command guidance for that operational area.

c. **Employ the Best Weapon for the Target.** The platoon has many weapons. Choosing the best weapon for a particular threat increases the likelihood of rapidly destroying or suppressing that threat. Normally, Bradley crews engage enemy vehicles, while infantry squads engage closer enemy threats (Chapter 6, Table 6-1).

d. **Avoid Overkill.** Using too many weapons against a single target wastes ammunition. It also decreases the platoon's ability to acquire and engage multiple targets effectively. Properly distributing platoon fires prevents overkill. That is, it keeps the platoon from using more ammunition and effort than needed to destroy or suppress a single target. To best distribute direct fire among the Bradley crews and infantry squads, the platoon can divide engagement areas into sectors of fire or into quadrants.

e. **Minimize Friendly Exposure.** To increase survivability, Bradley crews and infantry rifle squads avoid exposure to threat observation and fire, except as they must to engage. Using natural and man-made defilade positions for cover and concealment helps reduce exposure.

f. **Plan for Extreme Limited Visibility.** At night, limited visibility fire-control equipment enables the platoon to engage enemy forces at nearly the same ranges as during the day. Fog, smoke, blowing sand, and other obscurants can reduce visibility, preventing night vision-equipped systems from covering their surveillance responsibilities or from engaging targets at normal ranges. Every limited visibility plan relies on coordinating and using the Bradley's FLIR to help the infantry rifle squads, even though rifle squads have their own internal night-vision systems (NVDs) and illumination. Leaders adjust their fire plans based on visibility conditions and on the acquisition capabilities of their systems.

g. **Prevent Fratricide.** Leaders use ten tools to prevent the platoon from causing friendly and civilian casualties (fratricide):

- Rules of engagement.
- Weapons-control status.
- Weapon safety postures.
- Weapons safety procedures.
- Other control measures.
- Combat vehicle and aircraft identification training.
- Situational awareness.
- Positional awareness.
- Bradley commander confirmation.
- Vehicle recognition markings.
- Combat identification panels.

h. **Develop Contingencies for Diminished Capabilities.** Although leaders first develop their plans based on maximum capabilities, they also make backup plans that allow for casualties or for the damage or failure of weapons. Although leaders cannot plan for every possible problem, they can plan for the most likely ones.

9-5. FIRE-CONTROL MEASURES

To establish a direct-fire SOP, the leader applies fire-control measures. He modifies it based on METT-TC conditions and, as reconnaissance permits, he develops detailed fire plans. Fire-control and -distribution measures consist either of physical control measures or of simple, concise, clearly written weapons-control instructions (FM 3-21.71).

a. **Target Reference Point.** The leader designates recognizable terrain features as target reference points (TRPs). He uses TRPs to control both direct and indirect fires in support of the engagement plan. During movements, halts, and hasty actions, he selects and adjust TRPs, depending on the terrain he can see at the time. In the defense, he assigns TRPs along likely enemy avenues of approach, wherever he wants elements to mass fires.

b. **Sector of Fire.** To cover his entire area of responsibility, the leader divides it into sectors of fire. He assigns each sector to a subordinate element, crew-served weapon, or individual soldier. Sector assignment means responsibility for acquiring and engaging targets in that area. Limiting each element's or weapon's sector of fire prevents soldiers from accidentally engaging adjacent units. To overlap sectors for complete coverage with the direct-fire plan, the leader can use TRPs, clock directions, terrain-based quadrants, and friendly-based quadrants. He can also assign secondary sectors of fire to increase mutual support.

c. **Primary Direction of Fire.** When time is short or reference points too few to assign a sector of fire, the leader assigns a PDF instead of a TRP. To orient an element, weapon system, or soldier to a particular area on the battlefield, he uses the closest TRP, clock direction, cardinal direction, tracer on target, or infrared laser pointer.

d. **Trigger Line.** This is a prominent feature, natural or manmade, such as a ridge, stream, road, or railroad track. He uses this feature as a trigger line to initiate an engagement or to distribute fires in depth within a sector.

e. **Rules of Engagement.** These specify engagement limitations and circumstances:

(1) Factors that influence the ROE include--

- National command policy.
- Mission and commander's intent.
- Operational environment.
- Law of war.

(2) ROE always recognize the soldier's right of self-defense, clearly defining--

- The conditions in which a soldier may fire at a target.
- The conditions in which a soldier may fire warning shots.
- Combatants.
- The treatment of noncombatants.

f. **Weapons-Control Status.** The three levels of weapon control define the conditions, based on target-identification criteria, in which friendly elements engage targets. The platoon leader sets and adjusts weapons-control status based on the disposition of friendly and enemy forces and on the clarity of the situation. In general, a higher likelihood of fratricide requires more restrictive weapons control. The three levels of weapons-control status, in descending order of restriction, are as follows:

(1) **Weapons Hold.** Engage only if engaged or ordered to engage.

(2) **Weapons Tight.** Engage only those targets positively identified as enemy.

(3) **Weapons Free.** Engage any targets not positively identified as friendly.

g. **Engagement Priorities.** These serve three functions; they--

- Identify what type(s) of targets to engage first.
- Distribute fires among the various types of targets.
- Match weapons and ammunition to target type.

h. **Cease-Fire Criteria.** These are instructions that the commander gives to Bradley platoons to prevent overkill and to free the greatest number of systems to acquire and engage other targets.

i. **Fire Patterns.** The leader distributes and adjusts the fires of the infantry rifle squads, Bradley vehicle crews, or both into one or more of three basic fire patterns: frontal, cross, and depth. He does this to best cover a threat formation or multiple or simultaneous targets.

(1) **Frontal Fire.** When targets appear in front of the platoon in a lateral configuration, the platoon leader initiates frontal fire. BFVs engage targets to their fronts: the left flank BFV engages the leftmost target, and the right flank BFV engages the rightmost target. As they destroy their targets, the BFVs shift their fires toward the center of the enemy formation.

(2) **Cross Fire.** The platoon leader initiates cross fire when targets position themselves or move laterally in front of the platoon, or when obstructions prohibit frontal fire. With frontal fire, each flanking BFV engages the target on its own side first. With cross fire, each BFV engages the farthest target on the opposite side of the EA. The right flank BFV engages the leftmost target, and the left flank BFV engages the rightmost target. Firing diagonally across an EA like this gives the crew more flank shots. If the threat keeps moving forward, cross fire increases the chance of kills and reduces the chance of detection. As the platoon destroys its targets, it shifts fire towards the center of the enemy, and from near to far.

(3) **Depth Fire.** Leaders use depth fire for a target dispersed in column or column-like formation. The center BFVs engage the closest target; flanking BFVs engage deeper targets. As the platoon destroys targets, the BFVs all shift their fires towards the center of the enemy formation.

j. **Engagement Techniques.** The platoon leader can apply any of eight engagement techniques to destroy or suppress enemy targets, while minimizing friendly exposure:

(1) **Alternating Fire.** Either the BFVs or the members of the infantry rifle squad alternate fires into an area or onto a specific target. This--

- Provides constant suppressive fires.
- Keeps the enemy from acquiring friendly elements.
- Minimizes individual BFV and infantry rifle squad exposure.
- Presents multiple points of fire.

(2) **Simultaneous Fire.** All BFVs in a platoon or section, or members of the infantry rifle squad element, fire into their assigned sectors at the same time. Simultaneous fire achieves maximum destruction and fire superiority.

(3) **Sequential Fire.** A single soldier fires multiple AT4s in sequence, correcting each subsequent round until he achieves the desired target effect. Firing sequentially lets the soldier correct his fire based on his previous rounds.

(4) **Volley Fire.** Units fire volleys to rapidly mass the effects of their fires or to gain fire superiority. For example, a unit could initiate a support-by-fire operation with volley fire, then use alternating or sequential fire to maintain suppression. Firing in volleys also increases the chance that certain antiarmor weapons will hit and kill their targets. For example, to rapidly destroy a BMP that is engaging a friendly position, the infantry rifle squad can volley AT4 fire onto it.

(5) **Point Fire.** This is the directing of all weapons fire onto a specific target such as a machine gun or ATGM position. Spreading out the platoon on the ground improves point fire, because then the platoon can hit the target from multiple directions.

(6) **Area Fire.** For numerous or less obvious enemy positions, the platoon distributes fires over a large area. The platoon leader assigns each infantry rifle squad or BFV a sector of fire within the target area. This ensures that the platoon covers the entire target area with fire and observation.

(7) **Time of Suppression.** This is the time period, specified by the platoon leader, during which the platoon must suppress an enemy position or force. Both the platoon's BFV and infantry rifle squads receive the task to suppress an area in support of another element's assault.

(8) **Reconnaissance by Fire.** This is the process of engaging possible enemy locations to elicit a tactical response from the enemy such as return fire or movement. This response helps the platoon and subordinate leaders acquire targets accurately and mass fires against the enemy element.

k. **Weapons-Ready Posture.** This is an ammunition- and range-selection instruction that allows leaders to prepare systems, ammunition, and soldiers for the most likely engagement. Given an anticipated threat and visibility conditions (terrain and weather), leaders establish the desired weapon and battlecarry (ammunition and range) for each vehicle.

l. **Weapons-Safety Posture.** This is an ammunition-handling command. It gives leaders a way to precisely control the safety status of all of their weapons. Figure 9-4 shows the five weapons-safety postures. Soldier adherence to and leader supervision of the weapon safety posture prevents accidental discharges of weapons.

m. **Weapons-Safety Rules.** Whereas the term "weapons-safety posture" applies to ammunition, weapons-safety rules apply to weapons. Weapons-safety rules consist of instructions for handling weapons during combat and training. Their purpose is to prevent accidental discharges and injuries. Though each soldier bears the responsibility for handling his weapons safely, each leader must enforce the following rules:

- Handle each weapon as though it were loaded.
- Clear weapon immediately upon assuming control of it.
- Orient weapons away from other soldiers.
- Orient turret weapons away from friendly vehicles or soldiers.
- Avoid placing your hands over the muzzle of a weapon.
- Avoid resting the muzzle on your or someone else's body.
- Keep your weapon on SAFE unless preparing to fire.
- Adhere to your leaders' weapon-safety postures.

SAFETY POSTURE	COMMAND	BFV WEAPONS AND AMMUNITION	SQUAD WEAPONS AND AMMUNITION
Ammunition stowed	STOW AMMO	<ul style="list-style-type: none"> • Stow 25-mm and coax ammunition in shipping cans. • Stow TOW missiles in racks. • Stow smoke grenades in shipping cans. 	<ul style="list-style-type: none"> • Stow small arms ammunition in shipping cans. • Stow grenades in shipping boxes. • Stow AT4s and missiles in designated locations in the vehicle
Ammunition ready	<ul style="list-style-type: none"> • FILL MAGAZINES. • LOAD READY BOXES AND LAUNCHERS 	<ul style="list-style-type: none"> • Load 25-mm ready boxes. • Load coax ammunition boxes. • Load TOW missiles in the launcher. • Load smoke grenades in their launchers. 	<ul style="list-style-type: none"> • Fill magazines. • Load magazines, M249 ammunition boxes, hand grenades, and M203 grenades into pouches or vests.
Ammunition locked	LOCK AMMO	<ul style="list-style-type: none"> • Load 25-mm rounds into feeder. • Ensure manual safety is ON. • Place coax ammunition on feed tray. • Lock the bolt forward. 	<ul style="list-style-type: none"> • Lock magazines into rifle. • Ensure all weapons are on SAFE.
Weapons ready	READY WEAPONS	<ul style="list-style-type: none"> • Cycle 25-mm ghost round. • Place coax ammunition on the feed tray. • Lock bolt to rear. • Ensure manual safety is OFF. • Ensure ARM-SAFE-RESET switch is on SAFE. 	<ul style="list-style-type: none"> • Chamber round into rifle. • Place M249 ammunition on feed tray. • Lock bolt to rear. • Ensure all weapons are on SAFE.
Weapons cleared	CLEAR WEAPONS	<ul style="list-style-type: none"> • Remove and clear gun feeder. • Clear coax. • Remove bolt group. 	<ul style="list-style-type: none"> • Remove magazine. • Clear rifle. • Clear M249. • Remove ammunition box.

Figure 9-4. Weapons safety posture.

9-6. FIRE PLANS

Fire planning is a continuous process that focuses on METT-TC conditions. The platoon leader establishes the direct-fire SOP based on probable conditions and on the platoon's capabilities. He modifies it as he obtains more complete or more current information about METT-TC conditions. During the planning phase of an operation, the platoon leader analyzes METT-TC conditions. The result is a template of the enemy and anticipated conditions. The leader uses this template to alter his platoon SOP and establish mission-specific control measures (Figure 9-5, page 9-10). When the platoon halts temporarily, or when it executes hasty actions, the leader supplements or changes the SOP to fit current conditions. After reconnoitering, he develops an engagement plan that incorporates both direct and indirect fires and that supports the commander's fire plan and intent. Successful execution of any fire plan (from SOP to detail) requires rehearsal.

PERIOD OR PHASE	ACTION
Training	<ul style="list-style-type: none"> • Develop the direct-fire SOP based on contingencies and capabilities. • Rehearse the direct-fire SOP.
Preparation for combat	<ul style="list-style-type: none"> • Establish mission-specific fire-control and -distribution measures. • Adjust the SOP. • Rehearse.
Movement, halts, and hasty actions	<ul style="list-style-type: none"> • Issue supplemental instructions. • Talk through probable engagements, as time permits.
Post-reconnaissance	<ul style="list-style-type: none"> • Develop a detailed engagement plan. • Rehearse.

Figure 9-5. Fire-planning process.

a. **Direct Fire.** A well-rehearsed direct-fire SOP ensures that all members of the platoon react quickly and predictably (Figure 9-6, page 9-13). The leader bases each element of the direct-fire plan on the capabilities of the platoon and on the anticipated conditions. For example, if the contingency area is a desert with good observation and long engagement ranges, he selects extended battlecarry settings for the BFVs.

(1) Choosing a standard, respective position for TRPs allows the platoon leader to quickly establish and communicate his location. For example, he might number all reference points from left to right. Three TRPs usually suffice for a platoon during movements, halts, and hasty actions.

(2) The platoon leader assigns sectors and identifies engagement priorities to ensure the platoon acquires all targets and distributes fires effectively. One technique he could use is for both he and the platoon sergeant to search and engage mostly near- to mid-range troops, and for him to have the wingmen observe for mid- to long-range light armored fighting vehicles.

(3) The platoon leader designates a weapons-readiness posture for established sectors and engagement priorities. In addition, the platoon leader and platoon sergeant could, for example, select HE HI and Index 8 for range, while having the wingmen select AP HI and Index 12 for range.

(4) Having a standing fire pattern enables the platoon to distribute fires while engaging multiple, similar targets. For example, the platoon leader and platoon sergeant engage the close to middle targets, then work their way to the outside of the enemy formation. The wingmen, on the other hand, engage targets to their respective fronts, then work their way toward the inside of the enemy formation.

(5) The platoon leader sets standard engagement techniques to achieve desired target effects, minimizing friendly exposure. As an example, he could have the BFVs initiate with simultaneous fire, then revert to alternating fires. One infantry squad suppression pattern technique would be to engage initially with simultaneous fires, then to sustain suppression with alternating fires, with each weapon firing a given number of rounds or bursts.

(6) The platoon leader selects an initial weapons-control status that allows soldiers to engage the enemy, but that at the same time reduces the chance of fratricide. "Weapons tight" is a good initial weapons-control status.

(7) The platoon leader chooses signals for shifting fire that members of the platoon can both hear and see. For example, he might decide to use a green pyrotechnic and a certain code word to shift fires, and a red pyrotechnic and another code word to adjust or cease fires.

(8) The platoon leader plans for degraded capabilities and loss. In one example, a single BFV temporarily assumes the responsibilities of a nonmission-capable or degraded BFV of the same section. As the operational tempo permits, the platoon leader adjusts to compensate for the degraded capabilities and losses. Also, if an automatic rifleman or antiarmor gunner becomes a casualty, the assigned backup secures the M249, M240B, or any antiarmor weapon and assumes the downed soldier's sector responsibilities.

b. **Example Direct-Fire SOP.** A direct-fire SOP would include the following elements. Specific details are for example only:

(1) **Target Reference Points.**

- TRP 1--Left.
- TRP 2--Center.
- TRP 3--Right.

(2) **Shift Signals.**

- Shift fires-green pyrotechnic and "*Green Hornet*."
- Cease fires-red pyrotechnic and "*Redman*."

(3) **Weapons-Control Status.** This should be weapons tight, unless stated otherwise.

(4) **Sector of Fire and Weapons-Ready Posture.** (Figure 9-6.)

- The platoon leader and sergeant take on any close- to mid-range targets.
- The wingmen take on any mid- to long-range targets.
- The rear-most BFV (if last in the formation) takes on the secondary sector.

(5) **Engagement Priorities.**

- Platoon leader and platoon sergeant engage any troops.
- Wingmen engage any heavy- and light-armored fighting vehicles.

(6) **Cease-Fire Criteria.**

(a) The platoon leader and platoon sergeant cease firing at any target that a wingman is effectively engaging.

(b) The platoon leader ceases firing at any target that the platoon sergeant is effectively engaging.

(7) **Frontal Fire Pattern.**

(a) The platoon leader and platoon sergeant both engage from the inside (close targets) to the outside.

(b) Wingmen engage from the outside to the inside.

(8) **Engagement Technique.** The platoon fires simultaneous fire, then alternates fire.

(9) **Sectors.** (Figure 9-6.)

(10) **Weapons-Ready Posture.**

(a) One M240B or two M249s use a four-to-one mix at 500 meters.

(b) Grenadiers fire HEDP at 150 meters.

(c) AT4s fire at 200 meters.

(d) Riflemen fire ball ammunition at a range of 300 meters using the small apertures on their sights.

(e) The point man fires a burst.

(11) **Suppression Pattern.** The platoon fires simultaneous, then alternating fire.

(a) *Simultaneous Fire.*

- One M240B or two M249s fire six five-round bursts.
- The grenadiers fire two rounds of HEDP.
- The riflemen fire twenty aimed rounds.
- One AT4 or Javelin crew, 3 X 9, fire sequentially at hardened targets only.

(b) *Alternating Fire.*

- M249 or M240B Number 1 fires three five-round bursts.
- The riflemen fire five aimed rounds.
- The grenadier fires one round of HEDP.
- M249 or M240B Number 2 fires three five-round bursts.
- The riflemen fires five aimed rounds.
- The grenadier fires one round HEDP.
- The leaders fill lulls in fire.

c. **Mission-Specific Measures and SOP Adjustment.** Analyzing METT-TC reveals the need to set mission-specific fire-control and -distribution measures and to adjust the direct-fire SOP. The platoon leader marks physical control measures, such as TRPs, phase lines, and boundaries, on operational graphics and sketches. He assigns PDFs for specific elements based on probable enemy locations. He also adjusts elements of the direct-fire SOP, such as weapons-ready postures, engagement priorities, and sectors, based on new, anticipated conditions and on the current capabilities of individual soldiers, crews, squads, and systems.

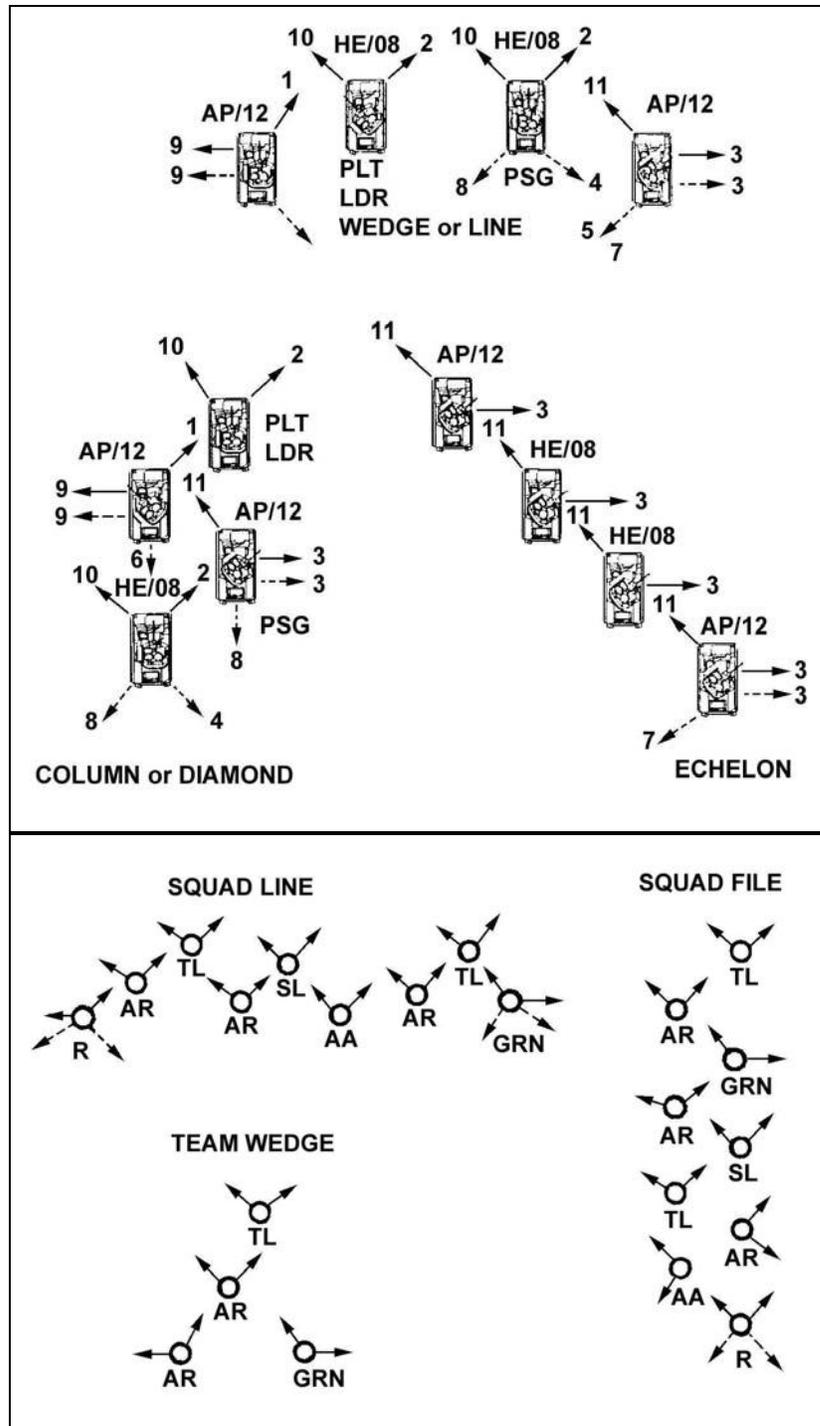


Figure 9-6. Example BFV platoon direct-fire SOP.

d. **Supplemental Instructions.** As an operation proceeds, the platoon leader issues fire-control and -distribution instructions based on observed and reported METT-TC conditions. The platoon leader--

(1) Continuously asks himself the following questions:

- What can I use to control fires?
- Where is the enemy likely to come from?
- What friendly units might be in front of me?

(2) Designates and adjusts TRPs as the terrain changes.

(3) Assigns PDFs toward probable enemy locations or avenues of approach.

(4) Changes the weapons-control status of friendly maneuvering units. For example, while moving, a platoon leader designates a road intersection as a TRP, assigns it as the PDF for one section and, while a friendly unit moves in front of the platoon, changes the weapons-control status from "Weapons Tight" to "Weapons Hold."

(5) Ensures that all subordinates know the TRPs. Points out their locations when he assigns TRPs or when previously assigned TRPs become visible.

e. **Detailed Fire Plans.** Reconnaissance forms the basis for preparing detailed fire plans, and rehearsal is the key to executing them.

(1) The company commander plans fires in as much detail as time permits (FM 3-90.1 and FM 3-90.2).

(a) *In the Offense.* He establishes TRPs, assigns PDFs, and plans indirect fires based on his reconnaissance.

(b) *In the Defense.* He integrates direct fires, supporting obstacles, and fire support to build EAs. He tells platoons where to mass fires by designating TRPs.

(2) The platoon leader orients forces on assigned company TRPs, assigns more TRPs as needed, and designates approximate positions for BFVs, squads, and infantry antiarmor missile systems and automatic weapons.

(3) The squad leader orients and assigns positions for any antiarmor and automatic weapons not directed by the platoon leader. He also positions the rest of the infantry squad.

(4) The Bradley commander establishes the exact fighting positions by observing his assigned TRP from both turret-defilade (scanning) and hull-defilade (engagement) positions.

(5) To help identify dead spaces, the leader has a vehicle move through the sector or EA. At the same time, he positions the squad's antiarmor weapons and the BC positions the BFVs.

(6) After approving BFV and infantry squad positions, the platoon leader--

(a) Draws a platoon sector sketch based on BFV range cards and on infantry squad and section sector sketches.

(b) Then, based on the company fire plan, he sets engagement priorities, weapon-ready posture, and a platoon fire pattern.

(c) Conducts rehearsals to ensure subordinates know and can execute the fire plan to standard.

f. **Sector Sketches.** The platoon leader uses sector sketches to make sure he covers his acquisition and engagement responsibilities, to orient subordinate elements, to provide information to higher leaders, and to control fires. After confirming weapons positions, he sketches his own engagement plan (Figures 9-7 and Figure 9-8, page 9-16).

(1) Each leader prepares sector sketches on acetate overlays to a scale established by the commander. The squad, section, and platoon sector sketches will look a lot alike. The main difference between them is, of course, the size of the element. For example, the platoon sketch shows the BFV, squad, and antiarmor missile positions. Squad and section sketches show the BFV and soldier fighting positions.

(2) Each leader submits his completed sector sketch to the next most senior leader for approval. After receiving approval, he distributes copies of his sketch to his subordinates.

(3) The company commander should ensure that platoon leaders and platoon sergeants receive copies of the company's fire plan. Each platoon leader issues copies of his platoon's sketch to section leaders and squad leaders. Every sector sketch must show--

- Main terrain features.
- TRPs.
- Primary and alternate positions.
- Primary and secondary sectors of fire and maximum engagement lines.
- Primary directions of fire or final protective lines.
- Dead spaces.
- Observation post(s).
- Obstacles.
- Indirect fires associated with the engagement plan.
- Adjacent element positions.
- Remount point(s).
- Supplementary fighting positions for BFVs and infantry squads.

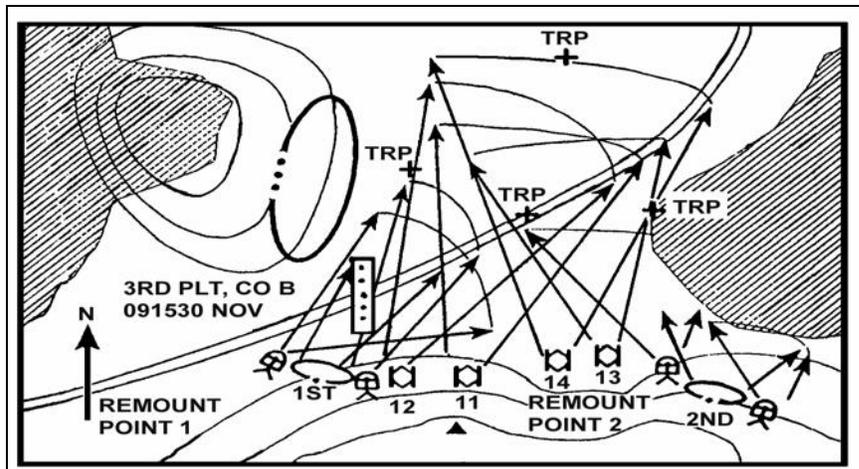


Figure 9-7. Platoon sector sketch.

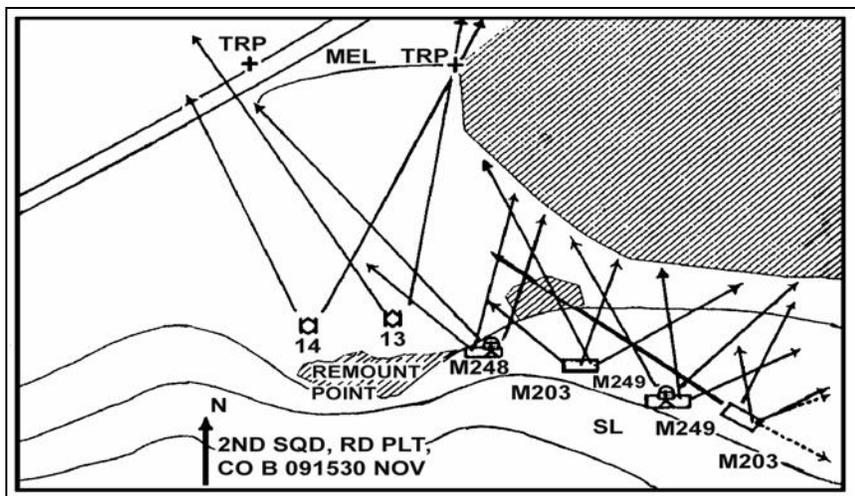


Figure 9-8. Squad or section sector sketch.

Section III. EVALUATION

Gunnery tasks are incorporated into tactical platoon collective tasks to allow live-fire evaluation. The standards for each collective task are in the training and evaluation outlines (T&EOs) in the MTP. These T&EOs are used to record the section's or platoon's evaluations. The evaluation packets need to cover all pertinent organizational information and task summary results. The senior trainer assesses the results of all evaluated collective tasks and rates the platoon "T" (trained), "P" (needs practice), or "U" (untrained). This section describes the roles, requirements, and guidelines for incorporating live-fire tasks in collective tasks.

9-7. EVALUATION TEAM

Evaluators enhance the platoon training experience by providing valuable and credible observations. Each evaluator should hold the same or higher rank than the evaluated element's leader. Ideally, the evaluator should have experience in the evaluated leader's position. This gives him credibility, and soldiers are more willing to learn from him. FM 3-90.1 and the MTP give more information about the evaluators' specific roles and procedures. The commander should task sufficient evaluators and exercise support personnel to observe and evaluate the platoon's performance. Those tasked help the range safety officer and perform their own assigned tasks. Battalion commanders must select qualified personnel to serve as members of the evaluation team.

a. **Senior Trainer.** The battalion commander or his representative (battalion executive officer or S3) develops, designs, and executes the training exercise. He collects all evaluation packets and penalty results. He factors in his own observations and assesses the platoon's overall training. He approves alibis and oversees the AAR.

b. **Senior Evaluator.** Each platoon has one senior gunnery evaluator. He should be a captain who has already commanded a company. He gives the senior trainer his evaluations, observations, and an initial assessment. He also conducts the AAR.

c. **Assistant Evaluator.** Each section and squad has one assistant gunnery evaluator. The assistant evaluator should be a lieutenant or sergeant first class who has experience as a platoon leader or platoon sergeant. He observes overall squad and section

leader tasks, dismounted element and vehicle actions, and fire control and distribution. He also helps ensure live-fire safety. He initially assesses the squad or section using the T&EOs. He provides input during the AAR.

d. **Gunnery Evaluator.** Each platoon has two gunnery evaluators, each of whom should be a master gunner or a qualified BCE who understands target operations. The gunnery evaluator follows his designated section, records vehicle-exposure times during defensive engagements and, during offensive engagements, confirms target kills with the range tower. Another gunnery evaluator can work with the computer operator to enhance range operations. For the purpose of assessing penalties and casualties, gunnery evaluators inform the senior evaluator as to which targets the crews missed and which crews' vehicles were overexposed during the engagements.

9-8. EVALUATION GUIDELINES

The following guidelines establish standards and procedures for gunnery tasks that support collective task assessment:

- a. Collective task standards in the MTP are used for evaluations.
- b. Penalties are imposed against the section's or platoon's vehicles when they are exposed to the threat beyond established threat-based times (Chapter 8). Penalties are imposed against the section's or platoon's dismounted elements based on targets they failed to kill. These penalties are assessed IAW the gunnery task-penalty matrix shown in Figure 9-9, page 9-18.
- c. The senior evaluator or his designated representative may assess additional penalties based on observations (NBC, indirect fires, or other situations), but he uses the matrix to determine minimum penalties.
- d. Penalties imposed are based on the respective threat target category and the weapon system (infantry squad or vehicle) exposed to the target.
- e. Timing procedures for determining vehicle exposure are the same as in crew gunnery evaluation (Chapter 8).
- f. If neither the platoon, crew, section, squad, nor soldier engages a target, and if no vehicle is exposed to the threat, then no penalty is assessed. The crew must meet the MTP standards for the evaluated task.
- g. Target engagement requires proper platoon fire commands.
- h. Target kills apply if the weapon system used to engage the target can destroy the replicated threat.
- i. The units should integrate CS and CSS into the exercise and perform applicable tasks. These can include Class I, III, and V resupply and casualty evacuation tasks. Combat lifesavers participate in CASEVAC.
- j. Unit or platoon SOP supplements the evaluation of the section's or platoon's actions during the exercise.
- k. The unit conducts AARs at the ends of the day and night phases.
- l. A section or platoon evaluated overall as "Untrained" must complete the entire phase before it can qualify. The section or platoon may not redo or refire a collective task in any phase to achieve a "needs practice" or better rating.
- m. The only acceptable alibis are those based on the failure of range targetry or on safety considerations unrelated to the firing platoon. Routine problems such as the failure of a vehicle, weapon, or communications equipment do not constitute alibis. Platoons can

deal with these problems as they would in combat--by cross-leveling ammunition, personnel, and equipment--but the mission continues. Only the battalion commander may approve alibis.

TARGET CATEGORIES	BFV OFFENSE OR RETROGRADE	BFV DEFENSE	DISMOUNTED INFANTRY
Aerial Targets	Catastrophic	Catastrophic	Two soldier casualties per target not killed.
TOW, Javelin, or Dragon Targets	Catastrophic	Mobility and Firepower	Two soldier casualties per target not killed.
AP Point Targets	Catastrophic	Firepower	Two soldier casualties per target not killed.
HE Point Targets	Mobility and Firepower	Firepower	One soldier casualty per target not killed.
ATGM Teams, Coax Point or Bunker Target	Mobility	Firepower	One soldier casualty per target not killed.
Dismount Squad, Coax Area, or Trench Line	Mobility	Firepower	One soldier casualty per target not killed.

Figure 9-9. BFV platoon gunnery task-penalty matrix.

9-9. ASSESSMENT OF PENALTIES

Penalty assessments reflect possible results of a platoon's action.

a. Vehicle penalties are classified as mobility, firepower, mobility and firepower, and catastrophic (Figure 9-9). During the conduct of the exercise, personnel must adhere to range safety requirements rather than enforce penalties that conflict with range safety.

(1) **Mobility Penalty.** If it receives a mobility penalty, a vehicle may fire, but it may not move (under its own power) until reconstituted. This can leave the vehicle exposed during the next engagement, which merits an additional penalty. To avoid the additional penalty, a platoon leader might have to adjust his direct-fire plan and engagement SOPs.

(2) **Firepower Penalty.** If it receives a firepower penalty, a vehicle may move, but it may not fire until reconstituted. It may, however, continue to relay situation reports and acquire and report any threat activity. Having a vehicle receive this penalty might require the platoon leader to adjust his direct-fire plan and engagement SOPs.

(3) **Combined Mobility and Firepower Penalty.** If it receives a combined mobility and firepower penalty, a vehicle can neither move *nor* fire until reconstituted.

(4) **Catastrophic Penalty.** If it receives a catastrophic penalty, a vehicle can do nothing until reconstituted. All personnel on board at time of notification are considered casualties IAW their *MILES Casualty Tags* (GTA 8-11-5).

b. Personnel penalties are also classified using these casualty tags. If the evaluator imposes personnel penalties, each soldier in the platoon, including each Bradley crewmember, receives a card. These cards identify a variety of personnel injuries ranging from minor injuries, requiring only self-aid, to priority litter injuries that require casualty evacuation. Killed-in-action cards are also used. Crew members (BC, driver, or gunner),

should receive return-to-duty cards because of range safety requirements that may require them to move the vehicle. These cards simulate the realism needed for leader decisions and incorporation of CSS missions.

c. Each collective task is evaluated individually. A collective task may consist of more than one live-fire engagement. Any penalty assessed during a collective task remains in effect throughout that collective task.

d. Reconstitution of the penalized element(s) occurs at completion of a collective task, if tactically feasible.

e. Evaluators use all penalties for a collective task to evaluate that collective task standard.

f. Failure to comply with an NBC condition during the day or night phase automatically results in a "killed in action" assessment for that soldier. He retains this status throughout that collective task.

9-10. EXAMPLES

This paragraph provides examples of situational evaluations and penalty assessments. The platoon is conducting the subtask "Overwatch/Support by Fire" during a mounted assault. Section A is in the overwatch position and Section B is bounding.

a. **Example 1.** Section A is presented two BMP targets. Both BMP targets are exposed simultaneously for 50 seconds. The BFV threat exposure time is 22 seconds for one BMP and 18 seconds for the other. Section A engages and kills the BMP with an 18-second threat exposure time while exposing a BFV for 16 seconds. Section A then kills the BMP with a 22-second threat exposure time while exposing a BFV for 20 seconds. No penalty is assessed.

b. **Example 2.** Section kills the BMP with an 18-second threat-exposure time while exposing a BFV for 17 seconds.

(1) **Description.** Section A fails to kill the BMP with a 22-second threat exposure time while exposing a BFV to the threat for more than 22 seconds. Thus, the BFV receives a penalty IAW the gunnery task-penalty matrix. Also, the senior evaluator may assess an additional penalty against the bounding section because it was exposed to the 22-second BMP, but did not destroy the threat.

(2) **Rationale.** Total target-exposure time is 50 seconds. Depending on how long the Section A BFV was exposed, the 22-second BMP could have had 27 seconds of target exposure time remaining. Therefore, that BMP could have had 27 seconds to acquire and apply a burst on a bounding BFV. This situation could vary based on conditions and range.

c. **Example 3.** The section kills the BMP with an 18-second threat exposure time while exposing a BFV for 17 seconds, but it fails to kill the BMP with a 22-second threat-exposure time. If no BFV in either section is exposed to the threat beyond the BFV exposure time, no penalty is assessed. However, the platoon must meet the MTP standards for the entire collective task (that is, it must kill or destroy a percentage of enemy).

d. **Example 4.** During the first live-fire engagement of a collective mounted assault task, a platoon concentrates fires on the objective from a support position. Seven targets are presented: three BMPs, two gun trucks, and two squads. Two of the platoon's BFVs are overexposed to one BMP and one squad. Therefore, for that engagement, the platoon

receives one catastrophic and one mobility penalty. The evaluator records the results on the gunnery scoresheet. (Figure 9-10 shows an example format for such a scoresheet.) In the second engagement, Section A bounds and overexposes itself to a BMP and to a squad. This costs it one catastrophic and one mobility penalty. Thus, the platoon receives a total of two catastrophic and two mobility penalties on the overall collective task. The evaluator uses the results along with the collective task standards in the MTP to make the assessments.

TASK	ELEMENT	SUBTASK	TARGETS PRESENTED	TARGET KILLS	PENALTIES ASSESSED
Assault mounted	Platoon	Concentrate fires on the enemy	1 BMP	1	
			1 BMP	1	
			1 BMP	1	1 BFV catastrophic
			1 Gun Truck	0	
			1 Gun Truck	1	
			1 Squad (7 IRETS)	1	
			1 Squad (7 IRETS)	1	1 BFV mobility
	Section A	Bound	1 BMP	1	
			1 BMP	0	1 BFV catastrophic
			1 Squad (7 IRETS)	0	1 BFV mobility
TOTALS			5 BMPs	4	2 BFV catastrophic
			2 Gun Trucks	1	
			3 Squads (7 IRETS)	2	2 BFV mobility

Figure 9-10. Example format for gunnery summary sheet.

Section IV. SECTION AND PLATOON DEVICE GUNNERY

Section and platoon device gunnery consists of BT III, the Infantry squad/section exercise, and BT IV, *Infantry Platoon Proficiency Course* (IPPC). These tables train and evaluate collective squad/section and platoon tasks. To conduct the exercises, leaders use MILES or PGS with LTID-equipped targets, or they use a force-on-force scenario. All evaluations follow ARTEP 7-7J-Drill and FM 3-21.71, and Section III of this chapter. BT IV (IPPC) is a prerequisite to BT XII, *Infantry Platoon Qualification*. Leaders must

conduct the IPPC at least once during the day and once at night within the six months before BT XII, page 12-6.

9-11. GUIDELINES

The following guidelines apply to section/platoon device gunnery:

- a. Company commanders select squad collective tasks for BT III, the Infantry squad/section exercise (ISSE).
- b. Battalion commanders, along with their S3s, determine which additional platoon collective tasks to evaluate during BT IV (IPPC).
- c. Company commanders, along with their master gunners, develop operational scenarios, OPORDs, and evaluation packets that support the squad collective tasks.
- d. Battalion S3s, along with their master gunners, develop operational scenarios, OPORDs, and evaluation packets to support the platoon collective tasks.
- e. BFV and target-exposure times follow guidelines in Chapter 8.
- f. In force-on-force scenarios, OPFOR requirements and standards follow ARTEP 7-7J-MTP.
- g. For a range-targetry scenario, leaders use the gunnery task-penalty matrix (Figure 9-9) to assess penalties.
- h. Requirements for Bradley A3 and ODS units include one day and one night engagement using digital communications equipment (ARTEP 7-7J MTP).

9-12. BRADLEY TABLE III, INFANTRY SQUAD AND SECTION EXERCISE

This table integrates the rifle squad with their vehicle section while conducting squad collective tasks. Before ISSE, Bradley crews learn to integrate their training on the vehicle. Units develop the ISSE scenario to support their METL and training emphasis. All squad and section members must participate in a realistic scenario that requires them to conduct battle-focused squad collective tasks that integrate, at a minimum, the following from ARTEP 7-7J-Drill:

- a. **Crew Drills.** (Minimum of three crew drills.)
- b. **Battle Drills.** (Minimum required drills.)
 - React to contact (mounted).
 - Break contact (mounted).
- c. **Tasks.** (Minimum of three additional, specific crew, squad, or section tasks.)

9-13. BRADLEY TABLE IV, INFANTRY PLATOON PROFICIENCY COURSE

This table integrates the mounted and dismounted elements of the platoon into the platoon collective tasks. The battalion develops the IPPC scenario based on the METL and training emphasis. All platoon members participate in a realistic scenario that requires the platoon to conduct battle-focused platoon collective tasks. At a minimum, this table evaluates four collective tasks from ARTEP 7-7J-Drill or -MTP. These tasks must support the missions that are evaluated during platoon qualification as well as the unit's METL.

Section V. PLATOON GUNNERY

Previous sections and chapters discussed tactical and gunnery skills training and evaluation for individuals, crews, squads, sections, and platoons. This section covers the development and conduct of platoon live-fire gunnery exercises. Infantry platoon live fire trains and evaluates how well the platoon integrates vehicle and rifle infantry and distributes and controls fire. Platoons perform tactical collective tasks with integrated live fire, in all conditions and with all platoon organic weapons. Platoon gunnery consists of BTs XI and XII, pages 9-25 and 12-5 (*Infantry Platoon Practice* and *Infantry Platoon Qualification*). Platoon collective tasks link directly to the seven platoon operations in ARTEP 7-7J MTP and to the combat drills in FM 3-21.71 and ARTEP 7-7J-Drill. The unit commander selects and develops tactical operations based on his METL and on the contingency AO. He integrates Infantry squad and vehicle crew gunnery tasks to support the tactical scenario. He uses the MTP T&EOs to assess overall performance. Chapter 8, Section III of this chapter, and the MTP discuss evaluation procedures and required personnel.

9-14. DEVELOPMENT OF EXERCISE

The MTP and the platoon gunnery exercises in this chapter establish an Army standard for training and evaluation. At the same time, they allow unit commanders to tailor tactical and gunnery tasks based on their particular missions and training emphasis. This paragraph identifies the required gunnery target presentations to support platoon collective tasks. Units determine specific threat target types and engagement distances or range bands. Platoon gunnery evaluation procedures and standards are in Section III of this chapter and the MTP. The following guidelines apply to both platoon practice and qualification:

a. **General Requirements.** Bradley platoon practice is a building block for Bradley platoon qualification. Both exercises are fully resourced with ammunition; however, other training resource constraints could prohibit the platoon from the prescribed firing practice. However, the platoon should collectively participate in live fire at least once before they must qualify using live rounds. When they do qualify, platoons follow the guidelines and standards in this chapter and in Section III of this chapter.

(1) The battalion commander and his S3 determine which MTP mission(s) to conduct based on the unit's METL and specific command guidance.

(2) The S3 identifies the collective tasks to evaluate based on the operational missions IAW the MTP.

(3) The S3 identifies which collective tasks to conduct live fire.

(4) Platoon gunnery will be conducted in two phases--one during the day and one at night.

(5) The S3 and battalion master gunner develop scenarios that require the platoon to conduct tactical missions and their respective collective tasks. Live-fire gunnery presentations are incorporated into the identified collective tasks. This chapter identifies the type and the minimum number of live-fire targets during qualification. However, units may add targets if resources allow.

(6) The S3, S2, and battalion master gunner select vehicle and troop arrays that represent threat forces in contingency areas or the required training emphasis. They also specify threat target types and engagement distances, or range bands as well as most-to-

least-dangerous targets, based on the threat analysis and training emphasis. The end product is a threat template for platoon gunnery exercises.

(7) Different target types are combined to create presentations. A target presentation is designed to force the platoon to distribute and control fire.

(8) The S3 develops an OPORD that supports the missions.

(9) The battalion master gunner prepares evaluation packets for each platoon. Each packet contains T&EOs (from the MTP) and gunnery summary sheets. He arranges the contents in collective-task sequence.

(10) The battalion master gunner coordinates all necessary resources and personnel to support the gunnery exercises (Chapter 5).

(11) The platoon uses all organic equipment and weapons systems.

(12) Either the MILES or PGS with LTIDs can replicate TOW, Javelin, and Dragon fire. Either MILES or a 9-mm subcaliber device can replicate AT4 fire.

(13) For the A3 and for FBCB2-equipped ODS models, BTs XI and XII, pages 9-25 and 12-5, must each include--

- One engagement under digital conditions in the day phase.
- One engagement under digital conditions in the night phase.

b. **Live-Fire Requirements.** Live-fire collective tasks are conducted on the range complex that offers the best available target and maneuver area.

(1) Platoon practice and platoon qualification may be conducted on the same range. However, target presentation will not be in the same sequence.

(2) The computer individually addresses all troop targets for scoring. Troop targets will not be linked together to create multiple kills.

(3) All targets within a presentation are presented simultaneously. This requires the firing element to properly control and distribute fires.

(4) Each firing vehicle is presented no more than two targets for each engagement, except for the A3, which can have three.

(5) For each squad that will fire, no more than two dismount squads are presented simultaneously.

(6) The infantry rifle elements conduct at least two NBC engagements; vehicle elements do the same. These requirements can be combined if both infantry rifle and vehicle crews fire during the engagement. One NBC engagement must be conducted during the day phase and one NBC engagement during the night phase. Commanders are encouraged to increase the number of NBC tasks conducted. The entire platoon is in MOPP4 for all NBC tasks.

(7) Indirect-fire support should be incorporated in the scenario, whether it is simulated or live fire (conduct live fire if possible). If mortars are used for illumination, this can count as fire support. The platoon may not engage any of the required targets with indirect fires. Indirect-fire targets are additional target presentations based on the threat template. The commander evaluates this task IAW ARTEP 7-7J-MTP.

c. **Scenario Enhancement.** Evaluators can use pyrotechnics and simulators (weapons effect) for effect and to cue the platoon to certain events.

(1) The scenario could include CS and CSS.

(2) Vehicles and soldiers should have specific MILES components that do not interfere with live fire. This allows the evaluators imposing penalties to enforce them rapidly.

(3) All individual soldiers should receive MILES casualty cards. These cards will replicate casualty status during live-fire tasks when penalties are imposed. Only vehicle commanders, gunners, and drivers should receive return-to-duty cards for safe movement of vehicles.

(4) Friendly targets should be incorporated into the scenario.

(5) Unit SOPs should be given to the evaluators for implementation into the evaluation.

(6) The firing platoon's company commander should follow the platoon for C2. Simulating radio traffic enhances the effects of the tactical scenario. Company commanders receive all platoon reports and issue instructions and FRAGOs based on the established scenario.

(7) Target presentations occur based on the platoon's tactical employment. The platoon should react to rather than anticipate target presentations.

d. **Targetry.** All targets are constructed IAW Chapter 5 of TC 25-8.

(1) **BFV Target Engagements.** (Chapter 8.)

(2) **Rifle Infantry Weapons.**

(a) **ATGM and Bunker Target Engagements.** Vehicle targets are shown the same as described for BFVs. RPG or ATGM teams are no more than three E-type silhouettes placed in line, in depth, or in a wedge formation, no more than 5 meters apart or 10 meters in depth (Chapter 5).

(b) **Infantry Rifle Squad and Trench-Line Target Engagements.** Realistic arrays include no more than 7 and no fewer than 4 E-type silhouettes placed in a linear or wedge formation. They are spread up to 5 meters apart, but the whole target array fits in an area up to 30 meters wide by 20 meters deep. For example, 14 troop targets equal two separate dismounted squad targets.

(c) **Substitutions.** If range facilities cannot support an HE area target, the leader can substitute three HE point targets. Each firing vehicle is presented no more than two targets for each engagement, except for the A3, which can have three.

(3) **Minimum Required Targets.** Figure 9-11 shows the minimum required targets.

TARGET	MINIMUM TARGETS
AP Point	24
HE Area	2
HE Point	18
Coax Area	6
Coax Point	4
Infantry Targets	112
TOW	1

Figure 9-11. Minimum required targets.

e. **Ammunition.** DA Pam 350-38 dictates ammunition allocations (Figure 9-12). It fully resources platoon practice and qualification for BFVs. It resources dismounted weapons based on squad and platoon LFX allocations. If resources are available and extra targets are added, platoons will receive additional ammunition based only on allocated

rounds per additional target type. Platoons will receive and internally distribute ammunition for the entire exercise (day and night phases). (Chapter 8 allocates ammunition for each BFV target--the 25-mm, TOW, and coax.)

AP	192 rounds
HE	194 rounds
7.62-MM	800 rounds
Infantry Rifleman	Based on STRAC
TOW	1 missile (or PGS or MILES)

Figure 9-12. Ammunition allocations.

f. **BFV Target-Exposure Time.** Each target has a different exposure time. To determine this time, the master gunner needs to know the type of engagement, target type, target conditions, and target distance. He uses the crew gunnery procedures in Chapter 8.

g. **Infantry Rifle Target-Exposure Time.** Dismount troop targets are presented four times, 5 seconds each time, at 10 second intervals.

h. **Allowable Variations.** Battalion commanders may add--

- Friendly targets to platoon qualification.
- Smoke and other obscurants to enhance the scenario's effects.

9-15. PREREQUISITES

The platoon must complete these prerequisite activities before conducting a live-fire gunnery exercise:

- a. All BFV crewmembers (including the platoon leader's backup crewmember) must qualify on the BGST within the previous three months (four months for RC units).
- b. All crews who fire live rounds must qualify (as a crew) within the previous six months. Platoons maintain their platoon integrity. That is, only one platoon at a time can take part in live fire--with no exceptions.
- c. All squad members must qualify on their individual weapons (M16, M203, M240B, and M249) within the previous six months.
- d. All squads must complete a squad live-fire exercise to ARTEP standards within the previous six months.
- e. Platoons must complete IPPC (BT IV) within the previous six months.

9-16. BRADLEY TABLE XI, INFANTRY PLATOON PRACTICE

This table prepares the platoon for qualification. This is the first table in which the BFV and dismounted infantry conduct live fire at platoon level. The objective is to practice BFV and infantry squad integration and coordination to form a platoon collective effort.

- a. The platoon should practice the fire-control and -distribution techniques they will use during qualification.
- b. Exercise development, standards, evaluation, ammunition, and target considerations are the same as for platoon qualification.

c. This table is resourced for full-caliber ammunition but can be modified for vehicle subcaliber, 7.62-mm coax. Training devices, such as MILES or PGS, may be used if ammunition or range constraints prohibit live-fire execution.

d. This table will model BT XII to include all collective and METL tasks for the contingency area of operations.

9-17. BRADLEY TABLE XII, INFANTRY PLATOON QUALIFICATION

Platoon qualification evaluates the platoon's ability to execute collective tasks in a tactical live-fire environment. Collective task evaluations measure the platoon's combat proficiency. Mounted and dismounted infantry are integrated and evaluated on their ability to fight as a cohesive BFV platoon. This is the focus of Bradley gunnery previously discussed in this chapter.

- a. The platoon must meet all prerequisites.
- b. Bradley platoon qualification must be conducted live-fire using full-caliber ammunition.
- c. The unit must follow--
 - (1) Scenario development guidelines.
 - (2) Ammunition and target guidelines.
 - (3) Standards, scoring, and evaluation procedures (Section III).

CHAPTER 10
Cavalry Section Advanced Tables

This chapter provides the procedures and standards the trainer needs to evaluate the cavalry section's advanced gunnery tables. It refers to ARTEP 17-57-10-MTP simply as "the MTP," except to distinguish it from other MTPs.

Section gunnery includes two tables for training and qualification (Figure 10-1).

These tables combine gunnery and tactical training and MTP operations and gunnery tasks from the MTP. They also train and evaluate the section's ability to execute its METL, and to engage and destroy multiple targets (stationary and moving) using turret weapons and indirect fires, in both good and limited visibility.

Each series of tactical and gunnery tasks replicates potential battlefield conditions. All scout platoons perform reconnaissance and security missions. Each mission includes unit and individual tasks. A successful section gunnery program trains all the tasks that support the unit's METL. Limited range resources require commanders to train individual and collective tasks before they train gunnery tables. The MTP outlines the steps needed for a unit to establish a successful training program.

Cavalry Section Advanced Gunnery Tables	Application	Page
BT IX Scout Section Training	Control and distribute direct fire to destroy enemy targets in a tactical scenario	10-5
BT X Scout Section Qualification	Integrate fire..... and maneuver; engage moving targets with CFV-mounted weapons, day and night.	10-10

Figure 10-1. Scout section firing tables.

10-1. PRINCIPLES OF TRAINING

When developing the section's gunnery program, the commander should remember these principles of training from FM 7-0:

- Train as you will fight or support.
- Make commanders and leaders the primary trainers.
- Train using appropriate doctrine.
- Use performance-oriented training.

- Use mission-oriented training.
- Train to fight and support as a combined arms and services section.
- Train to sustain proficiency.
- Train to challenge.

10-2. PURPOSE OF GUNNERY TABLES

The scout section gunnery tables train and evaluate Bradley-equipped scout sections. These gunnery tables test the scout section's ability to conduct reconnaissance and security missions and to engage stationary and moving targets. In any tactical scenario, leaders focus on the scout's primary mission of collecting and reporting information. The commander must also evaluate the scout's ability to use his combat resources (direct- and indirect-fire assets) effectively, while remaining undetected on the battlefield.

a. The commander can use the example scenarios in this paragraph to design his own tables, depending on resources available and the unit's training needs. This flexibility ensures that each unit receives the training it needs for its scout section to function effectively.

b. To maintain tactical emphasis throughout the scout section tables, each table has nine mandatory, combat-critical tasks and at least three tactical tasks, which the commander selects (Figure 10-2 shows the task list). The tactical tasks comprise 60 percent of each table; the other 40 percent are Bradley gunnery tasks. Sections are formally evaluated on tactics and gunnery tasks.

REQUIRED COMBAT-CRITICAL TASKS	EXAMPLE TACTICAL TASKS
1. Execute actions on contact.	Coordinate with adjacent platoon-size elements.
2. Collect/report information-- SALUTE.	Perform an area reconnaissance.
3. Call for/adjust indirect fire.	Perform a route reconnaissance.
4. Conduct tactical movement.	Perform a reconnaissance by fire.
5. Control scout section fires.	Prepare overlays for route reconnaissance reports.
6. Conduct a screen.	Emplace and retrieve a hasty minefield.
7. Perform a passage of lines.	Execute a dismounted patrol.
8. Occupy battle position.	Supervise the preparation of a section's defensive position.
9. Perform a zone reconnaissance.	Consolidate and reorganize a section following enemy contact (defense).
	Initiate unmasking procedures.
	Cross a chemically contaminated area.
	Prepare and submit both an NBC-1 and an NBC-4 report.
	Calculate and designate placement of both timber-cutting and steel-cutting charges.
	React to indirect fire.

Figure 10-2. Combat-critical and example tactical tasks.

c. The MTP is the primary source the commander uses to develop the performance checklists he will use in the tactical portions of the tables. To develop performance checklists from tasks other than those in the MTP, he uses unit SOPs and other FM s.

10-3. EVALUATION PROCEDURES AND STANDARDS

The following evaluation procedures and standards apply to section gunnery. They allow sections to train and practice the skills normally performed in combat. Evaluators use AARs to critique sections after they complete the tables. They do not rate crew duties (Appendix F) on these tables; however, a section does receive a penalty if an individual scout squad fails to perform tactically sound maneuvers or to hit the targets:

a. **Evaluation Procedures.** Evaluators use the performance checklists in the MTP to evaluate scout sections on tactics. If the commander selects any tactical tasks other than those in Figure 10-2, he must develop a performance checklist for each. He bases the checklist(s) on the MTP.

b. **Start Time.** Engagement times give the evaluator a tool for evaluating section engagements, which start--

- (1) When the first section vehicle on the move is exposed to the threat.

(2) When the first section vehicle in the defense stops in a hull-down position or fires the first round. Depending on the tactical scenario, target-exposure times should allow the section to report and determine the most desirable course of action (that is, indirect fire).

c. **Stop Time.** Three conditions determine engagement stop times.

(1) The section leader announces CEASE FIRE; all section vehicles have returned to the defilade position.

(2) All targets are killed.

(3) All section vehicles return to defilade positions for the final time.

d. **Alibi Criteria.** Chapter 8 lists acceptable alibi criteria.

e. **Evaluation Standards.** Terrain, weather, and distance between engagements dictate course time. Tactical tasks can be conducted at a nearby training area and combined with the gunnery portion if range areas are too small for tactical maneuvering; however, this is an exception. Commanders should integrate the tactical and gunnery tasks to maximize the training effectiveness of these tables. The section must achieve, as a minimum--

(1) A GO on 70 percent of the tactical tasks on the scout section tables--equal to 420 points on each table.

(2) A 70 percent target kill rate on gunnery tasks during each table--equal to 280 points on each table.

10-4. SCORING PROCEDURES

Each table uses a 1,000-point system for the areas of tactics and gunnery.

a. **Tactics.** Tactics count 60 percent (600 points), so total points fall between 1 and 600. Evaluators use the performance checklists in the MTP. The commander may adapt these checklists to more accurately reflect his METL. To calculate total points, he uses the tactical-evaluation formula shown in Figure 10-3. Depending on the METL's importance, he can assign point values to each task.

<p>TACTICS EVALUATION -- PERCENTAGE SCORE</p> <p>Divide the number of tactical tasks passed (TP) by the number of tactical tasks evaluated (TE). Multiply the result by 100.</p> <p>Example: If TP = 29 and TE = 31, then $(29 \div 31 = .94) \times 100 = 94\%$</p> <p>TACTICS EVALUATION -- POINTS EARNED</p> <p>Divide the number of tactical tasks passed (TP) by the number of tactical tasks evaluated (TE). Multiply the result by 600 (possible tactical points).</p> <p>Example: If TP = 29 and TE = 31, then $(29 \div 31 = .94) \times 600 = 564$</p> <p>The resulting number equals the number of points awarded for the <i>tactical</i> evaluation of the tables. (Round up .5 and above; round down .4 and below.)</p>
--

Figure 10-3. Tactical-evaluation formula.

b. **Gunnery.** Gunnery counts 40 percent (400 points), so total points must fall between 1 and 400. The commander and evaluator use the gunnery-evaluation formula shown in Figure 10-4 to calculate points IAW established destruction criteria for each weapon system and for all target presentations, to include the following:

- BFV-mounted weapons.
- Indirect fire.
- Dismounted engagements.

GUNNERY EVALUATION -- PERCENTAGE SCORE

Divide the number of targets destroyed (GD) by the number of targets presented (GP) and multiply the result by 100.

Example: If (GD) = 40 and (GP) = 48, then $(40 \div 48 = .83) \times 100 = 83\%$

GUNNERY EVALUATION -- POINTS EARNED

Divide the number of targets destroyed (GD) by the number of targets presented (GP). Multiply the result by 400 (possible gunnery points).

Example: If (GD) = 40 and (GP) = 48, then $(40 \div 48 = .83) \times 400 = 332$

The resulting number equals the number of points awarded for the *gunnery* evaluation of the tables. (Round up .5 and above; round down .4 and below.)

Figure 10-4. Gunnery-evaluation formula.

10-5. RATINGS

Leaders rate sections based on the following standards (Figure 10-5):

- Distinguished.** Section earns a combined score of 900 points or higher, which must include at least 420 (70 percent) tactical and 280 (70 percent) gunnery points.
- Superior.** Section earns a combined score of 800 to 899 points, which must include a minimum of 420 (70 percent) tactical and 280 (70 percent) gunnery points.
- Qualified.** Section earns a combined score of 700 to 799 points, which must include a minimum of 420 (70 percent) tactical and 280 (70 percent) gunnery points.
- Unqualified.** Section earns a combined score of 699 points or less, or it fails to achieve 420 (70 percent) tactical points or 280 (70 percent) gunnery points.

STANDARD	COMBINED SCORE	Score must include at least the following tactical and gunnery points and percentages:			
		Tactical Points	%	Gunnery Points	%
Distinguished	900 points or higher	420	70	280	70
Superior	800 to 899 points	420	70	280	70
Qualified	700 to 799 points	420	70	280	70
Unqualified	699 points or less	420	70	280	70

Figure 10-5. Scoring standards.

10-6. TARGETS

Target arrays should reflect the type of threat forces a section will normally encounter. FM 17-98 describes these forces in detail for both reconnaissance and security missions.

Based on the METL, the commander determines the number and types of targets to be engaged. At no time will the number of targets exceed the number of rounds allocated by DA Pam 350-38. Also, during each table phase, at least three 25-mm targets will be presented for each live-firing vehicle. This is due to the loading requirements of the M242 25-mm automatic gun.

a. **Thermal Targets.** In all cases, thermal targets should represent the accurate thermal signatures of threat vehicles.

b. **Target Signature.** When appropriate to the scenario, hostile fire simulators can simulate the threat vehicle(s) firing at the section.

c. **Target-Exposure Time.** The tables use the following target-exposure times:

(1) Targets in indirect-fire engagements are presented for 90 seconds.

(2) All offensive (direct-fire) engagements are presented for 50 seconds (day) or 60 seconds (night).

(3) All defensive (direct-fire) engagements are presented in depleting target arrays for 40 seconds (day) and 50 seconds (night).

NOTE: If troop targets are presented in a defensive engagement, they are also presented in the final target array.

10-7. BRADLEY TABLE IX, SCOUT SECTION TRAINING

The scout-section table trains and evaluates tactical and gunnery skills. It prepares section members for scout-section qualification. The commander can conduct this table with live fire or lasers. It must include, at a minimum, the nine combat-critical tasks, three tactical tasks (selected by the commander), and the required percentage of gunnery tasks (Figures 10-6 and 10-7).

a. **Prerequisites.** Before the scout section can fire Scout Table IX, they must meet the following conditions:

(1) Each crew in the section must have qualified within the previous six months. Due to crew turnover, the crew should fire the training and qualification tables immediately after they qualify as a crew. If one crewmember leaves before the section fires Scout Table IX, that crewmember's vehicle can fire Scout Table IX, but it may do so only in dry-fire status.

(2) Each vehicle crewmember must have passed the BGST IAW Appendix A.

ACTION	CONDITION, TARGET, SITUATION	TARGET HIT	TACTICAL TASKS
1. Conduct a zone reconnaissance.	Conducted zone reconnaissance.		<ul style="list-style-type: none"> • Conducted passage of lines. • Performed a zone reconnaissance. • Controlled techniques of movement.
2. Detect a combat outpost.	Observed two BMPs, 800 to 1,000 meters.		<ul style="list-style-type: none"> • Performed a zone reconnaissance. • Executed actions on contact. • Called for fire. • Sent a spot report.
3. Engage an outpost.	Engaged one BMP, 800 to 1,000 meters.	0 1	<ul style="list-style-type: none"> • Executed actions on contact. • Sent a spot report. • Occupied battle positions. • Controlled scout section fires. • Performed a zone reconnaissance.
4. Establish an OP.	On order, established an OP and conducted a patrol.		<ul style="list-style-type: none"> • Executed actions on contact. • Established a screen. • Planned and conducted a patrol.

Figure 10-6. Example Bradley Table IX, Scout Section Training (Day).

ACTION	CONDITION, TARGET, SITUATION	TARGET HIT	TACTICAL TASKS
1. Conduct a zone reconnaissance.	Conducted a zone reconnaissance to a screen position.		<ul style="list-style-type: none"> • Issued the order. • Performed a zone reconnaissance.
2. Conduct a screen.	Conducted a screen and received an order to perform a patrol.		<ul style="list-style-type: none"> • Established a screen. • Planned and conducted a patrol.
3. Conduct a screen.	Engaged two BMPs, 800 to 1,000 meters.	0 1	<ul style="list-style-type: none"> • Called for fire. • Reacted to indirect fires. • Displaced to subsequent screen line. • Sent a spot report. • Occupied battle positions. • Controlled scout section fires. • Conducted a passage of lines.

Figure 10-7. Example Bradley Table IX, Scout Section Training (Night).

b. **Requirements.** Each scout section must receive a passing score on the section-training table (Scout Table IX) before it can fire the section-qualification table (Scout Table X).

c. **Action.** The scout section conducts a reconnaissance mission, security mission, or both. It acquires, reports, and employs accurate direct and indirect fires to engage targets in a tactical array.

d. **Conditions.** The scout section uses reconnaissance and engagement techniques against threat targets. Moving and stationary targets appear individually and simultaneously. The table must include at least one NBC engagement and one auxiliary sight engagement.

e. **Standards.** The crew earns gunnery points IAW the gunnery evaluation formula in Figure 10-4. Crews are evaluated on their engagement techniques. Tactical standards must adhere to the MTP.

f. **Conduct of the Range.** Depending on the availability of maneuver area and range time, the scout section can use MILES or PGS and fire its training table at a local training area, or they can fire full-caliber gunnery at a range facility. The commander must decide, based on range time availability and his design of the section tables, the most appropriate location to conduct the table: MILES- or PGS-conducted tables, force-on-force engagements, or target lift mechanisms with LTID.

(1) **Tactical Tasks.** The unit commander must select at least three METL tasks to train and evaluate along with the nine combat-critical tasks. He must then develop a friendly and threat scenario so he can evaluate the tasks in a realistic tactical training setting. The training area should measure at least 1 by 2 kilometers. Evaluators use performance checklists to record tactical evaluation.

(2) **Gunnery Tasks.** The gunnery tasks for the scout section training table can include a live-fire, MILES, or PGS table. Neither the number of targets nor the rounds allocated can exceed the total number allowed by DA Pam 350-38.

(a) Live-fire gunnery works best, but range and maneuver area constraints might require separate conduct of the tactical and gunnery portions of the table. Commanders should try to integrate tactical and gunnery tasks.

(b) Units may use device-based gunnery to train before a major gunnery table. Time, training area, range facilities, and ammunition available determine the commander's method of training.

(3) **Resources.** To help the commander identify resources needed for table execution, Figure 10-8 recommends resources for live-fire gunnery. Figure 10-9 recommends resources for device-based gunnery.

1. Multipurpose range complex or suitable facility allowing two vehicles to maneuver as a section.
2. Class V, consisting of, but not limited to--
 - 25-mm AP or TP-T.
 - 7.62-mm 4:1 ball or tracer.
 - Artillery simulators.
 - Smoke pots.
 - Red smoke grenades.
 - White smoke grenades.
 - Green smoke grenades.
 - Red star clusters.
 - White or green star clusters.
3. Evaluators and support packages consisting of--
 - Performance checklists.
 - Sequence of events.
 - OPORD.
 - Scenario.
 - Dual-net radio capability.
 - Night-vision devices.
4. Wheeled or tracked vehicles for evaluators and support packages.
5. Medical support as required by local SOP.
6. Any items required by the supporting range facility SOP.
7. References:
 - FM 17-98
 - ARTEP 17-57-10-MTP ("*the MTP*")

Figure 10-8. Resource list for live fire-based gunnery.

1. M2 or M3 MILES equipment for each vehicle, consisting of--
 - TM 9-1265-375-10.
 - 25-mm coax machine gun laser transmitters.
 - TOW laser transmitter.
 - Belt No. 7 and belt No. 8 detector assemblies.
 - Man-worn helmet and torso harness-detector assemblies.
 - Combat vehicle kill indicator.
 - Control console.
 - Battery box assembly.
 - TOW simulator.
 - FLASHWESS.
2. Target-holding mechanisms with MILES target-interface devices, OPFOR with MILES, or vehicles modified to represent OPFOR.
3. MILES controller guns.
4. Class V consisting of, but not limited to--
 - 5.56-mm blank.
 - 7.62-mm blank.
 - Soldier-identification devices.
 - ATWESS cartridges.
 - Artillery simulators.
 - Smoke pots.
 - Red smoke grenades.
 - White or green star clusters.
5. Training area 1 kilometer by 2 kilometers or larger. Evaluators and support package follow:
 - Performance checklists.
 - Scenario.
 - Sequence of events.
 - OPORD.
 - Night-vision devices.
 - Dual-radio net capability.

Figure 10-9. Resource list for device-based gunnery.

(a) Live-fire gunnery requires a multilane range facility, such as a multipurpose range complex (MPRC), which allows at least two vehicles to maneuver as a section. Local range SOPs dictate support requirements.

(b) Device-based gunnery requires the use of MILES or PGS. A scout section is easily equipped with MILES or PGS. However, inattention to detail and failure to follow boresight and checkout procedures will seriously degrade training. Including MILES or PGS in a precombat evaluation helps identify and correct shortcomings. Whenever MILES or PGS is used, the master gunner makes sure the mounting and checkout procedures follow TM 9-1265-375-10.

(c) Both device-based and live-fire gunnery tables require evaluator support. Evaluators (selected from troop level) are identified, trained, and scheduled before conduct of the table. Each evaluator receives a scoring packet that contains performance checklists, scenarios, OPORDs, and sequence-of-events lists. Though internal evaluation is acceptable, external evaluation is preferred.

(4) **After-Action Review.** After the section completes the table, evaluators meet with the entire section for an after-action review. During the AAR, they discuss the section's strengths and weaknesses, and how they can improve. Videotaped tables provide positive and negative visual feedback to the section.

10-8. BRADLEY TABLE X, SCOUT SECTION QUALIFICATION

During qualification, leaders evaluate the scout section's tactical and gunnery proficiency in a realistic scenario (Figures 10-10 and 10-11, pages 10-12 and -13).

a. **Prerequisites.** The scout section must meet the following conditions before firing the scout section qualification table:

(1) Each scout section must have received a passing score on the scout section training table within three months before firing the scout section qualification table.

(2) Each vehicle crewmember must have passed the Bradley gunnery skill test (IAW Appendix A).

b. **Requirements.** Each scout section must qualify on the scout section-qualification table. As a minimum, the section must receive a GO on 70 percent of the tactical tasks and kill 70 percent of the targets in gunnery tasks.

c. **Action.** The scout section conducts a reconnaissance mission, a security mission, or both. Then it acquires targets, sends reports, and employs accurate direct and indirect fires to engage targets in a tactical array.

d. **Conditions.** The scout section uses reconnaissance and engagement techniques against threat targets. Moving and stationary targets appear individually and simultaneously. The table must include at least one NBC engagement and one auxiliary sight engagement.

e. **Standards.** Crews rate gunnery points and receive critiques on their engagement techniques. Tactical standards follow the MTP.

ACTION	CONDITION, TARGET, SITUATION	TARGET HIT	TACTICAL TASKS
1. Scout section conducts a route reconnaissance.	Scout section conducts reconnaissance of a route.		<ul style="list-style-type: none"> • Perform a passage of lines. • Reconnoiter a route specified in OPORD. • Report all obstacles. • Report trafficability. • Complete mission within 1 hour.
2. Scout section conducts a zone reconnaissance.	On order, scout section conducts a zone reconnaissance.		<ul style="list-style-type: none"> • Conduct a zone reconnaissance. • Coordinate with adjacent unit. • Control a technique of movement.
3. Scout section detects a security outpost.	Scout section detects one BMP, 800 to 1,000 meters.		<ul style="list-style-type: none"> • Execute actions on contact. • Send a spot report. • Call for fire.
4. Scout section detects elements of a combat outpost.	Scout section detects two BMPs, 800 to 1,000 meters.		<ul style="list-style-type: none"> • Execute actions on contact. • Send a spot report. • Call for fire.
5. Scout section is engaged by security outpost.	Scout section engages two BMPs, 800 to 1,000 meters and two infantry squads, 400 to 600 meters.	0 1 2 3 4	<ul style="list-style-type: none"> • Execute actions on contact. • Send a spot report. • Call for fire. • Occupy battle positions. • Control scout section fires. • Kill targets within 35 seconds.
6. Scout section detects a combat outpost.	Scout section detects three BTRs, one T-64, 1,800 to 2,200 meters.		<ul style="list-style-type: none"> • Execute actions on contact. • Send a spot report. • Call for fire.
7. Scout section is engaged by elements of a combat outpost.	Scout section engages two BMPs, 600 to 1,000 meters and two infantry squads, 400 to 600 meters.	0 1 2 3 4	<ul style="list-style-type: none"> • Execute actions on contact. • Send a spot report. • Call for fire. • Occupy battle positions. • Control scout section fires. • Kill targets within 30 seconds.
8. Scout section establishes a screen and engages division reconnaissance patrol elements.	On order, scout section establishes a screen. Scout section engages two BMPs, 800 to 1,200 meters and two infantry squads, 400 to 600 meters.	0 1 2 3 4	<ul style="list-style-type: none"> • Execute actions on contact. • Send a spot report. • Call for fire. • Occupy battle positions. • Control scout section fires. • Kill targets within 35 seconds.

Figure 10-10. Example scout section qualification (day).

ACTION	CONDITION, TARGET, SITUATION	TARGET HIT	TACTICAL TASKS
1. Scout section engages elements of a regimental reconnaissance patrol.	Scout section engages three BMPs, 800 to 1,000 meters and one infantry squad, 400 to 600 meters.	0 1 2 3 4	<ul style="list-style-type: none"> • Execute actions on contact. • Send a spot report. • Call for fire. • Occupy battle positions. • Control scout section fires. • Kill targets within 35 seconds.
2. Scout section engages elements of a motorized rifle company.	Scout section engages three BMPs, 800 to 1,000 meters and one infantry squad, 400 to 600 meters.	0 1 2 3 4	<ul style="list-style-type: none"> • Execute actions on contact. • Send a spot report. • Call for fire. • Occupy battle positions. • Control scout section fires. • Kill targets within 35 seconds.

Figure 10-11. Example scout section qualification (night).

f. **Conduct of the Range.** Scout section qualification tasks should reflect the scout section training table. Scout section qualification is a full-caliber gunnery table for a multilane range facility. When range facilities permit free maneuvering, leaders should conduct tactical and gunnery tasks at the same time. If the range facility does not allow free maneuvering, then leaders can conduct tactical qualification tasks on a separate, 1-by 2-kilometer training area. Qualification may not include practice runs. Finally, when possible, day fire should precede night fire.

(1) Local range SOPs dictate range conduct. Leaders should develop and obtain approval of firing scenarios well in advance of section qualification. For each table, at least three 25-mm targets are presented for each vehicle. However, DA Pam 350-38 dictates resource limits, including the number of targets used. (Figures 10-8 and 10-9 list recommended resources.)

(2) The tactical tasks in scout section qualification require a free-maneuver range facility or a separate 1- by 2-kilometer training area. Within the training area, OPFOR or target-lifting mechanisms can reinforce acquisition, reporting, and call-for-fire procedures.

(3) The gunnery tasks of scout section qualification require a multilane facility. This allows two vehicles to maneuver as a section. Local range SOPs dictate range-support packages.

(4) Before conducting the qualification table, commanders identify, train, and schedule extra evaluators at troop level. Each evaluator receives a scoring packet that contains performance-checklist scenarios, OPORDs, and a sequence of events. Commanders should try to use external evaluators, although they can use internal evaluators, if necessary.

g. **Scoresheet.** Figure 10-12, page 10-14, shows an example completed format for a cavalry Table IX and X scoresheet.

SCORESHEET FOR CAVALRY TABLES IX AND X										RANGE	
DAY RUN (A)			DATE			NIGHT RUN			DATE		
START TIME			STOP TIME			START TIME			STOP TIME		
EVALUATOR'S NAME (PRINT)					EVALUATOR'S NAME (PRINT)						
EVALUATOR'S NAME (SIGNATURE)					EVALUATOR'S NAME (SIGNATURE)						
TACTICAL					GUNNERY						
TASK	TASK NUMBER	TASK DESCRIPTION	T	P	U	MAIN GUN		MACHINE GUN		TOTAL	
						PRES	HIT	PRES	HIT	PRES	HIT
1	17-3-4010	Conduct a Zone Reconnaissance									
	17-3-0065	Conduct Troop-Leading Procedures									
	17-3-1016	Conduct a Tactical Movement									
2	17-3-1012	Conduct a Tactical Road March <i>One BMP (800 to 1,000 meters)</i>									
	17-3-1023	Conduct a Screen <i>Recon Patrol: Two BMPs (800 to 1,000 meters)</i>									
4	17-3-1039	Establish an Observation Post <i>Recon Patrol: Three BTRs and three T80s (1,800 to 2,200 meters)</i>									
	17-3-2605	Conduct a Section Defense									
5	17-3-1021	Execute Actions on Contact									
	12-3-C021	Conduct Consolidation and Reorganization Activities <i>Three BMPs (800 to 1,000 meters) and two trucks (600 to 1,000 meters)</i>									
	17-3-2601	Conduct a Hasty Occupation of a Section Battle Position									
6	17-3-1016	Conduct a Tactical Movement									
	17-3-2605	Conduct a Section Defense <i>Recon Patrol: Two BRDMs (1,400 to 1,600m) and two trucks (600 to 1,000m)</i>									
	17-3-2627	Displace Alternate/Successive Screen Line or Sec BP									
	17-3-1016	Conduct a Tactical Movement									
7	17-3-1021	Execute Actions on Contact									
	17-3-2601	Conduct a Hasty Occupation of a Section Battle Position <i>Four BMPs (800 to 1,200 meters), one Infantry Squad (400 to 600 meters)</i>									
	17-3-2605	Conduct a Section Defense <i>Battle Drill: React to Indirect Fires</i>									<i>Calls for fire but does not engage with direct fire.</i>
	17-3-1015	Coordinate/Assist a Passage of Lines (Forward/Rear)									
9	17-3-0065	Conduct Troop-Leading Procedures									
	17-3-1016	Conduct a Tactical Movement <i>Two BMPs (800 to 1,000 meters)</i>									
	17-3-1012	Conduct a Tactical Road March <i>Three BMPs (800 to 1,000 meters) and one truck (600 to 800 meters)</i>									
TOTAL (DAY)						TOTAL (DAY)					
TOTAL (NIGHT)						TOTAL (NIGHT)					
TOTAL						TOTAL					
TOTAL NUMBER OF "T"- or "P"-RATED TASKS						DIVIDE BY TOTAL NO. OF TGTS					
DIVIDED BY TOTAL NUMBER OF TASKS (23)						MULTIPLY BY 100					
MULTIPLY BY 100					X 100	TOTAL GUNNERY SCORE					
TOTAL TACTICAL SCORE						TOTAL MAIN GUN AMMO USED					
TACTICAL SCORE _____ + GUNNERY SCORE _____ = _____ ÷ 2 - 10% IF FRIENDLY ENGAGED = TABLE XII SCORE _____											
PLATOON		COMPANY OR TROOP		BN OR SQDN		BDE OR REGT		DIVISION		CORPS	

Figure 10-12. Example format for scoresheet, Cavalry Tables IX and X.

CHAPTER 11
Air Defense Advanced Tables

This chapter identifies the gunnery target presentations required to support collective tasks. Units determine specific threat target types and engagement distances. ARTEP MTPs 44-177-14 and -15, Chapters 9, discuss evaluation procedures and standards.

Before, training revolved around the squad in a nontactical environment. Now, advanced gunnery tables link directly to platoon and squad operations IAW FM 44-43, ARTEP MTPs 44-177-14 and -15, and the combat drills in ARTEP 44-177-14-Drill. Each task supports the commander based on his unit's METL. Gunnery events progress from preliminary to device to live fire.

The advanced tables in this chapter, which integrate tactical and gunnery tasks, give the commander the opportunity to evaluate his platoon on its ability to execute tactical and gunnery tasks (Figure 11-1). Specifically, he evaluates each platoon's collective ability to shoot, move, and communicate. He uses air-defense sensor systems to help crews acquire and identify friendly and hostile aerial targets. He can use the guidelines and procedures in this chapter to establish device-based gunnery exercises.

The advanced gunnery exercises in this chapter and in the MTP set the standards for training and evaluation. They also allow battalion commanders to tailor engagements based on particular contingency missions and training emphasis.

Air Defense Advanced Gunnery Tables	Page
Bradley Table IXA, Section Practice.....	11-7
Bradley Table XA, Section Qualification.....	11-7
Linebacker Table IXA, Section Practice.....	11-7
Linebacker Table XA, Section Qualification.....	11-7

Figure 11-1. Air defense advanced gunnery tables.

11-1. DEVELOPMENT OF EXERCISE

These requirements apply to both practice and qualification tables. Linebacker or BSFV section practice is a building block for section qualification. Both exercises are fully resourced with ammunition. However, other training resource constraints may prohibit firing section practice as prescribed. Section qualification must follow the guidelines and standards provided in this chapter and in Chapter 9. Figure 11-2, page 11-2, shows the ADA training strategy.

- a. Advanced gunnery tables incorporate at least eight collective tasks, the first five of which are mandatory.
- b. The S3 identifies three additional collective tasks to support the unit METL, then develops an OPORD to support the mission.

c. The battalion master gunner coordinates all of the resources and personnel needed to support the gunnery exercise.

d. Although this is not a timed event, commanders may impose time standards to coincide with the unit METL.

e. The platoon is organized into two maneuver sections. One section has three vehicles and the other section has two. The platoon leader commands and controls one section, and the senior section leader commands and controls the other. Tactics and gunnery scores for each section are combined and averaged into one overall rating for the platoon.

f. FAAD C3I sensors and *slew-to-cue* are used on all SVML aerial engagements. The platoon only engages manually when the data link is offline.

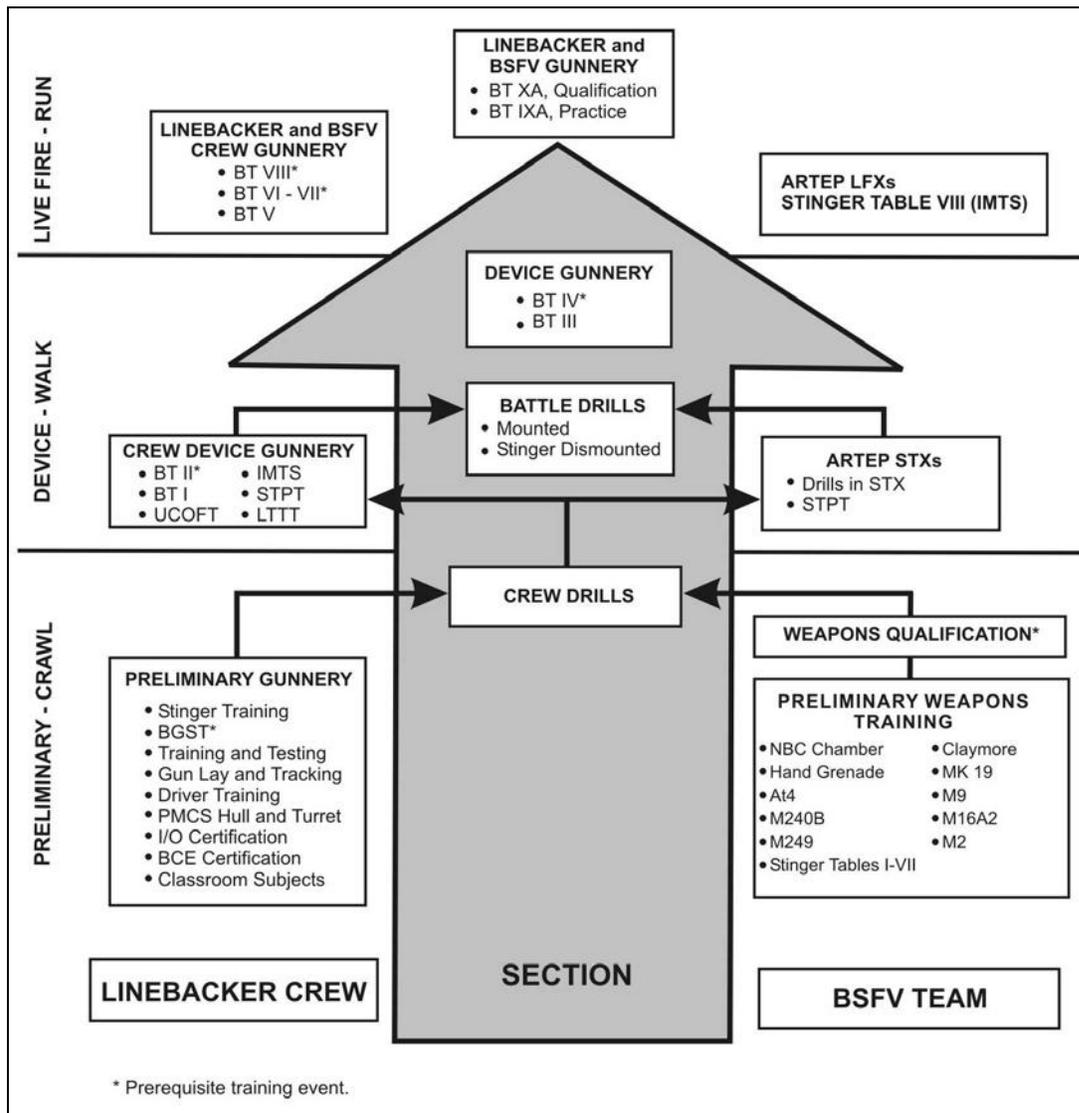


Figure 11-2. Training strategy for ADA.

11-2. LIVE-FIRE REQUIREMENTS

The live-fire collective tasks are conducted on a range complex that provides the best available target and maneuver area. These requirements apply to both practice and qualification live-fire tables. Aerial targets have priority over ground targets.

a. **Range.** Section practice and qualification may be conducted on the same range. However, targets will not be presented in the same sequence.

b. **Multiple, Simultaneous Targets.** When the target array consists of more than one target, simultaneous target exposure must be used. Simultaneous target exposure occurs when all targets for the task are presented at the same time, requiring crews to use proper engagement techniques.

c. **Realistic Practice.** Targets should represent the actual threat arrays a section could encounter on the battlefield. Sections must encounter a realistic array of single and multiple ground and aerial targets. Leaders may add friendly targets to emphasize the importance of training to prevent fratricide.

d. **Minimum Standards.** Each squad in the section must, at a minimum, execute the following tasks:

(1) **Bradley Table XA Tasks.**

- Three dismounted Stinger engagements.
- Two 25-mm aerial engagements.
- One 7.62-mm coaxial engagement.
- One ground engagement conducted using the auxiliary sight.
- Five 25-mm ground engagements.
- One engagement conducted under nuclear, biological, or chemical conditions.

(2) **Linebacker Table X Tasks.**

- Three standard vehicle-mounted launcher engagements.
- One 25-mm aerial engagement.
- One dismounted Stinger engagement.
- Five 25-mm ground engagements.
- Three 7.62-mm coaxial engagements.
- One ground engagement using the auxiliary sight.
- One engagement under nuclear, biological, or chemical conditions.

11-3. TARGETRY

Ground targets will be constructed IAW TC 25-8. Targets should also have signature devices to simulate enemy fire. Targets should also have thermal signatures. Aerial targets are the Su-25 Frogfoot and the Mi-24 Hind-D autogyro RPVTs. Typical speeds are between 45 and 70 mph for rotary-wing aircraft and between 45 and 100 mph for fixed-wing aircraft. Three requirements support target engagements. The only acceptable aerial target is the one-fifth-scale target.

a. For device gunnery, one-fifth scale targets need PGS retroreflectors and smoke.

b. For Stinger and 25-mm live aerial engagements, targets need infrared (IR) source and miss-distance indicator (MDI) scoring systems.

c. For each of the following weapons, place targets at the stated ranges:

- 25-mm targets--500 to 1,600 meters.
- Coax targets--300 to 700 meters.
- Aerial targets--1,000 to 5,000 meters.

11-4. AMMUNITION

Ammunition is allocated according to DA Pam 350-38. Section practice tables are fully resourced for Linebacker and Bradley Stinger fighting vehicles. Table 11-1 shows the allocation for each vehicle, by table.

AMMUNITION	TP-T	7.62-MM	ATWESS
Bradley Tables IXA and XA	80 rounds	50 rounds	3 rounds
Linebacker Tables IX and X	60 rounds	200 rounds	1 round

Table 11-1. Advanced gunnery ammunition requirement.

11-5. EVALUATION STANDARDS

If range areas are too small for tactical maneuvering, then tactical tasks can be conducted at a nearby training area and combined with the gunnery portion. Commanders should integrate the tactical and gunnery tasks to exploit the full training effectiveness of these tables. Each section of the platoon must earn at least 420 points on collective tasks. Each section of the platoon must earn at least 280 points on gunnery tasks (aerial and ground targets combined).

a. **Vehicle Exposure Time.** Target exposure times must fall within the standards in Chapter 9. In the defense, total time must fall within the 50-second time limit. However, the vehicle cannot remain exposed beyond the vehicle exposure timing matrixes (IAW the appropriate matrix). The timing standards for dismounted Stinger engagements are in accordance with ARTEP 44-177-14-Drill.

b. **Scoring Procedures.** Each table uses the following 1,000-point system for tactics and gunnery:

(1) Tactics counts 600 points. The senior evaluator uses the performance checklist in ARTEP 44-177-15-MTP.

(2) Gunnery counts 400 points. The senior evaluator combines and averages the scores for aerial and ground targets. He uses the final numbers to determine a total score for that section.

(3) The senior evaluator combines and averages scores for both sections of the platoon (tactics and gunnery) to obtain a single, overall platoon rating.

c. **Platoon Rating.** To qualify, the platoon's score must equal at least 700 points, with tactics and gunnery combined. Ratings follow:

(1) **Distinguished.** Combined score of at least 900 points.

(2) **Superior.** Combined score of 700 to 899 points.

(3) **Qualified.** Combined score of 700 to 799 points.

(4) **Unqualified.** Combined score of 699 or less, or failure to earn at least 420 points on tactics or 280 points on gunnery.

EXAMPLE:		
<i>Collective Tasks Attempted:</i>	<i>Collective Tasks Passed:</i>	<i>Score:</i>
10	8	480 out of 600 points
<i>Aerial or Ground Targets Presented:</i>	<i>Aerial or Ground Targets Engaged:</i>	<i>Score:</i>
24	20	333 out of 400 points
<p>NOTE: Total score for section (combining tactical and gunnery) $480 + 333 = 813$</p>		

11-6. ARMY UNIVERSAL TASK LIST

The gunnery tables incorporate the following collective tasks:

a. **Mandatory Tasks.**

- (1) Perform risk-management procedures.
- (2) Establish unit defense.
- (3) Respond to a chemical attack.
- (4) Conduct air-defense operations.
- (5) Conduct LOGPAC activities (resupply).

b. **Additional Collective Tasks.**

- (1) Develop IPB (SHORAD).
- (2) Provide command and control.
- (3) Plan air defense.
- (4) Handle enemy prisoners of war.
- (5) Conduct RSOP (SHORAD).
- (6) Conduct a convoy.
- (7) Establish the platoon command post.
- (8) Cross a chemically contaminated area.
- (9) Prepare for operations under NBC conditions.
- (10) Use passive air-defense measures.
- (11) Maintain operations security.
- (12) Conduct operational decontamination.
- (13) Perform field-sanitation functions.
- (14) Perform unit-level maintenance.
- (15) Treat casualties.
- (16) Sustain air-defense operations.
- (17) Conduct troop-leading procedures.
- (18) Establish liaison team.

- (19) Secure command post.
- (20) Take active combined arms air-defense measures against hostile aerial platforms.
- (21) Conduct battlefield stress-reduction and -prevention procedures.

11-7. EVALUATION TEAM

The evaluation team consists of one officer who is the planner, another officer, and one noncommissioned officer who actually evaluates the overall tactical performance of a platoon.

a. **Senior Evaluator.** The battalion S3 is responsible for the development, design, and execution of the exercise, with the assistance of the battalion master gunner. The battalion commander or his representative determines the overall training assessment of the section.

b. **Platoon Evaluator.** One captain with battery-command experience should evaluate the platoon leader on overall collective task completion and mission success and conducts the platoon after-action reviews.

c. **Assistant Evaluators.** A sergeant or staff sergeant with squad leader experience should assist the evaluator. Each crew has one assistant, who observes overall crew performance, leader tasks, vehicle actions, and fire control and distribution; he also helps with live-fire safety. He assesses the crew during evaluation and provides feedback to crewmembers during the AAR. To evaluate the Stinger dismounted position of the drill, the assistant evaluator must be Stinger certified.

d. **Allowable Variations.** The battalion commander may add friendly targets to advanced gunnery tables. He may modify the types of tasks IAW unit METL. In the absence of a moving target, a stationary frontal target of the same type and at the same range is used. If a stationary target is used, target conditions must be adjusted.

11-8. PREREQUISITES

Each crewmember must have qualified on the BGST (in the position he is occupying) within the previous three months. Reserve component crewmembers must have qualified on the BGST within the previous four months. All crewmembers must have qualified by position on either Linebacker or Bradley Table VIII within the previous six months. All crewmembers must have completed Stinger Crew Tables I through VIII.

11-9. REFIRE FOR QUALIFICATION

A section that fails to qualify must refire the failed engagements, but only until they earn enough points to qualify. The highest rating that a refiring section can obtain is "Qualified." Battalion commanders decide whether to accept alibis. The battalion commander only accepts alibis under the following conditions:

- Target failures or weapon malfunctions.
- Equipment failures not the result of crew error.
- Unsafe conditions not related to the firing vehicle.

11-10. BRADLEY TABLES IXA AND IX, SECTION PRACTICE

Firing the Section Practice 2 portion of Bradley Table IXA and of Linebacker Table IX prepares the sections for qualification. This is the first time that the squads function

together as a section using full-caliber ammunition. The objective is to practice integration and coordination to form a collective effort.

a. Sections should practice the fire-control and distribution techniques that they will use during qualification.

b. Exercise development, standards evaluation, ammunition, and target considerations are the same as for section qualification.

c. BT IXA and LT IX are fully resourced but can be modified by using devices, if ammunition or range constraints prohibit live-fire execution.

11-11. BRADLEY TABLES XA AND X, SECTION QUALIFICATION

The sections qualify on both Bradley Table XA and Linebacker Table X. These tables evaluate the crew's abilities to execute collective tasks in a tactical live-fire environment.

Conduct of these live-fire tables must follow--

- Scenario-development guidelines.
- Ammunition and target guidelines.
- Standards, scoring, and evaluation procedures.
- All prerequisites.

CHAPTER 12
Engineer Gunnery

FMs 7-0 and 7-1 explain how to plan, resource, and execute training events. ARTEP 5-335-DRILL, ARTEP 5-335-70-MTP, TC 5-150, and this chapter provide the TTP and standards to conduct and evaluate Engineer platoon gunnery training (Figure 12-1).

Chapter 3 covers crew training; Chapter 9 covers section and platoon device training; and this chapter covers platoon practice and qualification (Engineer Bradley Tables XI and XII). Together, these events integrate Bradley and Engineer squad tasks, which support tactical and gunnery scenarios in all conditions using all organic weapons. This trains leaders and subordinates to distribute and control fires.

The commander selects and develops tactical operations based on his mission-essential task list (METL) and on the unit's contingency area of operations.

Engineer Bradley Gunnery Tables	Page
Engineer Bradley Tables III and IV, Section and Platoon Device Gunnery.....	12-5
Engineer Bradley Table XI, Platoon Practice.....	12-5
Engineer Bradley Table XII, Platoon Qualification.....	12-6

Figure 12-1. Engineer Bradley firing tables.

12-1. ENGINEER PLATOON TRAINING PROGRAM

The commander develops his training program after assessing the unit's strengths and weaknesses. The resulting program must reflect crew and platoon turbulence, support the unit's METL, sustain strengths, and correct weaknesses. Any EBFV-equipped unit can adapt this program for its training requirements. The strategy progresses logically, integrating separate crew and squad training (crawl, walk, run) into platoon-level training. Figure 12-2 shows an engineer platoon training program.

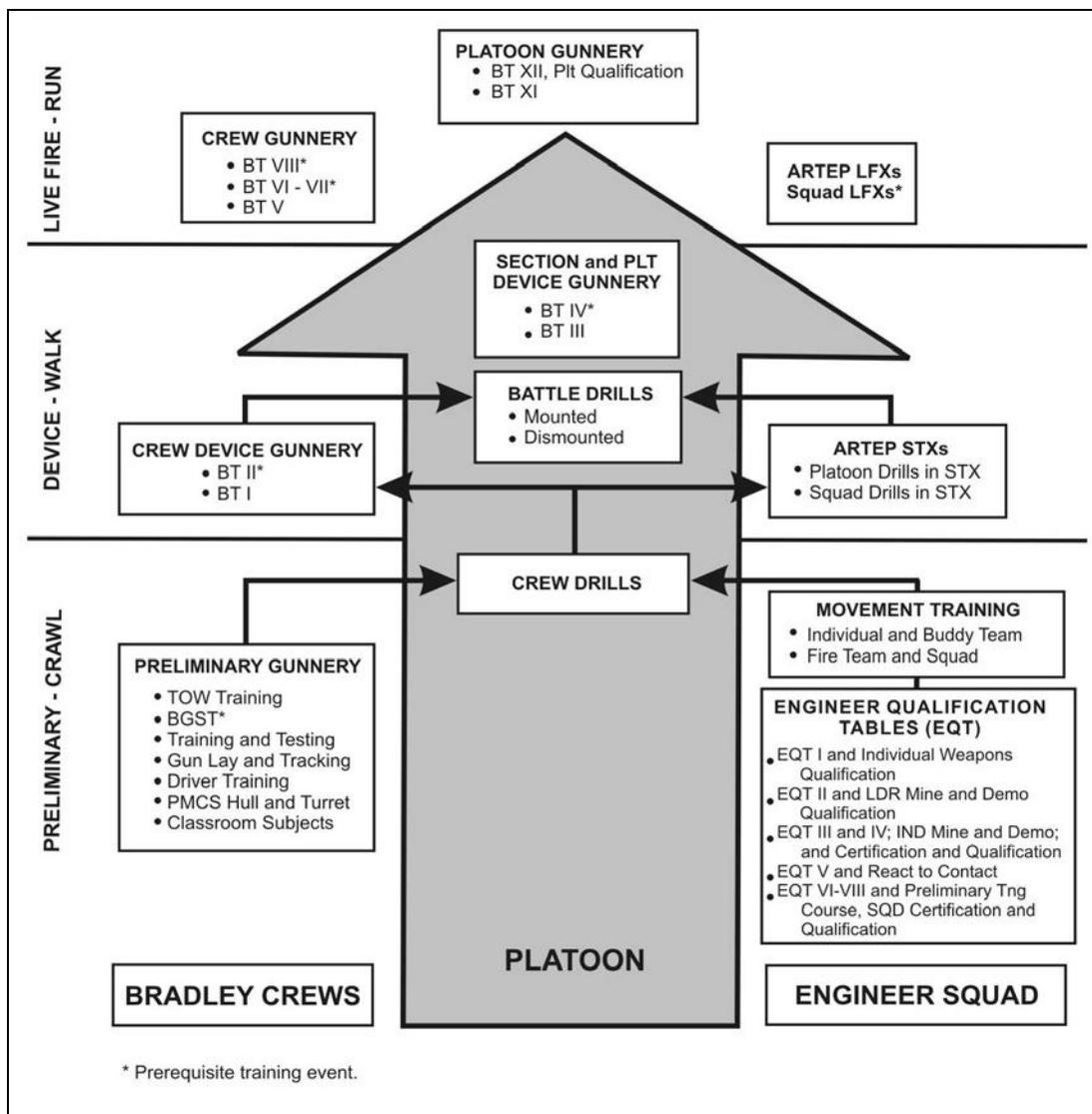


Figure 12-2. Engineer platoon training program.

12-2. DEVELOPMENT OF EXERCISE

All engineer platoons must be able to integrate the EBFV while performing mobility, countermobility, and survivability missions. These missions consist of individual and collective tasks performed at the platoon level. The MTP and the engineer platoon gunnery tables in this chapter set an Army standard for training and evaluation. At the same time, they allow unit commanders the flexibility to tailor all tactical and gunnery tasks to their particular METL and training emphasis. Chapter 9 of this manual, ARTEP 5-335-DRILL and TC 5-150, *Engineer Qualification Tables*, outline the engineer platoon's evaluation procedures and standards. This chapter specifies the required gunnery target presentations to support these collective tasks. The following guidelines apply to both the EBFV platoon practice and qualification tables:

- a. **General Requirements.** The EBFV platoon practice is a building block for EBFV platoon qualification.

(1) Ammunition constraints might keep the platoon from firing full-caliber ammunition during Table XI. Units must fill the void with available Bradley gunnery training devices and simulators. The EBFV platoon qualification is resourced with ammunition. That might make it the first time an EBFV platoon collectively fires an integrated live-fire scenario. When EBFV platoons qualify, they must follow the guidelines and standards in this chapter, Chapter 9, ARTEP 5-335-Drill, ARTEP 5-335-70-MTP, and TC 5-150.

(2) The battalion commander and the S3 select the MTP missions. They also develop a scenario that is tactically sound, supports the local range layout, and that reflects their unit's METL.

(3) The S3 picks collective tasks based on the unit's operational missions and MTP.

(4) The S3 and battalion master gunner--

(a) Determine which collective tasks the platoons will fire live.

(b) Develop scenarios that enable the platoon to conduct tactical missions while accomplishing the identified collective tasks. They incorporate live-fire gunnery presentations into the collective tasks.

(5) Conduct the platoon gunnery tables in two phases--one during the day and one at night.

(6) The S3, S2, and battalion master gunner select vehicle and troop target arrays that represent a realistic scenario. They also--

(a) Identify specific threat target types, engagement distances, and range bands.

(b) Specify most- and least-dangerous targets based on a threat template and analysis.

(7) The battalion staff develops an OPORD to support mission execution, which forces EBFV platoons to use all organic and attached equipment and weapon systems.

(8) The battalion master gunner assembles all platoon evaluation packets with the appropriate T&EOs and gunnery summary sheets. He arranges the T&EOs in the observer-controllers' (OCs') packets in collective-task sequence.

(9) LTIDs allow for MILES or PGS replication of TOW, Javelin, and Dragon fire. MILES or a 9-mm subcaliber device can replicate AT4 fire.

b. **Live-Fire Requirements.** Live-fire and collective tasks are conducted on the range complex that provides the best available targetry and maneuver area.

(1) Platoon practice and qualification can occur on the same range, but target scenarios differ. They must expose all targets within a particular band simultaneously. This forces the firing EBFV platoon to control and distribute fire properly at every level. For each firing section within the platoon, up to three vehicle or troop targets are presented at one time. For each firing platoon, one dismounted squad or up to two RPG teams are presented at one time.

(2) To prevent multiple kills, the computer must address each IRET target(s) separately.

(3) During the platoon qualification table, each dismounted and mounted element fires at least two NBC engagements--one day and one night. Both elements may fire during the same engagement. Commanders may increase the number of NBC tasks, during which the firing platoon assumes MOPP4 during all NBC tasks.

(4) Simulated or live indirect-fire support may be incorporated into the scenario to enhance realism. Indirect-fire support targets are additional targets that are determined

on the threat template and are not part of the direct-fire template. If mortars are used for illumination, and the task is evaluated according to the MTP, then the firing element receives credit for using fire support.

c. **Scenario Development.** Evaluators and range personnel can use pyrotechnics and simulators to simulate target effects and to cue certain events.

(1) A target presentation should enforce fire distribution and control at the team, squad, section, or platoon levels. It should also trigger certain training events.

(2) The scenario should include combat support (CS) and combat service support (CSS), and tasks like resupply or refuel on the move (ROM).

(3) Vehicles and soldiers should have the MILES components that do not interfere with live-fire engagements. MILES allows evaluators to rapidly assess personnel and vehicle casualties. It also allows EBFV platoons to incorporate personnel- and vehicle-evacuation procedures into all collective and live-fire tasks.

(4) Each soldier receives a MILES casualty card. Using these allows platoon evaluators to assess casualties during all collective- and live-fire tasks. However, vehicle commanders, gunners, and drivers will receive return-to-duty (RTD) cards, which allow them to move vehicles safely.

(5) Each platoon evaluator needs a copy of the unit's SOP to implement during the evaluation.

(6) The firing platoon's company commander should follow the platoon for command and control purposes. He can enhance the tactical scenario by simulating radio traffic, to include issuing instructions and FRAGOs and receiving reports from the platoon.

(7) Target presentation is based on the platoon's tactical employment. The platoon should react to and not anticipate target presentations.

d. **Targetry.** Units construct all targets IAW TC 25-8.

(1) Chapter 8 discusses EBFV targetry requirements, including 25-mm targetry and coax area and point targetry. Minimum target requirements by target type follow:

- AP Point 12
- HE Area 1
- HE Point..... 9
- Coax Area 12
- Coax Point..... 8
- Infantry Targets... 50
- TOW or Javelin..... 1

(2) Engineer dismounted targets look exactly like BFV dismounted targets. RPG and ATGM targets consist of three E-type silhouettes placed in line, in depth, or in a wedge formation, at up to 5 meters apart or 10 meters in depth (Chapter 8). Trench-line targets consist of four to seven E-type silhouettes arranged realistically. These targets are placed up to 5 meters apart in an area no larger than 30 meters in width and 20 meters in depth.

(3) The EBFV's target-exposure time varies, depending on the type of target and the presentation. To determine exposure time, the master gunner must know engagement type, target type, conditions, and distance to target.

(4) Dismounted troop targets are exposed four times, for five seconds each time, at ten-second intervals.

(5) To enhance the advanced table scenario, the battalion commander may add friendly targets, smoke, and other obscurants.

e. **Ammunition.** Platoons receive and internally distribute all of the ammunition allocated for the LFX, including that allocated for both the day and night phases.

(1) DA Pam 350-38 (STRAC) allocates the following ammunition:

- Full-caliber ammunition for EBFV platoon qualification.
- Ammunition for all dismounted squad and platoon LFXs.

(2) Chapter 8 lists ammunition allocations for each BFV target (coax, 25-mm and TOW or Javelin) as follows:

- AP or TPDS-T96 rounds
- HE or TP-T96 rounds
- 7.621,600 rounds
- Infantry TargetsIAW STRAC
- TOW or Javelin.....1 PGS or MILES missile

(3) If additional ammunition and range time are available, units can modify the scenario (threat targets).

12-3. PREREQUISITES

To participate in a live-fire platoon-gunnery exercise, the platoon must meet the following prerequisites. The platoon maintains integrity. That is, crewmembers always participate in platoon live-fire gunnery exercises with their own platoon(s):

a. Each EBFV primary and alternate crewmember must have qualified on the BGST within the previous three months (Active Component only).

b. Squad members and crewmembers must qualify and complete certain prerequisites within the previous six months.

(1) **Individual Weapon.** Each squad member (dismounted or mounted) has qualified on his individual weapon.

(2) **BT VIII--Crew Qualification.** EBFV crewmembers must have qualified on BT VIII, *Crew Qualification*.

(3) **BT IV--BPPC.** The EBFV platoon must have completed BPPC (BT IV).

c. Each platoon member has already completed EQBTs I through VIII. As a minimum, he has qualified on EQBTs I, III, and IV.

12-4. ENGINEER BRADLEY TABLES III AND IV, SECTION AND PLATOON DEVICE GUNNERY

Section and platoon device gunnery consists of BT III, Squad and Section Exercise, and BT IV, *Platoon Proficiency Course*. These tables train and evaluate collective squad/section and platoon tasks. To conduct the exercises, leaders use MILES or PGS with LTID-equipped targets, or they use a force-on-force scenario. Scenario development and evaluations follow ARTEP 5-335-Drill , TC 5-150 and Chapter 9 of this manual.

12-5. ENGINEER BRADLEY TABLE XI, PLATOON PRACTICE

Engineer Bradley Table XI serves as a building block to prepare the engineer platoon for qualification. Ammunition constraints might require the platoon to fire the practice table with Bradley training devices (PGS or MILES) rather than with full-caliber ammunition.

a. The platoon practices the fire-distribution and control techniques used during platoon qualification.

b. Engineer Bradley Table XI development, standards, evaluation, and target considerations mirror Engineer Bradley Table XII.

c. Engineer Bradley Table XI is resourced for PGS or MILES. However, if ammunition and range time are available, then the Engineer Bradley Table XI may be fired live.

12-6. ENGINEER BRADLEY TABLE XII, PLATOON QUALIFICATION

Platoon qualification evaluates the platoon's ability to execute collective tasks in a tactical live-fire environment. Collective-task evaluations measure the platoon's combat proficiency while executing mobility, countermobility, and survivability missions. Mounted and dismounted engineer squads are integrated and evaluated on their ability to fight as a cohesive EBFV platoon.

a. Follow the scenario-development guidelines in this chapter.

b. Follow the ammunition and target guidelines in this chapter.

c. Follow the standards, scoring, and evaluation procedures in Chapter 8, ARTEP 5-335-Drill, ARTEP 5-335-70-MTP, and TC 5-150.

d. Enforce all prerequisites in this chapter.

e. Conduct the engineer Bradley platoon qualification with live, full-caliber ammunition.

f. Incorporate appropriate EQBT IX through XII tasks into the dismounted portion of this Engineer Bradley Table XII.

CHAPTER 13
Fire-Support Team Gunnery

FM 7-0 (25-100) and FM 25-101 explain how to plan, resource, and execute training events. FMs 6-20-40, 6-30 and ARTEP 6-115-20-MTP, and this chapter provide the TTP and standards to conduct and evaluate BFIST gunnery training.

Chapter 3 covers crew training; this chapter covers BFIST team training (Figure 13-1):

- *BT IV--BFIST Team Proficiency Course.*
- *BT IX--BFIST Team Fires Integration Course.*
- *BT X--BFIST Team Certification.*

These exercises provide the standards for training and evaluating M7 crew performance, while allowing DIVARTY or battalion commanders to tailor engagements for their particular contingency missions and training emphasis.

BFIST Gunnery Tables	Page
BT IV, BFIST Proficiency Course	9-22
BT IX, BFIST Fires Integration Course	13-8
BT X, BFIST Certification	13-8

Figure 13-1. BFIST firing tables.

Section I. TRAINING PROGRAM

The brigade FSO must develop his training strategy after assessing his fire supporters' strengths and weaknesses. His assessment and strategy must reflect personnel turbulence (changes). The strategy must focus on his METL, sustain their strengths, and correct their weaknesses. Some tasks apply to all soldiers; some apply only to BFIST crews. Figure 13-2 shows an integrated training program. Any unit can adapt this strategy to its own requirements. BFIST gunnery progresses logically from fire-support crew training through collective, tactical, live-fire evaluation during Table X, *BFIST Team Certification*.

13-1. CREW TRAINING

Along with the master gunner, the brigade FSO is the principal trainer for crew duties, crew coordination, and gunnery skills. His main references include this manual; all of FM 6-30; FM 22-100; FM 3-21.71 (7-7J), ARTEP 7-7J-DRILL, ARTEP 7-7J-MTP; and the appropriate technical manuals.

a. **Preliminary Gunnery Training.** Preliminary gunnery training focuses on the technical aspects of the BFIST gunnery theory, turret operations, and elementary gunnery techniques. The trainers combine classroom instruction and hands-on training to teach each crewmember the abilities, limits, and traits of the vehicle. Crews learn how to manipulate the turret, lay the gun, and track and adjust fires for the 25-mm gun, and for the 7.62-mm coaxial machine gun. They also practice crew drills in the COFT, in BATS, and in hands-on tasks. Record BGST tests their technical proficiency.

b. **Device Gunnery Training.** Device gunnery training lets crews practice and refine their collective vehicle skills with low-cost training devices. This phase of training integrates individual crew duties and actions--crews perform as a team (Chapter 8). The crew conducts a defensive exercise that lets the driver practice "berm drills" while other crewmembers engage single and multiple targets, both stationary and moving. The Guard FIST II Trainer and Bradley Table II (BCPC) both evaluate their abilities.

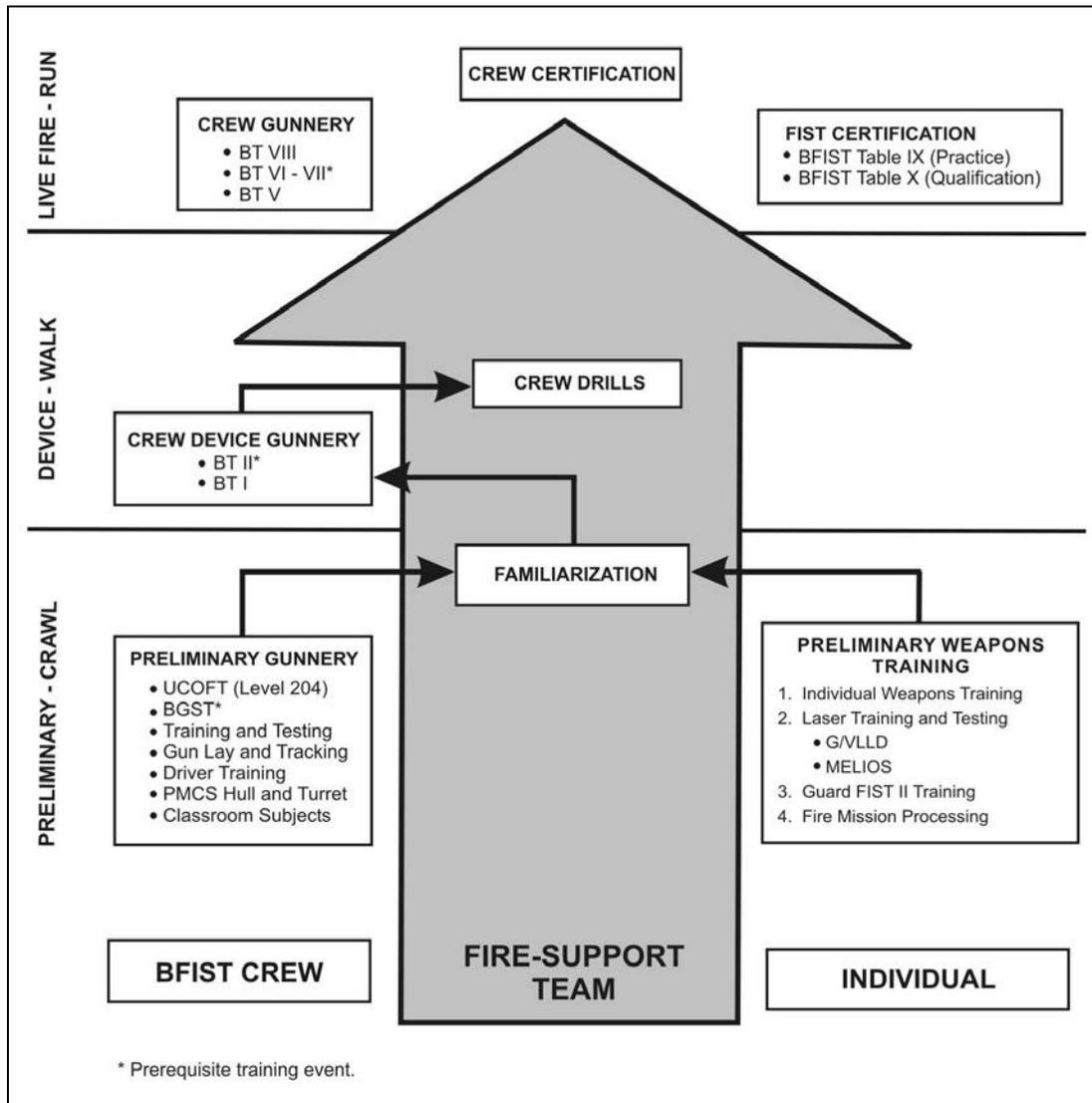


Figure 13-2. Bradley fire-support team training program.

c. **Crew Gunnery Training.** Crew gunnery lets the crew practice their collective crew-gunnery techniques with live ammunition. The crews must meet harder standards during challenging--and changing--conditions like those in combat. The outcome is a crew highly skilled in destroying likely enemy threats on the battlefield. BT VIII, *Crew Qualification*, evaluates the crew's proficiency.

13-2. COFT TRAINING STRATEGY

COFT is a valuable training tool that enhances crew training. As one example, the unit might place an HTU in the turret and an LCU in the crew shelter for practicing fire missions. Also, the division or regimental commander normally establishes the reticle aim-level standards for live fire. However, in the case of COFT, the unit commander does so. SAFAS only overrides the unit commander's reticle-aim standards if they are unsafe in live-fire conditions.

13-3. ADVANCED GUNNERY

Advanced gunnery requires leaders to combine the nontactical training into a tactical environment with a realistic scenario. They integrate tactical and gunnery tasks into the advanced tables, which include BFIST Tables IX and X, *Crew Fires Integration Course* and *Crew Certification*, respectively. These tables allow leaders to evaluate the BFIST crews on their collective abilities to execute both tactical and gunnery tasks, including shooting, moving, and communicating.

Section II. EVALUATION

BFIST gunnery evaluations require defined, measurable standards that reflect the proficiency level of the fire-support team. BFIST team evaluators and observer-controllers evaluate and enforce the standards. The crew uses the ISU because the M7 BFIST has no auxiliary sight. If the BFIST is later equipped with an auxiliary sight, the crew will use standard Bradley tasks.

13-4. STANDARDS

If ranges prohibit tactical maneuvering, commanders can conduct tactical tasks at a nearby training area and combine the tactical and gunnery tasks. This maximizes the training effectiveness of the firing tables. Each crew must earn at least 70 percent on collective tasks, 70 percent on gunnery tasks, and 80 percent on observed-fire tasks.

a. **Vehicle Exposure Time.** Leaders do not adjust vehicle- and target-exposure times when integrating observed-fire and direct-fire tasks. The vehicle cannot remain exposed past the vehicle-exposure times stated in the timing matrixes in Chapter 8.

b. **Scoring Procedures.** Each table uses a percentage system for tactics, observed fire, and gunnery. Scoring breaks down as follows:

(1) **Observed Fire.** This is worth 100 percent--80 percent equals 4 of 5 tasks T or P.

(2) **Tactics.** This is worth 100 percent--70 percent equals 7 of 10 tasks T or P.

Evaluators use the performance checklist in ARTEP 6-115-MTP and unit SOP.

(3) **Gunnery.** This is worth 100 percent--70 percent equals 4 of 5 tasks T or P.

(4) **Overall Rating.** To obtain an overall rating for the crew, combine and average the crew's scores for tactics, observed fire, and gunnery. Figure 13-3, page 13-4, shows the formula for computing the crew's cumulative (total) score. Once you compute it, round it up to the nearest whole number. For example, round 76.67 percent up to 77 percent.

c. **Crew Rating.** To qualify, the crew must earn a combined score of at least 70 percent on tactics, observed fire, and gunnery. Ratings break down as follows:

(1) **Distinguished.** Crew earns a combined score between 90 and 100 percent.

(2) **Superior.** Crew earns a combined score between 80 and 89 percent.

(3) **Qualified.** Crew earns a combined score between 70 and 79 percent.

(4) *Unqualified*. Crew earns a combined score of 69 percent or less, that is, failure to score at least 70 percent on tactics, 80 percent on observed fire, or 70 percent on gunnery.

TARGETS OR TASKS	ATTEMPTED OR PRESENTED	PASSED OR ENGAGED	SCORE
Collective Tasks	10	7	70 percent: 6 Trained 1 Needs practice 3 Untrained
Observed-Fire Targets	5	4	80 percent: 3 Trained 1 Needs practice 1 Untrained
Direct-Fire Targets • Threat • Nonthreat	5 5	4 0	80 percent: 4 Trained 0 Needs practice 1 Untrained
Total			

Figure 13-3. Formula for computing cumulative score.

13-5. TEAM

The evaluation team consists of one officer (the planner), a senior NCO, and a junior NCO. The senior evaluator evaluates the platoon's overall tactical performance.

a. **Senior Evaluator.** The Brigade FSO develops, designs, and executes the exercise, with the help of the master gunner. The battalion commander or his representative assesses the section's overall performance during training.

b. **Crew Evaluator.** A BFIST-experienced senior NCO should perform the crew evaluation, with one evaluator for each crew. He evaluates the crew on overall collective task completion and mission success, and then he conducts the AAR.

c. **Assistant Evaluator.** A BFIST-certified sergeant or staff sergeant should serve as assistant evaluator. Each crew requires one assistant evaluator. He assesses the crew during evaluation, observing their overall performance of leader tasks and their vehicle-related actions. He also helps ensure live-fire safety. Finally, he provides input during the AAR.

d. **Allowable Variations.** A DIVARTY or battalion commander may add friendly targets to advanced gunnery tables. He may also modify the types of tasks used, IAW the unit's METL. If leaders cannot obtain a moving target, they may use a stationary frontal target of the same type and at the same range. To use a stationary target, they must adjust target conditions accordingly.

e. **Engagement Standards.** Crews use the engagement standards from generic Bradley tasks for direct-fire targets. However, on indirect-fire missions, crews have 30 seconds to identify the target, give the proper fire command, lase the target, and send the fire mission. Scoring criteria follow:

T -- Identify the target and send the fire mission within 20 seconds.

P -- Identify the target and send the fire mission within 30 seconds.

U -- Fail to identify the target or send the fire mission after 31 seconds.

f. **Task Standards.** Leaders use generic Bradley engagement task standards for BFIST direct-fire targets. Evaluators score the BFIST team's proficiency in lasing, in using the proper fire command, and in transmitting the FR message during gunnery. Bradley Tables II through VI include indirect-fire targets in their target arrays. All fire-mission engagements are presented before direct-fire engagements (Figure 13-4, page 13-6). The crew must earn at least a "P" rating on 4 out of 7 indirect engagements.

(1) **Target Kill Standards.** During range setup, the master gunner records grid coordinates for all fire-mission targets. To receive target-kill credit, the crew must send the correct target grid, accurate to within 150 meters, to the FSE. For all fire missions, master gunners use the farthest targets on the range.

(2) **BFIST Exposure Matrixes.** Leaders use generic Bradley exposure matrixes for BFIST direct-fire engagements. The BFIST crew engages indirect-fire targets from turret defilade. If the crew exposes the vehicle, then the BFV matrix standard applies IAW the conditions of the engagement and the threat vehicle's capability to engage the BFIST. Whether in the defense, the offense, or retrograde, the BFIST crew has 30 seconds to identify and engage indirect-fire targets.

(3) **Timing of the Engagement.** Time begins when the indirect-fire target is fully exposed (target locked). Evaluators time this engagement separately from the self-defense engagement. For example, due to range and time limitations, all indirect targets have one condition--normal. Evaluators check other conditions during Tables IX and X. If the crew exposes the vehicle, leaders use the matrixes in Chapter 8. For example, target-exposure time for a stationary T-72 at 2,500 meters is 23 seconds.

(a) After the BFIST crew engages the indirect target, direct-fire targets are presented. Time target exposures separately for indirect-fire and direct-fire targets.

(b) Whether or not the BFIST crew engages the indirect-fire target, the direct-fire target(s) must appear as soon as the 30-second, indirect-fire period expires. Crew must pass all subtask standards in order to meet task standards.

(4) **Critical Subtask Standards.** Evaluators use critical subtask standards to score the BFIST crew's ability to engage indirect-fire targets in less than normal operating conditions. Before the crew can meet a task's overall engagement standards, it must first meet the subtask standards. Until then, leaders consider the crew untrained on that task. The crew engages all target(s) in the FIST mode.

(a) *Gunner's Engagement.* The gunner uses his handstation to identify and lase targets in the FIST mode. He also operates the TSCP (targeting-station control panel).

(b) *Commander's Engagement.* The commander uses his handstation to identify and lase targets in the FIST mode.

	TARGET POSTURE	TARGET CONDITION	BFIST EXPOSURE TIME (THREAT TIME TO HIT)	TARGET EXPOSURE TIME
1	T-72 tank	Normal, Stationary, or Indirect Target	Depends on range of target and whether or not the BFIST crew exposes the vehicle from turret defilade.	30 seconds
2	BTR-80, moving, 1,200 meters, NBC environment	2 conditions	24 seconds	50 seconds
3	ATGM, 600 meters, NBC environment	1 condition	11 seconds	50 seconds

Figure 13-4. Defense, day engagement, indirect.

(5) **Crew Engagement.** The crew switches to gun mode when presented with direct-fire targets. The gunner or the BC lases in FIST mode, then switches to gun mode, and then reacquires the target for engagement.

(6) **Leader Subtask Standard.** The leader subtask evaluates the BFIST commander's ability to control the crew, vehicle, MEP, and self-defense system. The BFIST commander must maintain control to synchronize reengagements and operate efficiently. He must also use the proper fire-mission commands for each indirect engagement and when engaging direct-fire targets.

(7) **Noncritical Subtask Standard.** These tasks remain unchanged, except for the response terms for the fire-mission command.

(8) **BFIST Crew Live-Fire Gunnery Standards.** These standards also remain the same, except for the addition of a fire mission before the direct-fire engagements. Therefore, Tables V and VI include one new task for the BFIST crew: Engage and Destroy Stationary Indirect Targets from a Stationary and Moving M7 BFIST During Both Day and Night.

Section III. ADVANCED GUNNERY

Advanced gunnery tables let the commander evaluate the team's ability to execute tactical and gunnery tasks. A successful team gunnery program trains all tasks required to support the unit's METL. Team (advanced) gunnery consists of BFIST Tables IX and X. The objective is to integrate direct and indirect fires to form a team collective effort.

13-6. DEVELOPMENT OF EXERCISE

Units determine specific threat target types and engagement distances. Chapter 8, this chapter, and FM 6-30 provide evaluation procedures and standards. Certain guidelines apply to all BFIST tables.

a. **Concept of the BFIST Tables.** Leaders use a "scenario-based training" concept to develop the BFIST Tables, which they resource based on the unit METL. Each

engagement's tactical scenario includes battlefield awareness, situational awareness, and SOPs. The crew then makes decisions based on this scenario.

(1) **Example 1.** The BFIST crew occupies an OP position behind an infantry company in the defense. GSR shows an MTI of 12 vehicles moving in your defensive sector. The crew is presented with a moving BMP at 1,200 meters, an RPG team at 600 meters, and a T-72 at 4,000 meters. The crew should report the BMP and the RPG team and should initiate a report to the maneuver commander on the T-72. The maneuver commander then makes the tactical decision to request fire on the T-72.

(2) **Example 2.** The BFIST crew has pushed forward with a dismounted scout section and set up in an OP. The scout section has received the order to avoid engaging the enemy. They must only observe and report. The BFIST crew must request fires on the attacking enemy's tank elements, then engage the direct-fire targets. The BFIST crew occupies a turret-defilade position. They are presented with or they are engaged by (signature device) an RPG team at 400 meters and a T-72 at 3,000 meters. They should engage the RPG team first, then initiate a fire mission on the T-72.

b. **General Requirements.** BFIST table IX is a building block for BFIST Table X (crew qualification). BFIST Table X is fully resourced with ammunition. However, other training resource constraints may prohibit firing some practice as prescribed. Leaders conduct BFIST crew qualification IAW the guidelines and standards in this chapter and in Chapter 8.

(1) Advanced gunnery tables incorporate at least sixteen collective tasks. The first six are mandatory.

(2) The DIVARTY or battalion commander identifies three more collective tasks to support the unit METL.

(3) The Brigade FSO develops an OPORD to support the execution of the mission.

(4) The unit master gunner coordinates all necessary resources and personnel to support the gunnery exercise.

(5) This is not a timed event, but commanders may impose time standards to coincide with the unit METL.

(6) The crews or FIST teams will operate, scan, and lase targets in FIST mode. They will engage direct-fire targets in gun mode. This trains them to maintain their weapons status for their primary mission.

(7) BFIST crews must fire these tables in order to receive proper training on the total vehicle operation. They must train as much as possible to ensure that they can smoothly move from FIST mode to gun mode. They must know how to quickly and accurately reacquire target(s) and engage with the 25-mm or coax.

c. **Live-Fire Requirements.** Leaders conduct live-fire collective tasks on the range complex that provides the best available observed-fire targets, maneuver area, and direct-fire targets.

(1) Leaders can conduct crew practice and qualification on the same range. However, they use a different target-presentation sequence for each.

(2) When the target array consists of more than one target, all targets are presented for a particular task simultaneously. They require crews to use proper battlefield analysis, situational awareness, and engagement techniques.

(3) Targets should represent realistic threat arrays that a crew might encounter on the battlefield. Leaders can include friendly targets to emphasize the importance of fratricide training.

d. **Minimum Standards.** The crew must meet the following minimum standards:

(1) **BFIST Tables IXA and XA.**

- Three observed-fire engagements (two digital and one voice).
- Two 25-mm point engagements.
- Two 7.62-mm coaxial engagements (one point and one area).
- One engagement conducted under NBC conditions.

(2) **BFIST Tables IXB and XB.**

- Two observed-fire engagements (one digital and one voice).
- Two 25-mm point engagements.
- One 7.62-mm coaxial engagement (area).
- One engagement conducted under NBC conditions.

(3) **BFIST Tables IX and X.** Leaders can conduct these with maneuver units using Bradley or tank Table XII, platoon qualification.

e. **Targetry.** Leaders have 25-mm targets constructed IAW TC 25-8. They equip targets with signature devices to simulate enemy fire. They ensure targets also have thermal-signature devices. Observed-fire targets can include employed steel (hulks) or constructed targets. The following requirements support target engagements:

- (1) Ensure device-based targets all have sensing devices for either PGS or MILES.
- (2) Place 25-mm targets between 600 meters and 1,200 meters.
- (3) Place coax targets between 300 and 900 meters.
- (4) Place observed-fire targets between 800 and 7,000 meters.

f. **Ammunition.** DA Pam 350-38 allocates ammunition and fully resources BFIST tables. Figure 13-5 shows example allocations for each vehicle.

BFIST TABLES XA AND XB	
Ammunition Type	Rounds or Each
TP-T	45
TPDS-T	45
7.62-MM	250
155-MM HE	20
155-MM Fuse, PD	20
120-MM Mortar	20
Signature Device	10

Figure 13-5. Example advanced gunnery ammunition requirement, BFIST Tables XA and XB.

13-7. PREREQUISITES FOR BFIST TABLE X

Each crewmember must have qualified on the BGST within the previous three months. They must also have passed BT II (BCPC, enhanced for BFIST) within the previous three months. They must have qualified on Bradley Table VIII within the previous six months. All crews must have completed BFIST Table IX within the previous three months, and they must have completed the DIVARTY or battalion FIST certification exercises within the previous six months.

13-8. COLLECTIVE TASK LIST

The advanced gunnery tables incorporate the following collective tasks. Leaders may add other tasks to support the unit's METL and the area contingency plan, or to compensate for unit strengths and weaknesses:

- Establish fire-support operations.
- Plan fires in support of maneuver operations.
- Participate in fire-support rehearsal.
- Establish an observation post.
- Conduct fire missions.
- Coordinate and control fire plan execution.
- Coordinate, direct, and adjust other fire-support assets.
- Perform risk-management procedures.
- Respond to a chemical attack.
- Cross a chemically contaminated area.
- Prepare for operations under nuclear, biological, or chemical conditions.
- Maintain operations security.
- Conduct operational decontamination.

- Perform field sanitation functions.
- Treat casualties.
- Conduct battlefield stress-reduction and prevention procedures.
- Perform unit-level maintenance.

13-9. REFIRE FOR QUALIFICATION

A crew that fails to qualify must re-fire only the engagements that it fails. Also, it must only fire the number of engagements needed to qualify. However, "Qualified" is the highest rating that a re-firing crew can obtain. Either the battalion commander or the brigade FSO decides whether to accept a crew's alibi. If he does, the crew re-fires the alibi engagement. Criteria for acceptable alibis include--

- Target failure or weapon malfunction.
- Equipment failure, not due to crew error.
- Unsafe conditions, not due to crew error.

13-10. BFIST TABLE IX, CREW FIRES-INTEGRATION COURSE

This device-based table forms a building block for BFIST Table X. The objective is for the crew to practice executing collective tasks in a tactical environment. STRAC does not authorize ammunition for this table.

- a. Crews should practice the same observed- and direct-fire techniques they will use during crew certification.
- b. Exercise development, standards evaluation, training aids, and target considerations are the same as for crew certification.
- c. This table uses either PGS or MILES.
- d. Crews can use live fire for observed-fire and direct-fire missions, given appropriate ranges and sufficient ammunition, but they must first meet the prerequisites for firing live ammunition.

13-11. BFIST TABLE X, CREW CERTIFICATION

Crew certification evaluates the crew's ability to execute collective tasks in a tactical live-fire environment. Leaders always conduct BFIST Table X with live fire, and they ensure that this table follows--

- All prerequisites.
- Scenario development guidelines.
- Ammunition and target guidelines.
- Standards, scoring, and evaluation procedures.

13-12. FIRE COMMANDS

Figure 13-6 shows a fire-command format. Set PROC MODE in both LCU and HTU to ACTIVE. This allows the transfer of target data to the FR grid format. Resetting PROC to PASSIVE mode requires the user to retrieve target data from the RECEIVED MESSAGE queue.

ELEMENT	BC	OBSERVER AND GUNNER	FSSO
Alert	GUNNER		Pulls up FR grid format
Weapon, ammo, fire mission	FIRE MISSION		
Description	TWO TANKS		
Direction			
Distance	No need for BC to announce when ELRF determines range.	<i>"Identified two T-72s, lasing"</i>	* Includes address IAW unit SOP and TGT type, subtype, and strength. ** Firing mode will be FFE unless BC, or unit SOP specifies otherwise.
Execution a. Mission type (other than FFE) b. Actual target description such as "T-72" or "BMP" c. Method of Engagement d. Method of control	Send to LCU SEND (say after maneuver commander clears fire mission)		"Checking Grid" "Ready to Send" "Fire Mission Sent" "Acknowledgement"
Termination (IAW FM 6-30)			

Figure 13-6. Fire command format.

APPENDIX A
Bradley Gunnery Skills Test

The BGST is a tool for evaluating and determining a crew's level of proficiency, IAW prescribed training, to conduct live-fired gunnery. As the name implies, it evaluates the crew's Bradley gunnery skills. However, it does not replace the tasks in the 11B, 12B, 13F, 14R, or 19D soldier's manuals.

A-1. ADMINISTRATION

All Bradley crewmembers must successfully complete the BGST within three months before they fire live rounds (four months for RC). However, if a soldier qualified in his current vehicle positioned within the past three months (four months for RC), then he only needs to requalify if the commander wants him to do so.

- a. All Bradley crews must achieve a GO on all tasks to receive an overall GO.
- b. Trainers administer the BGST using actions, conditions, and standards as well as administrative guidelines and performance measures.
- c. Trainers should also use the BGST as a diagnostic tool. It helps them to determine the level and effectiveness of cross training throughout the Infantry squad.
- d. Battalion commanders can add tasks to the BGST for a more comprehensive evaluation, but they cannot delete tasks from it. Once all crews attain basic proficiency, commanders should add NBC conditions to further BGST training.
- e. The evaluator logs individual crewmember information on a roster. He can test one crewmember at a time. He obtains and displays all required materials and equipment IAW the instructions in this manual or, if unique, the instructions in the task.

A-2. EVALUATION

Internal or external evaluators can administer the BGST, but external evaluators work better. All evaluators must qualify on the BGST within one year of the date the commander allows them to evaluate BGST testing. Evaluators must achieve a GO on any task they were to evaluate within the 30 days before they evaluate it. Figure A-1 shows an example completed DA Form 7522-R (*Bradley Gunnery Skills Test Scoresheet*).

- a. **Prerequisite Training.** Leaders conduct preliminary gunnery training before they administer the Bradley gunnery skill test.
- b. **Criteria for Successful Completion of BGST.** To achieve a GO for the task, a crewmember must complete all of the performance measures within the specified time. To achieve an overall GO on the BGST, the crewmember must receive a GO on every task.
- c. **Critique and Followup.** After the crewmember completes the task, the evaluator critiques him.
 - (1) If a crewmember meets the task standards, the evaluator directs him to the next task.
 - (2) If a crewmember fails to achieve the standards on any performance measure, he earns a NO GO on the task. The evaluator explains to the crewmember what he did wrong and how to correct his mistakes. Then, he retests the crewmember IAW local SOP.

d. **Scoring.** The evaluator records each crewmember's scores directly on the task performance measures as well as on the unit's performance scoresheet. The evaluator includes his own name and the date; the soldier's name, grade, unit, duty position, and overall score (GO or NO GO); and any remarks such as vehicle type. He scores everyone either GO or NO GO for each task. The crewmember earns a NO GO if he--

- Fails to complete the task.
- Performs a task or a task step incorrectly.
- Fails to meet the time standard.

e. **Performance Measures.** Leaders cross-reference the performance measures for all tasks with the latest TMs. In case of a discrepancy between performance measures in this manual and in the TM, the TM takes precedence. Leaders should also try to cross-reference against applicable soldier's manuals. This helps them to standardize training and testing. Figure A-1 shows an example completed BGST scoresheet.

A-3. TASKS

Table A-1 shows the location of each task in this appendix. Only task 10A requires the use of the TM.

NO.	TITLE	PG
Task 1	Clear, Remove, Disassemble, Assemble, and Install an M242 25-mm Gun	A-4
Task 2	Load a 25-mm Gun Feeder	A-8
Task 3	Apply Immediate Action on a 25-mm Gun	A-10
Task 4	Unload and Clear a 25-mm Feeder	A-12
Task 5	Install an M240C Coax MG (M2, M3, M2A2, M3A2, or M2A2 ODS; or M3A2 ODS)	A-14
Task 5a	Install an M240C Coax MG (M2A2 ODS FBCB2 or M3A2 ODS FBCB2, or M2A3 or M3A3 Only)	A-16
Task 6	Load, Fire, and Apply Immediate Action on an M240C Coax MG (M2, M3, M2A2, M3A2, or M2A2 ODS or M3A2 ODS)	A-18
Task 6a	Load, Fire, Apply Immediate Action on M240C Coax MG (M2A2 ODS FBCB2, M3A2 ODS FBCB2, or M2A3 or M3A3 Only)	A-21
Task 7	Clear M240C Coax MG and Unload 7.62-mm Ammo (M2, M3, M2A2, M3A2, or M2A2 ODS, or M3A2 ODS)	A-24
Task 7a	Clear M240C Coax MG and Unload 7.62-mm Ammo (M2A2 ODS FBCB2, M3A2 ODS FBCB2, or M2A3 or M3A3 Only)	A-27
Task 8	Remove an M240C Coax MG (M2, M3, M2A2, M3A2, M2A2 ODS, or M3A2 ODS)	A-30
Task 8a	Remove an M240C Coax MG (M2A2 ODS FBCB2, M3A2 ODS FBCB2, or M2A3 or M3A3 Only)	A-32
Task 9	Disassemble (Field Strip) and Assemble an M240C Coax MG	A-34
Task 10	Boresight Turret Weapon Systems (M2, M3, M2A2, M3A2, M2A2 ODS, or M3A2 ODS)	A-38
Task 10a	Boresight Turret Weapon Systems (M2A3, M3A3 Only)	A-43
Task 10b	Boresight Turret Weapon Systems (BFIST)	A-48
Task 11	Load and Unload the 25-mm HE Ready Box	A-52
Task 12	Load and Unload the 25-mm AP Ready Box	A-55
Task 13	Identify Combat Vehicles	A-58
Task 14	Set Up Radio (ASIP) for Digital Communications (M2A2 ODS FBCB2, M3A2 ODS FBCB2, or M2A3 or M3A3 Only)	A-62

Table A-1. BGST task index.

BRADLEY GUNNERY SKILLS TEST SCORESHEET				
For use of this form see, FM 3-22.1; the proponent agency is TRADOC.				
NAME <i>(Last, First, MI)</i> SGT ALVIN YORK		UNIT 1/29TH IN	BUMPER NO 4	
TASK NO	TASK TITLE	GO	NO-GO	RETEST
1.	Clear, remove, disassemble, assemble, and install an M242 25-mm gun.	X	X	X
2.	Load an M242 25-mm gun feeder.	X	X	X
3.	Apply immediate action on an M242 25-mm gun.	X	X	X
4.	Unload and clear an M242 25-mm gun feeder.	X	X	X
5.	Install an M240C coax machine gun.	X	X	X
5a.	Install an M240C coax machine gun <i>(ODS and A3 only)</i> .	X	X	X
6.	Load, fire, and apply immediate action on an M240C coax machine gun.	X	X	X
6a.	Load, fire, and apply immediate action on an M240C coax machine gun <i>(ODS and A3 only)</i> .	X	X	X
7.	Clear an M240C coax machine gun and unload 7.62-mm ammunition.	X	X	X
7a.	Clear an M240C coax machine gun and unload 7.62-mm ammunition <i>(ODS and A3 only)</i> .	X	X	X
8.	Remove an M240C coax machine gun.	X	X	X
8a.	Remove an M240C coax machine gun <i>(ODS and A3 only)</i> .	X	X	X
9.	Disassemble <i>(field strip)</i> and assemble an M240C coax machine gun.	X	X	X
10.	Boresight turret weapon systems.	X	X	X
10a.	Boresight turret weapon systems <i>(A3 only)</i> .	X	X	X
10b.	Boresight turret weapon systems <i>(BFIST)</i> .	X	X	X
11.	Load and unload 25-mm HE ready box.	X	X	X
12.	Load and unload 25-mm AP ready box.	X	X	X
13.	Identify combat vehicles.	X	X	X
14.	Set up radio (SINCGARS) for digital communications.	X	X	X
CREWMEMBER'S OVERALL BGST SCORE		X	X	X
CREWMEMBER <i>(Print or type name)</i> SGT ALVIN YORK		EVALUATOR <i>(Print or type name)</i> SFC MICHAEL JORDAN		
CREWMEMBER <i>(Sign)</i> 		EVALUATOR <i>(Sign)</i> 		

DA FORM 7522-R, SEP 2003

APD V1.00

Figure A-1. Example completed DA Form 7522-R, BGST Scoresheet.

TASK 1
CLEAR, REMOVE, DISASSEMBLE, ASSEMBLE,
AND INSTALL AN M242 25-MM GUN

CONDITIONS

Given a Bradley with an installed 25-mm gun.

STANDARDS

Within 10 minutes, the crewmember--

1. Cleared, removed, and disassembled the 25-mm gun.
2. Assembled and installed the 25-mm gun so that it operated properly.

EVALUATION PROCEDURES

1. **Administrative Process.** At this task, the evaluator logs information about each crewmember on a roster. He supplies the crewmember with all required materials and equipment, displaying them IAW this manual. He uses the performance measures to record the crewmember's performance. Afterward, he tells the crewmember how well the crewmember performed on this task and directs him to the next task or to further training. One evaluator can test one--and only one--crewmember at a time.
2. **Procedures Used When Personnel Receive a NO GO.** If a crewmember fails to achieve the standards on the performance measures, he earns a NO GO. When this happens, the evaluator explains to the crewmember what he did wrong and how to correct his mistakes. Then, he retests the crewmember IAW local SOP.

PERSONNEL, EQUIPMENT, AND MATERIALS

- Qualified 11B, 12B, 13F, 14R, or 19D, sergeant or above.
- Operational Bradley fighting vehicle with BII.
- TM 9-2350-252-10-2, TM 9-2350-284-10-2, or TM 9-2350-294-10-2-1.
- FM 3-22.1.
- Stopwatch.
- Clipboard with pen.
- One helper, qualified 11B, 12B, 13F, 14R, or 19D, sergeant or below.

PRETEST PREPARATION

Before testing this task, the evaluator—

1. Places trim vane in work-stand position (M2 and M3 through A2 only).
2. Removes 25-mm gun and ensures all parts are present.
3. Replaces all unserviceable or missing parts.
4. Installs M242 25-mm automatic gun.

PRETEST CONDITIONS FOR EACH EXAMINEE

Before testing each examinee, the evaluator prepares as follows:

1. Sets gun to zero elevation.
2. Ensures master and turret power switches are off.
3. Ensures turret is in manual mode.
4. Ensures gun guard is removed and gas bag is unzipped and out of the way.
5. Ensures weapon properly installed.

TEST PLANNING TIME

The evaluator allots time as follows:

Administration--5 minutes.

Test--20 minutes.

Total--25 minutes.

INSTRUCTIONS TO EXAMINEE

The evaluator will read the following instructions aloud to the examinee:

"Let me have your attention. This task evaluates your ability to remove and install the M242 25-millimeter gun.

"You must unlock the barrel and begin to remove it. After you do this, your helper will help you finish removing the gun barrel.

"During reassembly, he will help you lift the gun barrel, but you must guide and lock the barrel in place.

"You have 10 minutes to remove and disassemble the gun, and then 10 more minutes to reassemble and install it.

"Do you understand these instructions?"

Pause for 5 seconds, then say--

"You have 10 minutes to complete each task."

Pause again, then say--

"Begin."

Start timing at once. If the examinee fails to complete the task after the allotted time, then say, loudly enough for him to hear--

"Stop."

If you think that he is going to damage equipment or injure himself, then say--

"Stop."

PERFORMANCE MEASURES

1. Completed first ten performance measures in sequence and all performance measures within 10 minutes.
2. Cleared, removed, and disassembled the 25-mm gun.
 - a. **Removed Feeder.**
 - Checked to ensure bolt and bolt positioned indicator were in SEAR.
 - Ensured manual safety handle was in SAFE.
 - Raised feeder handle.
 - Removed power cable.
 - Lowered feeder handle.
 - Removed link chutes.
 - Removed feed chutes.
 - Pulled out straight drive shaft.
 - Raised feeder handle.

- Removed feeder.
 - Moved feeder from turret to crew area.
 - Removed any ammunition from the gun rotor.
 - Cleared the feeder by cycling once in HE and once in AP.
 - Placed feeder on a clean, flat surface with feeder handle lowered.
 - Pushed in the straight drive shaft on receiver.
 - Ensured breach was cleared of all spent casings or live ammunition.
 - Ensured ejection port was cleared of all spent casings or live ammunition.
 - Ensured bolt surface was cleared of all spent casings or live ammunition.
- b. **Removed Barrel.**
- Unlocked gun barrel.
 - Removed gun barrel.
- c. **Removed Bolt and Track.**
- Pulled out the straight drive shaft.
 - Cycled bolt out of SEAR position.
 - Removed bolt and track assembly.
 - Inserted the straight drive shaft handle.
- d. **Removed Receiver.**
- Unlocked 25-mm gun receiver.
 - Removed receiver from turret to crew area.
- e. **Disassembled Bolt and Track Assembly.**
- Removed bolt carrier from track assembly.
 - Unlocked bolt from forward locking position.
 - Removed firing pin sleeve keeper.
 - Removed firing pin and its sleeve from bolt and separated pin and sleeve.
 - Removed cam pin.
 - Removed bolt from bolt carrier.
3. Assembled and installed the 25-mm gun.
- a. **Assembled Track and Bolt Assembly.**
- Slid bolt into bolt carrier.
 - Inserted cam pin.
 - Inserted firing pin and sleeve into bolt.
 - Inserted firing pin sleeve keeper.
 - Locked bolt in forward position.
 - Placed bolt and carrier on track assembly.
- b. **Installed Bolt and Track Assembly.**
- Pulled out the straight drive shaft.
 - Inserted bolt and track assembly into receiver.
 - Locked track latch handle.
 - Moved bolt to SEAR position.
 - Pushed in the straight drive shaft.
- c. **Installed Receiver.**
- Pulled anti-rotation latch handle out.
 - Installed receiver into trunnion.
 - Locked receiver in place.

d. Installed Barrel.

- Installed barrel into barrel support.
- Locked into place.

e. Installed Feeder.

- Verified feeder timing.
- Pulled out the straight drive shaft.
- Ensured 25-mm gun bolt was in SEAR position.
- Raised feeder handle.
- Positioned feeder on receiver.
- Lowered feeder handle.
- Inserted and locked the straight drive shaft.
- Installed feed chutes.
- Installed link-eject chutes.
- Raised feeder handle.
- Installed power cable.
- Lowered feeder handle.

TASK 2
LOAD A 25-MM GUN FEEDER

CONDITIONS

Given a Bradley with 25-mm dummy ammunition loaded in the AP- and HE-ready boxes.

STANDARDS

Within 5 minutes, the crewmember loaded the 25-mm gun so that it was ready to fire.

EVALUATION PROCEDURES

1. **Administrative Process.** At this task, the evaluator logs information about each crewmember on a roster. He supplies the crewmember with all required materials and equipment, displaying them IAW this manual. He uses the performance measures to record the crewmember's performance. Afterward, he tells the crewmember how well the crewmember performed on this task and directs him to the next task or to further training. One evaluator can test one--and only one--crewmember at a time.
2. **Procedures Used When Personnel Receive a NO GO.** If a crewmember fails to achieve the standards on the performance measures, he earns a NO GO. When this happens, the evaluator explains to the crewmember what he did wrong and how to correct his mistakes. Then, he retests the crewmember IAW local SOP.

PERSONNEL, EQUIPMENT, AND MATERIALS

- Qualified 11B, 12B, 13F, 14R, or 19D, sergeant or above.
- All operational BFVs through A3 with BII.
- TM 9-2350-252-10-2, TM 9-2350-284-10-2, or TM 9-2350-294-10-2-1.
- FM 3-22.1.
- 90 rounds of 25-mm dummy ammunition.
- Stopwatch.
- Clipboard with pen.
- One helper, qualified 11B, 12B, 13F, 14R, or 19D, sergeant or below.

PRETEST PREPARATION

1. Ensure all power is off.
2. Inspect and load 45 rounds of dummy ammunition in AP-ready box.
3. Inspect and load 45 rounds of dummy ammunition in HE-ready box.
4. Clear the 25-mm gun.
5. Inspect for presence and damage of HE and AP feed chutes.
6. Set travel lock.
7. Ensure ammunition is in the AP or HE forwarder.
8. Ensure bolt and bolt position indicators are in SEAR.

PRETEST CONDITIONS FOR EACH EXAMINEE

1. Ensure all turret power is off.
2. Ensure travel lock is set.
3. Ensure all turret tools are present.
4. Ensure that bolt and bolt position indicators are in SEAR.

TEST PLANNING TIME

Administration	5 minutes
Test	5 minutes
Total	10 minutes

INSTRUCTIONS TO EXAMINEE

The evaluator will read the following instructions aloud to the examinee:

"Let me have your attention. This task evaluates your ability to load the 25-millimeter gun feeder.

"Do you understand these instructions?"

Pause for 5 seconds, then say--

"You have 5 minutes to complete the task."

Pause again, then say--

"Begin."

Start timing at once. If the examinee has not completed the task after 5 minutes, then say loudly enough for him to hear--

"Stop."

If at any time you think that he is going to damage the equipment or injure himself, then say--

"Stop."

PERFORMANCE MEASURES

1. Completed performance measures within 5 minutes.
2. Loaded the 25-mm gun feeder.
 - a. Ensured that the bolt and bolt-position indicator were in the SEAR position.
 - b. Ensured manual safe handle was in SAFE position.
 - c. Pulled out feed select solenoid to HE position.
 - d. Forwarded HE ammunition to 25-mm gun feeder.
 - e. Loaded the 25-mm gun feeder with two rounds of HE ammunition.
 - f. Released tension off HE ammunition.
 - g. Pushed feed select solenoid to AP position.
 - h. Forwarded AP ammunition to 25-mm gun feeder.
 - i. Loaded 25-mm gun feeder with one round of AP ammunition.
 - j. Released tension off AP ammunition.

TASK 3
APPLY IMMEDIATE ACTION ON A 25-MM GUN

CONDITIONS

Given a Bradley with BII, 25-mm dummy ammunition loaded, and a 25-mm gun that fails to fire.

STANDARDS

Within 1 minute, the crewmember applied immediate action so that the 25-mm gun would fire.

EVALUATION PROCEDURES

1. **Administrative Process.** At this task, the evaluator logs information about each crewmember on a roster. He supplies the crewmember with all required materials and equipment, displaying them IAW this manual. He uses the performance measures to record the crewmember's performance. Afterward, he tells the crewmember how well the crewmember performed on this task and directs him to the next task or to further training. One evaluator can test one--and only one--crewmember at a time.
2. **Procedures Used When Personnel Receive a NO GO.** If a crewmember fails to achieve the standards on the performance measures, he earns a NO GO. When this happens, the evaluator explains to the crewmember what he did wrong and how to correct his mistakes. Then, he retests the crewmember IAW local SOP.

PERSONNEL, EQUIPMENT, AND MATERIALS

- Qualified 11B, 12B, 13F, 14R, or 19D, sergeant or above.
- Operational M2, M2A2, or M2A2 ODS; M2A3, M3, M3A2, or M3A2 ODS; M3A3 with BII.
- TM 9-2350-284-10-2, TM 9-2350-252-10-2, or TM 9-2350-294-10-2-1.
- FM 3-22.1.
- 90 rounds of 25-mm dummy ammunition.
- Stopwatch.
- Clipboard with pen.
- One helper, qualified 11B, 12B, 13F, 14R, or 19D, sergeant or below.

PRETEST PREPARATION

1. Ensure master power is on.
2. After examinee enters turret, turn on turret power and turret drive.
3. Ensure turret tools are present and stowed properly.
4. Ensure 25-mm feeder is loaded.

PRETEST CONDITIONS FOR EACH EXAMINEE

1. Ensure all power is on.
2. Ensure that bolt and bolt position indicators are in SEAR position.

TEST PLANNING TIME

Administration	5 minutes
Test	1 minute
Total	6 minutes

INSTRUCTIONS TO EXAMINEE

The evaluator will read the following instructions aloud to the examinee:

"Let me have your attention. This task evaluates your ability to perform misfire procedures on the 25-millimeter gun.

"Do you understand these instructions?"

Pause for 5 seconds, then say--

"You have 1 minute to complete the task."

Pause again, then say--

"Time starts when you squeeze the trigger."

Begin timing when the examinee squeezes the trigger. If the examinee has not completed the task after 1 minute, then say loudly enough for him to hear--

"Stop."

If at any time you think that he is going to damage the equipment or injure himself, then say--

"Stop."

PERFORMANCE MEASURES

1. Completed performance measures within 1 minute.
2. Performed misfire procedures on the 25-mm gun.
 - a. Ensured ARM-SAFE-RESET switch was in ARM position.
 - b. Said to the crew--
"25-mm misfire."
 - c. Released trigger switches and waited 5 seconds.
 - d. Pressed SS of ammunition selected.
 - e. On the M2A3 only, moved the rate switch on the system control box to SS.
 - f. Pressed misfire button.
 - g. Squeezed trigger switches.
 - h. Ensured sear indicator light was on.

TASK 4
UNLOAD AND CLEAR A 25-MM FEEDER

CONDITIONS

Given a Bradley with BII, 25-mm gun installed, and loaded with 25-mm dummy ammunition.

STANDARDS

Within 10 minutes, the crewmember unloaded and cleared the 25-mm gun feeder.

EVALUATION PROCEDURES

1. **Administrative Process.** At this task, the evaluator logs information about each crewmember on a roster. He supplies the crewmember with all required materials and equipment, displaying them IAW this manual. He uses the performance measures to record the crewmember's performance. Afterward, he tells the crewmember how well the crewmember performed on this task and directs him to the next task or to further training. One evaluator can test one--and only one--crewmember at a time.
2. **Procedures Used When Personnel Receive a NO GO.** If a crewmember fails to achieve the standards on the performance measures, he earns a NO GO. When this happens, the evaluator explains to the crewmember what he did wrong and how to correct his mistakes. Then, he retests the crewmember IAW local SOP.

PERSONNEL, EQUIPMENT, AND MATERIALS

- Qualified 11B, 12B, 13F, 14R, or 19D, sergeant or above.
- Operational M2, M2A2, M2A2 ODS; M2A3, M3, M3A2 or M3A2 ODS; M3A3 with BII.
- TM 9-2350-284-10-2, TM 9-2350-252-10-2, or TM 9-2350-294-10-2-1.
- FM 3-22.1.
- 90 rounds of 25-mm dummy ammunition.
- Stopwatch.
- Clipboard with pen.
- One helper, qualified 11B, 12B, 13F, 14R, or 19D, sergeant or below.

PRETEST PREPARATION

1. Ensure turret power is on.
2. Ensure both ready boxes are loaded with 45 rounds of dummy ammunition.
3. Ensure the feeder is loaded with one round of AP and two rounds of HE.
4. Set turret travel lock.
5. Set ARM-SAFE-RESET switch to ARM and select ammunition.

PRETEST CONDITIONS FOR EACH EXAMINEE

1. Ensure master power is on.
2. Ensure turret tools are in proper stowage position.
3. Ensure feeder is loaded with ammunition.
4. Ensure ARM-SAFE-RESET switch is set to ARM.
5. Ensure ammunition is selected.

TEST PLANNING TIME

Administration	5 minutes
Test	10 minutes
Total	15 minutes

INSTRUCTIONS TO EXAMINEE

The evaluator will read the following instructions aloud to the examinee:

"Let me have your attention. This task evaluates your ability to unload and clear the 25-millimeter gun feeder."

"Do you understand these instructions?"

Pause for 5 seconds, then say--

"You have 10 minutes to complete the task."

Pause again, then say--

"Begin."

Start timing at once. If the examinee has not completed the task after 10 minutes, then say loudly enough for him to hear--

"Stop."

If at any time you think that he is going to damage the equipment or injure himself, then say--

"Stop."

PERFORMANCE MEASURES

1. Completed performance measures within 10 minutes.
2. Unloaded the 25-mm gun feeder.
 - a. Moved ARM-SAFE-RESET switch to RESET, then to SAFE.
 - b. Checked to ensure bolt and bolt position indicator were in sear.
 - c. Turned off turret power.
 - d. Moved manual safety to SAFE.
 - e. Raised feeder handle.
 - f. Removed power cable.
 - g. Lowered feeder handle.
 - h. Disconnected link eject chutes and removed links.
 - i. Unloaded HE ammunition.
 - j. Unloaded AP ammunition.
 - k. Removed feed chutes.
 - l. Pulled out straight drive shaft handle.
 - m. Raised feeder handle.
 - n. Removed feeder.
 - o. Removed any ammunition from the gun rotor.
 - p. Cleared the feeder by cycling once in HE and once in AP.
 - q. Removed any rounds or expended casings from receiver and ejection port.

TASK 5
INSTALL AN M240C COAX MACHINE GUN
(M2, M3, M2A2, M3A2, OR M2A2 ODS; OR M3A2 ODS)

CONDITIONS

Given a Bradley with BII and a cleared M240C machine gun.

STANDARDS

Within 2 minutes, the crewmember installed the M240C machine gun.

EVALUATION PROCEDURES

1. **Administrative Process.** At this task, the evaluator logs information about each crewmember on a roster. He supplies the crewmember with all required materials and equipment, displaying them IAW this manual. He uses the performance measures to record the crewmember's performance. Afterward, he tells the crewmember how well the crewmember performed on this task and directs him to the next task or to further training. One evaluator can test one--and only one--crewmember at a time.
2. **Procedures Used When Personnel Receive a NO GO.** If a crewmember fails to achieve the standards on the performance measures, he earns a NO GO. When this happens, the evaluator explains to the crewmember what he did wrong and how to correct his mistakes. Then, he retests the crewmember IAW local SOP.

PERSONNEL, EQUIPMENT, AND MATERIALS

- Qualified 11B, 12B, 13F, 14R, or 19D, sergeant or above.
- Operational M2, M2A2, M2A2 ODS or M3, M3A2, M3A2 ODS with BII.
- TM 9-2350-284-10-2 or TM 9-2350-252-10-2.
- FM 3-22.1.
- Operational M240C coax machine gun.
- Stopwatch.
- Clipboard with pen.
- One helper, qualified 11B, 12B, 13F, 14R, or 19D, sergeant or below.

PRETEST PREPARATION

1. Ensure front and rear mounting brackets are present and operational.
2. Ensure that the M240C coax mounts properly.
3. Place turret in manual mode.

PRETEST CONDITIONS FOR EACH EXAMINEE

1. Ensure mounting brackets are undamaged.
2. Ensure M240C coax is undamaged.
3. Ensure turret power and drive is off.
4. Ensure coax access doors are closed.

TEST PLANNING TIME

Administration	5 minutes
Test	2 minutes
Total	7 minutes

INSTRUCTIONS TO EXAMINEE

The evaluator will read the following instructions aloud to the examinee:

"Let me have your attention. This task evaluates your ability to install the M240C coaxial machine gun.

"Do you understand these instructions?"

Pause for 5 seconds, then say--

"You have 2 minutes to complete the task."

Pause again, then say--

"Begin."

Start timing at once. If the examinee has not completed the task after 2 minutes, then say loudly enough for him to hear--

"Stop."

If at any time you think that he is going to damage the equipment or injure himself, then say--

"Stop."

PERFORMANCE MEASURES

1. Completed performance measures within 2 minutes.
2. Elevated gun to 300 mils (200 mils old mount).
3. Installed M240C coaxial machine gun.
 - a. Opened coax access doors.
 - b. Mounted the coax--old mount (M2 or M3):
 - Placed coax in plenum onto the mount.
 - Aligned alignment lugs with cradle mount.
 - Pushed coax all the way in.
 - Ensured coax was fully seated.
 - c. Mounted the coax--new mount (M2A2 or M2A2 ODS; or M3A2 or M3A2 ODS):
 - Pulled retaining pins out.
 - Placed coax in plenum.
 - Pushed coax all the way in.
 - Ensured coax was fully seated.
 - Pushed in retaining pins fully.
 - Pulled on rear of coax to ensure that retaining pins were locked in position.
 - d. Joined and secured rear mount to coax (old mount).
 - e. Installed solenoid cable plug on plenum jack (old mount).
 - f. Closed coax access doors.

TASK 5A
INSTALL AN M240C COAX MACHINE GUN
(M2A2 ODS FBCB2 OR M3A2 ODS FBCB2, OR M2A3 OR M3A3 ONLY)

CONDITIONS

Given a Bradley with BII, and a cleared M240C machine gun.

STANDARDS

Within 2 minutes, the crewmember installed the M240C machine gun.

EVALUATION PROCEDURES

1. **Administrative Process.** At this task, the evaluator logs information about each crewmember on a roster. He supplies the crewmember with all required materials and equipment, displaying them IAW this manual. He uses the performance measures to record the crewmember's performance. Afterward, he tells the crewmember how well the crewmember performed on this task and directs him to the next task or to further training. One evaluator can test one--and only one--crewmember at a time.
2. **Procedures Used When Personnel Receive a NO GO.** If a crewmember fails to achieve the standards on the performance measures, he earns a NO GO. When this happens, the evaluator explains to the crewmember what he did wrong and how to correct his mistakes. Then, he retests the crewmember IAW local SOP.

PERSONNEL, EQUIPMENT, AND MATERIALS

- Qualified 11B, 12B, 13F, 14R, or 19D, sergeant or above.
- Operational M2A2 ODS appliqué, M2A3 or M3A2 ODS appliqué, or M3A3 with BII.
- TM 9-2350-284-10-2 or TM 9-2350-294-10-2-1.
- FM 3-22.1.
- Operational M240C coax machine gun.
- Stopwatch.
- Clipboard with pen.
- One helper, qualified 11B, 12B, 13F, 14R, or 19D, sergeant or below.

PRETEST PREPARATION

1. Ensure front and rear mounting brackets are present and operational.
2. Ensure that the M240C coax mounts properly.
3. Place turret in manual mode.

PRETEST CONDITIONS FOR EACH EXAMINEE

1. Ensure mounting brackets are undamaged.
2. Ensure M240C coax is undamaged.
3. Ensure turret power and drive is off.
4. Ensure coax access doors are closed.
5. Ensure CTD bracket is latched.

TEST PLANNING TIME

Administration	5 minutes
Test	2 minutes

Total 7 minutes

INSTRUCTIONS TO EXAMINEE

The evaluator will read the following instructions aloud to the examinee:

"Let me have your attention. This task evaluates your ability to install the M240C coaxial machine gun.

"Do you understand these instructions?"

Pause for 5 seconds, then say—

"You have 2 minutes to complete the task."

Pause again, then say--

"Begin."

Start timing at once. If the examinee has not completed the task after 2 minutes, then say loudly enough for him to hear--

"Stop."

If at any time you think that he is going to damage the equipment or injure himself, then say--

"Stop."

PERFORMANCE MEASURES

1. Completed performance measures within 2 minutes.
2. Elevated gun to 300 mils.
3. Opened coax machine gun access doors.
 - a. Unlatched CTD from its bracket.
 - b. Released handle on right access door to unlatched door.
 - c. Pulled out on left side of CTD to open left access door.
 - d. Pushed in right coax machine gun access door.
4. Mounted coax machine gun.
 - a. Placed coax machine gun on gun mount.
 - b. Ensured gun barrel points forward and trigger points down.
 - c. Aligned mounting holes on gun with retaining pins on gun mount.
 - d. Pushed retaining pins fully into gun.
 - e. Flipped in handles on retaining pins to lock.
 - f. Checked that coax barrel locking latched was locked.
 - g. Checked that coax barrel did not turn.
5. Closed coax machine gun access doors.
 - a. Pulled in right coax machine gun access door.
 - b. Pushed in on left side of CTD to close left access door.
 - c. Latched handle on right coax access door.
 - d. Latched CTD on bracket.

TASK 6
LOAD, FIRE, AND APPLY IMMEDIATE ACTION ON AN
M240C COAX MACHINE GUN
(M2, M3, M2A2, M3A2, OR M2A2 ODS OR M3A2 ODS)

CONDITIONS

Given a Bradley with BII, an M240C machine gun installed, and 300 rounds of dummy 7.62-mm ammunition loaded into the ready box.

STANDARDS

Within 6 minutes, the crewmembers--

- Loaded the coax machine gun.
- Fired the coax machine gun.
- Applied immediate action to the coax machinegun.

EVALUATION PROCEDURES

1. **Administrative Process.** At this task, the evaluator logs information about each crewmember on a roster. He supplies the crewmember with all required materials and equipment, displaying them IAW this manual. He uses the performance measures to record the crewmember's performance. Afterward, he tells the crewmember how well the crewmember performed on this task and directs him to the next task or to further training. One evaluator can test one--and only one--crewmember at a time.
2. **Procedures Used When Personnel Receive a NO GO.** If a crewmember fails to achieve the standards on the performance measures, he earns a NO GO. When this happens, the evaluator explains to the crewmember what he did wrong and how to correct his mistakes. Then, he retests the crewmember IAW local SOP.

PERSONNEL, EQUIPMENT, AND MATERIALS

- Qualified 11B, 12B, 13F, 14R, or 19D, sergeant or above.
- Operational M2, M2A2, or M2A2 ODS or M3, M3A2, or M3A2 ODS with BII.
- TM 9-1005-313-10.
- TM 9-2350-284-10-2 or TM 9-2350-252-10-2.
- FM 3-22.1.
- M240C coax machine gun.
- 300 rounds of 7.62-mm dummy ammunition.
- Stopwatch.
- Clipboard with pen.
- One helper, qualified 11B, 12B, 13F, 14R, or 19D, sergeant or below.

PRETEST PREPARATION

1. Clear the weapon.
2. Disassemble the weapon to ensure that all parts are present and serviceable.
3. Assemble the weapon to ensure that all parts are present and serviceable.
4. Ensure rounds do not bind in feed chute.
5. Remove rounds from feed chute.

PRETEST CONDITIONS FOR EACH EXAMINEE

1. Ensure all power is off.
2. Ensure M240C machine gun bolt is forward.
3. Ensure manual safe is set to FIRE position.

TEST PLANNING TIME

Administration	5 minutes
Test	6 minutes
Total	11 minutes

INSTRUCTIONS TO EXAMINEE

The evaluator will read the following instructions aloud to the examinee:

"Let me have your attention. This task evaluates your ability to load, fire, and apply immediate action to the M240C machine gun.

"Do you understand these instructions?"

Pause for 5 seconds, then say—

"You have 6 minutes to complete the task."

Pause again, then say--

"Begin."

Start timing at once. If the examinee has not completed the task after 6 minutes, then say loudly enough for him to hear--

"Stop."

If at any time you think that he is going to damage the equipment or injure himself, then say--

"Stop."

PERFORMANCE MEASURES

1. Completed performance measures within 6 minutes.
2. Loaded the M240C coax machine gun.
 - a. Opened forwarder access door (M2 or M3 only).
 - b. Opened coax machine gun access doors.
 - c. Charged coax machine gun.
 - d. Set manual safety on coax to SAFE.
 - e. Opened cover assembly and feed tray.
 - f. Inspected chamber for rounds.
 - g. Placed ammunition in forwarder.
 - h. Closed forwarder access door (M2 or M3 only).
 - i. Forward ammunition to the feed tray.
 - j. Closed feed tray.
 - k. Installed ammunition belt on feed tray.
 - l. Closed cover assembly.
 - m. Closed coax machine gun access doors.
3. Fired coax machine gun.

- a. Ensured turret drive system switch was off.
 - b. Opened coax machine gun access doors.
 - c. Pushed manual safety to firing position.
 - d. Closed coax machine gun access doors.
 - e. Turned turret power switch to ON.
 - f. Moved turret drive switch to ON.
 - g. Pressed 7.62-mm ammunition button.
 - h. Moved ARM-SAFE-RESET switch to ARM.
 - i. Fired coax machine gun.
4. Applied immediate action procedures to the M240C coax machine gun.
- a. Moved ARM-SAFE-RESET switch to SAFE.
 - b. Announced "*Coax misfire*" to crew.
 - c. Moved turret drive system switch to OFF.
 - d. Opened coax access doors.
 - e. Pulled charger handle back until bolt locked to the rear.
 - f. Closed coax access doors.
 - g. Turned turret drive system switch to ON.
 - h. Moved ARM-SAFE-RESET switch to ARM.
 - i. Squeezed palm switch and trigger switch on commander's control handle.

TASK 6A
LOAD, FIRE, AND APPLY IMMEDIATE ACTION ON AN
M240C COAX MACHINE GUN
(M2A2 ODS FBCB2, M3A2 ODS FBCB2, OR M2A3 OR M3A3 ONLY)

CONDITIONS

Given a Bradley with BII and an M240C machine gun installed, and 300 rounds of dummy 7.62-mm ammunition loaded into the ready box.

STANDARDS

Within 6 minutes, the crewmembers--

1. Loaded the coax machine
2. Fired the coax machine gun.
3. Applied immediate action to the coax machinegun.

EVALUATION PROCEDURES

1. **Administrative Process.** At this task, the evaluator logs information about each crewmember on a roster. He supplies the crewmember with all required materials and equipment, displaying them IAW this manual. He uses the performance measures to record the crewmember's performance. Afterward, he tells the crewmember how well the crewmember performed on this task and directs him to the next task or to further training. One evaluator can test one--and only one--crewmember at a time.
2. **Procedures Used When Personnel Receive a NO GO.** If a crewmember fails to achieve the standards on the performance measures, he earns a NO GO. When this happens, the evaluator explains to the crewmember what he did wrong and how to correct his mistakes. Then, he retests the crewmember IAW local SOP.

PERSONNEL, EQUIPMENT, AND MATERIALS

- Qualified 11B, 12B, 13F, 14R, or 19D, sergeant or above.
- Operational M2A2 ODS appliqué, M3A2 ODS appliqué, or M2A3 or M3A3 with BII.
- TM 9-2350-284-10-2 or TM 9-2350-294-10-2-1.
- TM 9-1005-313-10.
- FM 3-22.1.
- M240C coax machine gun.
- 300 rounds 7.62-mm dummy ammunition.
- Stopwatch.
- Clipboard with pen.
- One helper, qualified 11B, 12B, 13F, 14R, or 19D, sergeant or below.

PRETEST PREPARATION

1. Clear the weapon.
2. Disassemble and reassemble the weapon to ensure that all parts are present and serviceable.
3. Ensure rounds do not bind in feed chute.
4. Remove rounds from feed chute.

PRETEST CONDITIONS FOR EACH EXAMINEE

1. Ensure all power is off.
2. Ensure M240C machine gun bolt is forward.
3. Ensure manual safe is set to FIRE position.

TEST PLANNING TIME

Administration	5 minutes
Test	6 minutes
Total	11 minutes

INSTRUCTIONS TO EXAMINEE

The evaluator will read the following instructions aloud to the examinee:

"Let me have your attention. This task evaluates your ability to load, fire, and apply immediate action to the M240C machine gun.

"Do you understand these instructions?"

Pause for 5 seconds, then say—

"You have 6 minutes to complete the task."

Pause again, then say--

"Begin."

Start timing at once. If the examinee has not completed the task after 6 minutes, then say loudly enough for him to hear--

"Stop."

If at any time you think that he is going to damage the equipment or injure himself, then say--

"Stop."

PERFORMANCE MEASURES

1. Completed performance measures within 6 minutes.
2. Loaded the M240C coax machine gun.
 - a. Unlatched CTD from its bracket.
 - b. Released handle on right access door to unlatch door.
 - c. Pulled out on left side of CTD to open left access door.
 - d. Pushed in right coax machine gun access door.
 - e. Charged coax machine gun.
 - f. Set manual safety on coax to SAFE.
 - g. Opened cover assembly and feed tray.
 - h. Inspected chamber for rounds.
 - i. Placed ammunition in forwarder.
 - j. Forwarded ammunition to the feed tray.
 - k. Closed feed tray.
 - l. Installed ammunition belt on feed tray.
 - m. Closed cover assembly.
 - n. Pulled in right coax machine gun access door.

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- o. Pushed in on left side of CTD to close left access door.
 - p. Latched handle on right coax access door.
 - q. Latched CTD on bracket.
 3. Fired coax machine gun.
 - a. Ensured turret drive system switch was off.
 - b. Unlatched CTD from bracket.
 - c. Released handle on right access door to unlatched door.
 - d. Pulled out on left side of CTD to open left access door.
 - e. Pushed in right coax machine gun access door.
 - f. Pushed manual safety to fire position.
 - g. Pulled in right coax machine gun access door.
 - h. Pushed in on left side of CTD to close left access door.
 - i. Latched handle on right coax access door.
 - j. Latched CTD on bracket.
 - k. Moved turret power switch to ON.
 - l. Moved turret drive switch to ON.
 - m. Pressed 7.62-mm ammunition button.
 - n. Moved ARM-SAFE-RESET switch to ARM.
 - o. Fired coax machine gun.
 4. Applied immediate action procedures to the M240C coax machine gun.
 - a. Moved ARM-SAFE-RESET switch to SAFE.
 - b. Announced "*Coax misfire*" to crew.
 - c. Moved turret drive system switch to OFF.
 - d. Unlatched CTD from its bracket.
 - e. Released handle on right access door to unlatched door.
 - f. Pulled out on left side of CTD to open left access door.
 - g. Pushed in right coax machine gun access door.
 - h. Pulled charger handle back until bolt locked to the rear.
 - i. Pulled in right coax machine gun access door.
 - j. Pushed in on left side of CTD to close left access door.
 - k. Latched handle on right coax access door.
 - l. Latched CTD on bracket.
 - m. Turned turret drive system switch to ON.
 - n. Moved ARM-SAFE-RESET switch to ARM.
 - o. Squeezed palm switch and trigger switch on commander's handstation.

TASK 7
CLEAR AN M240C COAX MACHINE GUN AND UNLOAD 7.62-MM
AMMUNITION
(M2, M3, M2A2, M3A2, OR M2A2 ODS, OR M3A2 ODS)

CONDITIONS

Given a Bradley with BII and coax machine gun loaded with 300 rounds of 7.62-mm dummy ammunition.

STANDARDS

Within 4 minutes, the crewmember--

1. Cleared the M240C.
2. Unloaded the ammunition from the forwarder and stowed it in the ammunition can.

EVALUATION PROCEDURES

1. **Administrative Process.** At this task, the evaluator logs information about each crewmember on a roster. He supplies the crewmember with all required materials and equipment, displaying them IAW this manual. He uses the performance measures to record the crewmember's performance. Afterward, he tells the crewmember how well the crewmember performed on this task and directs him to the next task or to further training. One evaluator can test one--and only one--crewmember at a time.
2. **Procedures Used When Personnel Receive a NO GO.** If a crewmember fails to achieve the standards on the performance measures, he earns a NO GO. When this happens, the evaluator explains to the crewmember what he did wrong and how to correct his mistakes. Then, he retests the crewmember IAW local SOP.

PERSONNEL, EQUIPMENT, AND MATERIALS

- Qualified 11B, 12B, 13F, 14R, or 19D, sergeant or above.
- Operational M2, M2A2, M2A2 ODS or M3, M3A2, M3A2 ODS with BII.
- TM 9-1005-313-10.
- TM 9-2350-284-10-2 or TM 9-2350-252-10-2.
- FM 3-22.1.
- Operational M240C coax (installed).
- 300 rounds of 7.62-mm dummy ammunition.
- Stopwatch.
- Clipboard with pen.
- One helper, qualified 11B, 12B, 13F, 14R, or 19D, sergeant or below.

PRETEST PREPARATION

1. Clear the weapon.
2. Disassemble and reassemble the weapon to ensure that all parts are present and operational.
3. Install the M240C.
4. Load the M240C coax with dummy 7.62-mm ammunition.

PRETEST CONDITIONS FOR EACH EXAMINEE

1. Turn on master power.

2. Turn on turret power and turret drive.
3. Select and arm M240C coax.

TEST PLANNING TIME

Administration	5 minutes
Test	4 minutes
Total	9 minutes

INSTRUCTIONS TO EXAMINEE

The evaluator will read the following instructions aloud to the examinee:

"Let me have your attention. This task evaluates your ability to clear the M240C coaxial machine gun and to unload the 7.62-mm ammunition.

"This test is scored in sequence. Do you understand these instructions?"

Pause for 5 seconds, then say—

"You have 4 minutes to complete the task."

Pause again, then say--

"Begin."

Start timing at once. If the examinee has not completed the task after 4 minutes, then say loudly enough for him to hear--

"Stop."

If at any time you think that he is going to damage the equipment or injure himself, then say--

"Stop."

PERFORMANCE MEASURES

1. Completed performance measures within 4 minutes.
2. Cleared the coax machine gun.
 - a. Moved ARM-SAFE-RESET switch to SAFE.
 - b. Turned turret drive switch to OFF.
 - c. Opened coax machine gun access doors.
 - d. Pulled charger handle back firmly.
 - e. Moved manual safety up to SAFE position.
 - f. Opened cover assembly.
 - g. Removed ammunition belt from feed tray.
 - h. Opened feed tray.
 - i. Checked to see if chamber was cleared of ammunition.
 - j. Closed feed tray.
 - k. Closed cover assembly.
 - l. Moved manual safety to FIRE position.
 - m. Dry fired coax machine gun by riding the bolt forward.
 - n. Pulled charger handle back firmly.
 - o. Dry fired coax machine gun by riding the bolt forward.
 - p. Closed coax machine gun access doors.

3. Unloaded 7.62-mm ammunition.
 - a. Opened forwarder access door (M2 or M3 only).
 - b. Removed coax ammunition from feed chute and forwarder (M2 or M3 only).
 - c. Removed coax ammunition from feed chute.
 - d. Closed forwarder access door (M2 or M3 only).

TASK 7A
CLEAR AN M240C COAX MACHINE GUN AND UNLOAD
7.62-MM AMMUNITION
(M2A2 ODS FBCB2, M3A2 ODS FBCB2, OR M2A3 OR M3A3 ONLY)

CONDITIONS

Given a Bradley with BII, coax machine gun loaded with 300 rounds of 7.62-mm dummy ammunition.

STANDARDS

Within 4 minutes, the crewmember--

1. Cleared the M240C.
2. Unloaded the ammunition from the forwarder and stowed the ammunition in the ammunition can.

EVALUATION PROCEDURES

1. **Administrative Process.** At this task, the evaluator logs information about each crewmember on a roster. He supplies the crewmember with all required materials and equipment, displaying them IAW this manual. He uses the performance measures to record the crewmember's performance. Afterward, he tells the crewmember how well the crewmember performed on this task and directs him to the next task or to further training. One evaluator can test one--and only one--crewmember at a time.
2. **Procedures Used When Personnel Receive a NO GO.** If a crewmember fails to achieve the standards on the performance measures, he earns a NO GO. When this happens, the evaluator explains to the crewmember what he did wrong and how to correct his mistakes. Then, he retests the crewmember IAW local SOP.

PERSONNEL, EQUIPMENT, AND MATERIALS

- Qualified 11B, 12B, 13F, 14R, or 19D, sergeant or above.
- Operational M2A2 ODS appliqué, M3A2 ODS appliqué, or M2A3 or M3A3 with BII.
- TM 9-2350-284-10-2 or TM 9-2350-294-10-2-1.
- TM 9-1005-313-10.
- FM 3-22.1.
- Operational M240C coaxes (installed).
- 300 rounds dummy 7.62-mm ammunition.
- Stopwatch.
- Clipboard with pen.
- One helper, qualified 11B, 12B, 13F, 14R, or 19D, sergeant or below.

PRETEST PREPARATION

1. Clear the weapon.
2. Disassemble and reassemble the weapon to ensure that all parts are present and operational.
3. Install the M240C.
4. Load the M240C coax with dummy 7.62-mm ammunition.

PRETEST CONDITIONS FOR EACH EXAMINEE

1. Turn on master power.
2. Turn on turret power and turret drive.
3. Select and arm M240C coax.

TEST PLANNING TIME

Administration	5 minutes
Test	4 minutes
Total	9 minutes

INSTRUCTIONS TO EXAMINEE

The evaluator will read the following instructions aloud to the examinee:

"Let me have your attention. This task evaluates your ability to clear the M240C coaxial machine gun and to unload the 7.62-mm ammunition.

"This test is scored in sequence. Do you understand these instructions?"

Pause for 5 seconds, then say—

"You have 4 minutes to complete the task."

Pause again, then say--

"Begin."

Start timing at once. If the examinee has not completed the task after 4 minutes, then say loudly enough for him to hear--

"Stop."

If at any time you think that he is going to damage the equipment or injure himself, then say--

"Stop."

PERFORMANCE MEASURES

1. Completed performance measures within 4 minutes.
2. Cleared the coax machine gun.
 - a. Moved ARM-SAFE-RESET switch to SAFE.
 - b. Turned turret drive switch to OFF.
 - c. Unlatched CTD from its bracket.
 - d. Released handle on right access door to unlatched door.
 - e. Pulled out on left side of CTD to open left access door.
 - f. Pushed in right coax machine gun access door.
 - g. Pulled charger handle back firmly.
 - h. Moved manual safety up to SAFE position.
 - i. Opened cover assembly.
 - j. Removed ammunition belt from feed tray.
 - k. Opened feed tray.
 - l. Checked to see if chamber was cleared of ammunition.
 - m. Closed feed tray.
 - n. Closed cover assembly.

- o. Moved manual safety to FIRE position.
 - p. Dry fired coax machine gun by riding the bolt forward.
 - q. Pulled charger handle back firmly.
 - r. Dry fired coax machine gun by riding the bolt forward.
 - s. Pulled in right coax machine gun access door.
 - t. Pushed in on left side of CTD to close left access door.
 - u. Latched handle on right coax access door.
 - v. Latched CTD on bracket.
3. Unloaded 7.62-mm ammunition.
- a. Removed coax ammunition from feed chute.
 - b. Removed coax ammunition from ammo box.
 - c. Placed unloaded ammunition in empty 7.62-mm ammo cans.

TASK 8
REMOVE AN M240C COAX MACHINE GUN
(M2, M3, M2A2, M3A2, M2A2 ODS, OR M3A2 ODS)

CONDITIONS

Given a Bradley with BII and a cleared coax.

STANDARDS

Within 2 minutes, the crewmember removed the coax machine gun.

EVALUATION PROCEDURES

1. **Administrative Process.** At this task, the evaluator logs information about each crewmember on a roster. He supplies the crewmember with all required materials and equipment, displaying them IAW this manual. He uses the performance measures to record the crewmember's performance. Afterward, he tells the crewmember how well the crewmember performed on this task and directs him to the next task or to further training. One evaluator can test one--and only one--crewmember at a time.
2. **Procedures Used When Personnel Receive a NO GO.** If a crewmember fails to achieve the standards on the performance measures, he earns a NO GO. When this happens, the evaluator explains to the crewmember what he did wrong and how to correct his mistakes. Then, he retests the crewmember IAW local SOP.

PERSONNEL, EQUIPMENT, AND MATERIALS

- Qualified 11B, 12B, 13F, 14R, or 19D, sergeant or above.
- Operational M2, M2A2, or M2A2 ODS or M3, M3A2, or M3A2 ODS with BII.
- TM 9-2350-284-10-2 or TM 9-2350-252-10-2.
- FM 3-22.1.
- M240C machine gun (installed).
- Stopwatch.
- Clipboard with pen.
- One helper, qualified 11B, 12B, 13F, 14R, or 19D, sergeant or below.

PRETEST PREPARATION

1. Ensure that the master power is off.
2. Ensure turret drive system is in manual.
3. Ensure turret drive system is off.

PRETEST CONDITIONS FOR EACH EXAMINEE

1. Ensure that the weapon is cleared.
2. Ensure that the turret power is off.
3. Ensure that the turret drive is off.

TEST PLANNING TIME

Administration	5 minutes
Test	2 minutes
Total	7 minutes

INSTRUCTIONS TO EXAMINEE

The evaluator will read the following instructions aloud to the examinee:

"Let me have your attention. This task evaluates your ability to remove the M240C coaxial machine gun.

"Do you understand these instructions?"

Pause for 5 seconds, then say—

"You have 2 minutes to complete the task."

Pause again, then say--

"Begin."

Start timing at once. If the examinee has not completed the task after 2 minutes, then say loudly enough for him to hear--

"Stop."

If at any time you think that he is going to damage the equipment or injure himself, then say--

"Stop."

PERFORMANCE MEASURES

1. Completed performance measures within 2 minutes.
2. Removed M240C coax machine gun.
 - a. Opened coax machine gun access doors.
 - b. Removed solenoid cable plug from plenum jack (old mount).
 - c. Disconnected rear mount pin handle from mount pinhole.
 - d. Removed coax machine gun from plenum.
 - e. Closed coax machine gun access doors.

TASK 8A

REMOVE AN M240C COAX MACHINE GUN (M2A2 ODS FBCB2, M3A2 ODS FBCB2, OR M2A3 OR M3A3 ONLY)

CONDITIONS

Given a Bradley with BII and a cleared coax.

STANDARDS

Within 2 minutes, the crewmember removed the coax machine gun.

EVALUATION PROCEDURES

1. **Administrative Process.** At this task, the evaluator logs information about each crewmember on a roster. He supplies the crewmember with all required materials and equipment, displaying them IAW this manual. He uses the performance measures to record the crewmember's performance. Afterward, he tells the crewmember how well the crewmember performed on this task and directs him to the next task or to further training. One evaluator can test one--and only one--crewmember at a time.
2. **Procedures Used When Personnel Receive a NO GO.** If a crewmember fails to achieve the standards on the performance measures, he earns a NO GO. When this happens, the evaluator explains to the crewmember what he did wrong and how to correct his mistakes. Then, he retests the crewmember IAW local SOP.

PERSONNEL, EQUIPMENT, AND MATERIALS

- Qualified 11B, 12B, 13F, 14R, or 19D, sergeant or above.
- Operational M2A2 ODS appliqué, M3A2 ODS appliqué, or M2A3 or M3A3 with BII.
- TM 9-2350-284-10-2 or TM 9-2350-294-10-2-1.
- FM 3-22.1.
- Stopwatch.
- Clipboard with pen.
- One helper, qualified 11B, 12B, 13F, 14R, or 19D, sergeant or below.

PRETEST PREPARATION

1. Ensure that the master power is off.
2. Ensure turret drive system is in manual.
3. Ensure turret drive system is off.

PRETEST CONDITIONS FOR EACH EXAMINEE

1. Ensure that the weapon is cleared.
2. Ensure that the turret power is off.
3. Ensure that the turret drive is off.

TEST PLANNING TIME

Administration	5 minutes
Test	2 minutes
Total	7 minutes

INSTRUCTIONS TO EXAMINEE

The evaluator will read the following instructions aloud to the examinee:

"Let me have your attention. This task evaluates your ability to remove the M240C coaxial machine gun.

"Do you understand these instructions?"

Pause for 5 seconds, then say--

"You have 2 minutes to complete the task."

Pause again, then say--

"Begin."

Start timing at once. If the examinee has not completed the task after 2 minutes, then say loudly enough for him to hear--

"Stop."

If at any time you think that he is going to damage the equipment or injure himself, then say--

"Stop."

PERFORMANCE MEASURES

1. Completed performance measures within 2 minutes.
2. Removed M240C coax machine gun.
 - a. Unlatched CTD from its bracket.
 - b. Released handle on right access door to unlatch door.
 - c. Pulled out on left side of CTD to open left access door.
 - d. Pushed in right coax machine gun access door.
 - e. Disconnect rear mount pin handle from mount pinhole.
 - f. Removed coax machine gun from plenum.
 - g. Pulled in right coax machine gun access door.
 - h. Pushed in on left side of CTD to close left access door.
 - i. Latched handle on right coax access door.
 - j. Latched CTD on bracket.

TASK 9
DISASSEMBLE (FIELD STRIP) AND ASSEMBLE AN
M240C COAX MACHINE GUN

CONDITIONS

Given an M240C coax machine gun placed on a flat surface and cleared of ammunition.

STANDARDS

The crewmember--

1. Within 2 minutes, disassembled the M240C machine gun.
2. Within 2 minutes, assembled the M240C machine gun.

EVALUATION PROCEDURES

1. **Administrative Process.** At this task, the evaluator logs information about each crewmember on a roster. He supplies the crewmember with all required materials and equipment, displaying them IAW this manual. He uses the performance measures to record the crewmember's performance. Afterward, he tells the crewmember how well the crewmember performed on this task and directs him to the next task or to further training. One evaluator can test one--and only one--crewmember at a time.
2. **Procedures Used When Personnel Receive a NO GO.** If a crewmember fails to achieve the standards on the performance measures, he earns a NO GO. When this happens, the evaluator explains to the crewmember what he did wrong and how to correct his mistakes. Then, he retests the crewmember IAW local SOP.

PERSONNEL, EQUIPMENT, AND MATERIALS

- Qualified 11B, 12B, 13F, 14R, or 19D, sergeant or above.
- Operational M2, M2A2, M2A2 ODS, M2A3 or M3, M3A2, M3A2 ODS, or M3A3 with BII.
- TM 9-2350-284-10-2, TM 9-2350-252-10-2, or TM 9-2350-294-10-2-1.
- FM 3-22.1.
- M240C coax machine gun.
- Stopwatch.
- Clipboard with pen.
- One helper, qualified 11B, 12B, 13F, 14R, or 19D, sergeant or below.

PRETEST PREPARATION

1. Ensure that the equipment is operational.
2. Ensure that the weapon is removed from vehicle.
3. Ensure that the weapon is cleared.

PRETEST CONDITIONS FOR EACH EXAMINEE

1. Ensure that the weapon is placed on a flat surface.
2. Ensure that the weapon is cleared of ammunition.

TEST PLANNING TIME

Administration	5 minutes
Test	4 minutes
Total	9 minutes

INSTRUCTIONS TO EXAMINEE

The evaluator will read the following instructions aloud to the examinee:

"Let me have your attention. This task evaluates your ability to disassemble and assemble the M240C machine gun. The weapon has been cleared.

"Do you understand these instructions?"

Pause for 5 seconds, then say—

"You have 4 minutes to complete the task."

Pause again, then say--

"Begin."

Start timing at once. If the examinee has not completed the task after 4 minutes, then say loudly enough for him to hear--

"Stop."

If at any time you think that he is going to damage the equipment or injure himself, then say--

"Stop."

PERFORMANCE MEASURES

1. Completed performance measures within 4 minutes.
2. Disassembled (field strip) M240C coax machine gun.
 - a. Depressed and held barrel-locking latch.
 - b. Turned barrel released to upright position.
 - c. Removed barrel.
 - d. Depressed trigger pin spring and removed pin.
 - e. Pulled trigger-housing assembly down and back.
 - f. Pulled charger handle through cable guide.
 - g. Pulled back plate latch and lifted buffer straight up.
 - h. Pressed driving spring in, then up, and pulled it out.
 - i. Depressed cover latches and raised cover assembly.
 - j. Pulled charger handle back; pulled out the bolt and operating rod assembly.
 - k. Closed cover, pushed spring pin out, and removed it.
 - l. Pressed latches and removed cover assembly and feed tray.
3. Reassembled M240C coax machine gun.
 - a. Positioned feed tray and cover assembly, pushed cover assembly forward, closed cover, and inserted spring pin.
 - b. Inserted spring pin from right side.
 - c. Opened cover assembly.
 - d. Set bolt operating rod assembly on top of rails (receiver).

- e. Extend bolt to unlocked position; then pushed assembly all the way in.
- f. Closed and locked cover.
- g. Inserted driving spring in the operating rod, pushed in fully, and lowered it to seat the stud in the hole of the receiver.
- h. Installed buffer and ensured that it latched.
- i. Slid charger handle through cable guide and positioned trigger housing assembly in place.
- j. Inserted pin.
- k. Inserted barrel fully into socket, pushed barrel release to the right as far as it would go (no less than two, and no more than seven clicks).
- l. Conducted function checks of the M240C.

TASK 10
BORESIGHT TURRET WEAPONS SYSTEMS
(M2, M3, M2A2, M3A2, M2A2 ODS, OR M3A2 ODS)

CONDITIONS

Given an operational Bradley with BII and coax installed, operational boresight kit with 25-mm gun adapter, and TM 9-2350-252-10-2 or TM 9-2350-284-10-2. This is the only BGST task that requires the use of the technical manual.

STANDARDS

Within 25 minutes (30 minutes for M2A2 ODS or M3A2 ODS), the crewmember boresighted--

1. 25-mm gun (day and night).
2. Auxiliary sight.
3. M240C coax.
4. TOW launcher.
5. Laser range finder (M2A2 ODS or M3A2 ODS only).

EVALUATION PROCEDURES

1. **Administrative Process.** At this task, the evaluator logs information about each crewmember on a roster. He supplies the crewmember with all required materials and equipment, displaying them IAW this manual. He uses the performance measures to record the crewmember's performance. Afterward, he tells the crewmember how well the crewmember performed on this task and directs him to the next task or to further training. One evaluator can test one--and only one--crewmember at a time.
2. **Procedures Used When Personnel Receive a NO GO.** If a crewmember fails to achieve the standards on the performance measures, he earns a NO GO. When this happens, the evaluator explains to the crewmember what he did wrong and how to correct his mistakes. Then, he retests the crewmember IAW local SOP.

PERSONNEL, EQUIPMENT, AND MATERIALS

- Qualified 11B, 12B, 13F, 14R, or 19D, sergeant or above.
- Operational M2, M2A2, M2A2 ODS or M3, M3A2, M3A2 ODS with BII.
- TM 9-2350-252-10-2 or TM 9-2350-284-10-2.
- FM 3-22.1.
- Boresight kit.
- Boresight panel (1,200 meters distant).
- Stopwatch.
- Clipboard with pen.
- One helper, qualified 11B, 12B, 13F, 14R, or 19D, sergeant or below.

PRETEST PREPARATION

1. Ensure boresight telescope is operational.
2. Ensure engine is off.
3. Ensure master power is on.
4. Ensure all drive-select levers are in power mode.
5. Ensure turret power and turret drive are off.

6. Ensure vehicle is parked on level ground.
7. Ensure ballistic sight covers are closed.
8. Ensure driver and cargo hatches are closed.

PRETEST CONDITIONS FOR EACH EXAMINEE

1. Ensure ARM-SAFE-RESET switch is set to SAFE.
2. Ensure thermal sight is off.
3. Ensure magnification is set to low.
4. Ensure the range index is on 12.
5. Ensure reticle brightness is off.
6. Offset day and night 25-mm boresight knobs.
7. Offset coax mount azimuth elevation knobs.
8. Offset TOW boresight screen.
9. Move turret out of target area.
10. Ensure travel lock is engaged.
11. Ensure turret shield door is closed.

TEST PLANNING TIME

Administration	5 minutes
Test	25 minutes
Total	30 minutes

Test for M2A2

ODS or M3A2 ODS	30 minutes
Total	35 minutes

INSTRUCTIONS TO EXAMINEE

The evaluator will read the following instructions aloud to the examinee:

"Let me have your attention. This task evaluates your ability to boresight the M242 25-millimeter automatic gun, the M240C coaxial machine gun, the auxiliary sight, and the TOW launcher.

"For M2A2 ODS or M3A2 ODS models, you must also boresight the laser range finder.

"Do you understand these instructions?"

Pause for 5 seconds, then say--

"You have 25 minutes (30 minutes for M2A2 ODS or M3A2 ODS models) to complete the task."

Pause again, then say--

"Begin."

Start timing at once. If the examinee has not completed the task after 25 minutes (30 minutes for M2A2 ODS, M3A2 ODS), then say loudly enough for him to hear--

"Stop."

If at any time you think that he is going to damage the equipment or injure himself, then say--

"Stop."

Any time the helper installs the boresight telescope, the red streamer must be attached.

PERFORMANCE MEASURES

1. Completed performance measures within 25 minutes (30 minutes for M2A2 ODS, M3A2 ODS models).
2. Turned on turret power.
3. Moved night vision power switch to ON.
4. Opened ballistic sight cover doors.
5. Moved range control knob to "0."
6. Moved magnification switch to HIGH.
7. Moved sensor select to CLEAR or NEUTRAL.
8. Boresighted M242 25-mm automatic gun:
 - a. Pressed AP SS button.
 - b. Ensured that AP appears on status indicator.
 - c. Adjusted reticle brightness knob.
 - d. Moved turret traverse drive-select lever to manual position.
 - e. Moved gun elevation drive-select lever to manual position.
 - f. Moved TOW elevation drive-select lever to power position.
 - g. Centered gun reticle on aiming point of target.
 - h. Helper installed 25-mm boresighted adapter and boresighted telescope on the muzzle end of the 25-mm barrel.
 - i. Helper focused boresighted telescope on target.
 - j. Helper aligned elevation crosshair in boresighted reticle on aiming point of target.
 - k. Helper checked accuracy of boresighted telescope.
 - l. Aligned gun reticle on aiming point of target.
 - m. Helper and gunner switched positions and verified alignment.
 - n. Removed boresight telescope and boresight adapter from 25-mm gun barrel.
9. Boresighted the laser range finder (M2A2 ODS, M3A2 ODS only):
 - a. Moved magnification switched to HIGH.
 - b. Moved laser switched to ON.
 - c. Engaged and fully locked boresighted prism.
 - d. Located laser reticle.
 - e. Aligned laser reticle in center of the gun reticle circle.
 - f. Disengaged and locked boresighted prism.
 - g. Moved laser switch OFF.
10. Boresighted the auxiliary sight:
 - a. Positioned auxiliary sight to the commander's position.
 - b. Focused auxiliary sight.
 - c. Looked at aiming point image in auxiliary sight reticle.
 - d. Adjusted elevation linkage.
 - e. Loosened horizontal adjustment lock screw.
 - f. Centered aiming point image.
 - g. Locked horizontal adjustment lock screw.

- h. Checked aiming point image.
- 11. Boresighted the M240C coax machine gun.
 - a. Pressed 7.62-mm ammunition button.
 - b. Ensured that 7.62 appeared in status indicator.
 - c. Ensured alignment of gun reticle on aiming point of target.
 - d. Moved to commander's seat.
 - e. Helper installed boresight adapter and boresight telescope in muzzle end of M240C coax machine gun.
 - f. Helper focused boresight telescope on boresighted panel.
 - g. Helper aligned azimuth crosshair reticle on aiming point of target.
 - h. Helper removed boresight telescope and boresight adapter.
- 12. Aligned nightsight:
 - a. Moved sensor select switch to NIGHT.
 - b. Aligned elevation crosshair and azimuth crosshair on gun reticle on aiming point of target.
 - c. Moved sensor select switch to CLEAR or NEUTRAL.
 - d. Ensured alignment of gun reticle on aiming point of target.
- 13. Prepared turret for power operation.
 - a. Moved gun elevation drive-select lever to POWER.
 - b. Moved turret-traverse drive-select lever to POWER.
- 14. Boresighted TOW system.
 - a. Turned on turret drive and raised TOW launcher.
 - b. Turned off turret drive.
 - c. Hung red streamer on turret drive system switch.
 - d. Pressed TOW button.
 - e. Ensured that TOW appeared on status indicator.
 - f. Moved TOW elevation drive-select lever to manual position.
 - g. Moved gun elevation drive-select lever to power position.
 - h. Moved turret-traverse drive-select lever to manual position.
 - i. Helper installed boresight telescope and hung red streamer on boresighted telescope.
 - j. Aligned azimuth crosshair of TOW reticle on aiming point of target.
 - k. Adjusted the TOW launcher for azimuth, if necessary.
 - l. Helper aligned elevation crosshair of boresight-telescope reticle on target's aiming point.
 - m. Aligned elevation crosshair of TOW reticle on aiming point of target.
 - n. Helper removed boresight telescope and red streamer from TOW launcher. Gunner visually inspected it.
 - o. Removed red streamer from turret drive system switch.
 - p. Moved TOW elevation drive-select lever to POWER.
 - q. Moved turret-traverse drive-select lever to POWER.
 - r. Moved turret-drive switched to ON.
 - s. Lowered TOW launcher.
 - t. Moved turret drive system switch to OFF.

TASK 10A

BORESIGHT TURRET WEAPONS SYSTEMS (M2A3, M3A3)

CONDITIONS

Given an operational Bradley with BII and coax installed, operational boresight kit with 25-mm gun adapter, and TM 9-2350-294-10-2-1.

STANDARDS

Within 25 minutes, the crewmember--

1. Boresighted the--
 - TAS and backup sight to the 25-mm gun.
 - CIV to the 25-mm gun.
 - TAS and backup sight to the coax.
 - TAS to the TOW launcher.
2. Aligned the--
 - TAS TV NFOV to the aided target tracker.
 - TAS TV WFOV to the aided target tracker.
 - CIV FLIR to the TV.

EVALUATION PROCEDURES

1. **Administrative Process.** At this task, the evaluator logs information about each crewmember on a roster. He supplies the crewmember with all required materials and equipment, displaying them IAW this manual. He uses the performance measures to record the crewmember's performance. Afterward, he tells the crewmember how well the crewmember performed on this task and directs him to the next task or to further training. One evaluator can test one--and only one--crewmember at a time.
2. **Procedures Used When Personnel Receive a NO GO.** If a crewmember fails to achieve the standards on the performance measures, he earns a NO GO. When this happens, the evaluator explains to the crewmember what he did wrong and how to correct his mistakes. Then, he retests the crewmember IAW local SOP.

PERSONNEL, EQUIPMENT, AND MATERIALS

- Qualified 11B, 12B, 13F, 14R, or 19D, sergeant or above.
- Operational M2A3 or M3A3 with BII.
- TM 9-2350-294-10-2-1.
- FM 3-22.1.
- Boresight kit.
- Boresight panel (1,200 meters distant).
- Stopwatch.
- Clipboard with pen.
- One helper, qualified 11B, 12B, 13F, 14R, or 19D, sergeant or below.

PRETEST PREPARATION

1. Ensure boresight telescope is operational.
2. Ensure engine is off.
3. Ensure master power is on.
4. Ensure all drive-select levers are in POWER mode.

5. Turn turret power on.
6. Ensure vehicle is parked on level ground.
7. Ensure ballistic sight covers are closed.
8. Ensure driver and cargo hatches are closed.
9. Log on to FBCB2.
10. Return to the A3 tactical screen.

PRETEST CONDITIONS FOR EACH EXAMINEE

1. Ensure ARM-SAFE-RESET switch is at SAFE position.
2. Ensure range index is at 1.
3. Move turret out of target area.
4. Ensure travel lock is engaged.
5. Ensure turret shield door is closed.

TEST PLANNING TIME

Administration	5 minutes
Test	25 minutes
Total	30 minutes

INSTRUCTIONS TO EXAMINEE

The evaluator will read the following instructions aloud to the examinee:

"Let me have your attention. This task evaluates your ability to boresight the TAS backup sight to the 25-mm gun; the CIV to the 25-mm gun; the TAS backup sight to the coaxial machine gun; and the TAS to the TOW launcher.

"You must also align the TAS TV NFOV to the ATT; the TAS TV WFOV to the ATT, and the CIV FLIR to the TV.

"Do you understand these instructions?"

Pause for 5 seconds, then say—

"You have 25 minutes to complete the task."

Pause again, then say--

"Begin."

Start timing at once. If the examinee has not completed the task after 25 minutes, then say loudly enough for him to hear--

"Stop."

If at any time you think that he is going to damage the equipment or injure himself, then say--

"Stop."

Any time the helper installs the boresight telescope, the red streamer must be attached.

PERFORMANCE MEASURES

1. Boresighted turret weapons systems.
 - a. Ensured turret power was on.

- b. Ensured turret drive was off.
 - c. Placed the gun elevation and traverse select levers in MANUAL and the TOW select lever in POWER.
 - d. Opened the ballistic sight doors.
 - e. Adjusted the focus, reticle, and symbology brightness and the image contrast and brightness on both the TAS and the CIV sights.
 - f. If using FLIR, adjusted gain, level, polarity, and zoom as needed.
2. Inserted the boresight telescope into the 25-mm adapter.
 - a. Inserted the tapered shaft of the telescope snugly into the tapered hole of the adapter with the red index mark on the adapter in the 12 o'clock position. This positioned the telescope's eyepiece in the 3 o'clock position.
 - b. Removed the objective eyepiece lens caps from the telescope.
 - c. Unfold and attached the red warning flag to the telescope's objective-lens barrel.
 3. Inserted the boresight telescope assembly into the 25-mm gun barrel.
 - a. Inserted the boresight telescope assembly into the 25-mm gun barrel with the red index mark on the adapter in the 12 o'clock position. Ensured that the red mark on the 25-mm adapter aligned with the red index mark on the telescope's body. This positioned the telescope's eyepiece in the 3 o'clock position.

NOTE: Regardless of which end you look in, the rifling spins to the right.

- b. Ensured that the tapered muzzle cone of the boresight telescope assembly seated firmly on the muzzle brake of the 25-mm gun barrel.
4. Positioned the boresight telescope assembly crosshairs on the top left-hand corner of the boresight panel.
 - a. Had helper direct the gunner to position the telescope crosshair on the top left-hand corner of the boresight panel using manual traverse and elevation handwheels.
 - b. Turned the boresight telescope assembly clockwise using the knurled section of 25-mm adapter only. Turned the adapter within the gun barrel.
 5. Collimated the boresight telescope assembly.
 - a. While gripping the knurled section of the 25-mm adapter, rotated the index mark (the red dot) to the 6 o'clock position. This should have put the eyepiece at the 9 o'clock position. Ensured that the tapered muzzle cone of the adapter seated against the muzzle brake of the 25-mm gun barrel.
 - b. Viewed the boresight panel. If the aim point had moved from its original position, you adjusted the reticle (Step 6). If no adjustment was needed, you went to Step 7.
 6. Adjusted the crosshairs in the boresight telescope reticle.
 - a. Rotated the adjustment protective shroud on the boresight telescope to expose the adjustment knobs.
 - b. Using the reticle adjustment knobs on the telescope, moved the reticle one-half of the difference between the previous point and the new position, in both azimuth and elevation.
 - c. Had the gunner use the manual elevation and traverse handwheels to move the turret, in order to put the telescope crosshairs back on top of the left corner of the boresight panel.

- d. While gripping the knurled section of the 25-mm adapter, rotated the index mark (the red dot) clockwise to the right to the 12 o'clock position. This would have placed the telescope eyepiece at the 3 o'clock position.
 - e. Looked through boresighted telescope. If the crosshair in telescope failed to align with top left-hand corner of the boresight panel, then continued to move the reticle one-half of the difference from the previous point to the top left corner of the boresight panel. Used the reticle-adjustment knobs on the telescope to do this.
 - f. Repeated Step 6 until the reticle did not move from one position to the next. This normally takes three to five cycles.
 - g. Once you were able to rotate the 25-mm adapter without the telescope crosshairs moving from the initial aiming point (top left-hand corner) of the boresight panel, you had collimated the telescope to the 25-mm gun.
 - h. Had the gunner and helper swap positions to check optical alignment through the IBAS and boresight telescope.
7. Operate the commander's tactical display:
 - a. From the CTD, selected MAIN.
 - b. From the TACTICAL screen, selected SETUP.
 - c. From the setup screen, selected FIRE CONTROL.
 - d. From fire control, selected MANUAL boresight.
 8. Performed preboresighting tasks.
 - a. Ensured Tasks 1 and 2 on the PREBORESIGHTING TASKS screen had been performed.
 - b. Performed system null.
 - c. If TOW was to be boresighted, raised TOW launcher and placed red streamer on turret drive system switch.
 - d. Opened the sight shield doors.
 - e. Placed the turret-drive system (TDS) in MANUAL mode.
 - f. When ready, pressed CONTINUE.
 - g. Selected BORESIGHT TAS, BACKUP SIGHT TO 25-MM GUN.
 - h. When ready, selected CONTINUE from the TOOLS, EQUIPMENT, CONDITIONS, PERSONNEL REQUIRED screen.
 - i. Boresighted the TAS, and backed up the sight to the 25-mm gun.
 9. Read and performed all 10 tasks on the BORESIGHT TAS, BACKUP SIGHT TO 25-MM GUN screen.
 10. Selected CONTINUE.
 - a. When ready, selected CONTINUE from the BORESIGHT CIV TO 25-MM GUN, TOOLS, EQUIPMENT, CONDITIONS, AND PERSONNEL REQUIRED screen.
 - b. Boresighted the CIV to the 25-mm gun. Read and performed all 7 tasks on the BORESIGHT CIV TO 25-MM GUN screen.

NOTE: When boresighting coax or TOW, do not collimate.

- c. From the BORESIGHT TAS, BACKUP SIGHT TO COAX, TOOLS, EQUIPMENT, CONDITIONS, AND PERSONNEL REQUIRED screen, selected CONTINUE.
- d. Boresighted the TAS, and backed up the sight to the coax.

11. Read and performed all 13 tasks from BORESIGHT TAS, BACKUP SIGHT TO COAX screen.
12. Selected CONTINUE.
 - a. When ready, selected CONTINUE from the BORESIGHT TAS TO TOW LAUNCHER, TOOLS, EQUIPMENT, CONDITIONS, AND PERSONNEL REQUIRED screen.
 - b. Boresighted the TAS to the TOW launcher.
 - c. Read and performed all 8 tasks from the BORESIGHT TAS TO TOW LAUNCHER screen.
13. Selected CONTINUE.
 - a. When ready, selected CONTINUE from the ALIGN TAS TV NFOV TO ATT, TOOLS, EQUIPMENT, CONDITIONS, AND PERSONNEL REQUIRED screen.
 - b. Aligned the TAS TV NFOV to the aided target tracker.
 - c. Read and performed all 4 tasks on the screen.
14. Selected CONTINUE.
 - a. When ready, selected CONTINUE from the ALIGN TAS TV WFOV TO ATT, TOOLS, EQUIPMENT, CONDITIONS, AND PERSONNEL REQUIRED screen.
 - b. Aligned the TAS TV WFOV to the aided target tracker.
 - c. Read and performed all 4 tasks on the screen.
15. Selected CONTINUE.
 - a. When ready, selected CONTINUE from the ALIGN CIV FLIR TO TV, TOOLS, EQUIPMENT, CONDITIONS, AND PERSONNEL REQUIRED screen.
 - b. Aligned the CIV FLIR TV.
 - c. Read and performed all 7 tasks on the screen.
16. Selected CONTINUE.
 - a. From the ZERO 25-MM GUN screen, selected EXIT and returned to main screen.
 - b. Removed the red streamer from the turret drive system switch.
 - c. Moved the TOW elevation drive-selected lever to POWER.
 - d. Moved the turret traverse drive-selected lever to POWER.
 - e. Moved the turret drive switched to ON.
 - f. Lowered the TOW launcher.
 - g. Moved the turret drive system switch to OFF.
17. Completed performance measures within 25 minutes.

TASK 10B
BORESIGHT TURRET WEAPONS SYSTEMS (M7 BFIST)

CONDITIONS

Given an operational M7 BFIST with BII, operational boresight kit with 25-mm-gun adapter, installed coax, and TM 9-2350-297-10-2. (Only this BGST task requires the use of the technical manual.)

STANDARDS

Within 25 minutes the crewmembers boresighted--

- Laser range finder.
- 25-mm gun.
- M240C coax.
- Nightsight and daysight.

EVALUATION PROCEDURES

1. **Administrative Process.** At this task, the evaluator logs information about each crewmember on a roster. He supplies the crewmember with all required materials and equipment, displaying them IAW this manual. He uses the performance measures to record the crewmember's performance. Afterward, he tells the crewmember how well the crewmember performed on this task and directs him to the next task or to further training. One evaluator can test one--and only one--crewmember at a time.
2. **Procedures Used When Personnel Receive a NO GO.** If a crewmember fails to achieve the standards on the performance measures, he earns a NO GO. When this happens, the evaluator explains to the crewmember what he did wrong and how to correct his mistakes. Then, he retests the crewmember IAW local SOP.

PERSONNEL, EQUIPMENT, AND MATERIALS

- Qualified BFIST 13F sergeant or above.
- Operational BFIST M7 with BII.
- TM 9-2350-284-10-2-1 and TM 9-2350-297-10-2.
- Boresight kit.
- Boresight panel (1,200 meters distant).
- Stopwatch.
- Clipboard with pen.
- One helper, qualified BFIST 13F sergeant or below.

PRETEST PREPARATION

1. Ensure boresight telescope is operational.
2. Ensure engine is off.
3. Ensure master power is on.
4. Ensure all drive-select levers are in POWER mode.
5. Ensure turret drive system is off.
6. Ensure vehicle is parked on level ground.
7. Ensure ballistic sight covers are closed.
8. Ensure driver and cargo hatches are closed.

PRETEST CONDITIONS FOR EACH EXAMINEE

1. Ensure ARM-SAFE-RESET switch is at SAFE position.
2. Ensure thermal sight is off.
3. Ensure magnification is set at low.
4. Ensure range index is at 12.
5. Ensure reticle brightness is off.
6. Offset day and night 25-mm boresight knobs.
7. Offset coax-mount azimuth-elevation knobs.
8. Offset prism boresight screen.
9. Move turret out of target area.
10. Ensure travel lock is engaged.
11. Ensure turret shield door is closed.

TEST PLANNING TIME

Administration	5 minutes
Test	25 minutes
Total	30 minutes

INSTRUCTIONS TO EXAMINEE

The evaluator will read the following instructions aloud to the examinee:

"Let me have your attention. This task evaluates your ability to boresight the M242, 25-mm automatic gun, the M240C coaxial machine gun, and the eye-safe laser range finder.

"Do you understand these instructions?"

Pause for 5 seconds, then say—

"You have 25 minutes to complete the task."

Pause again, then say--

"Begin."

Start timing at once. If the examinee has not completed the task after 25 minutes, then say loudly enough for him to hear--

"Stop."

If at any time you think that he is going to damage the equipment or injure himself, then say--

"Stop."

Any time the helper installs the boresight telescope, the red streamer must be attached.

PERFORMANCE MEASURES

1. Completed performance measures within 25 minutes.
2. Boresighted turret weapon systems.
 - a. Ensured turret power was on.
 - b. Moved night-vision power switch to ON.
 - c. Opened ballistic-sight cover doors.

- d. Moved range-control knob to 0.
- e. Moved sensor-selected switch to CLEAR or NEUTRAL.
- 3. Boresighted eye-safe laser range finder (ELRF).
 - a. Moved magnification switch to HIGH.
 - b. Moved TSCP power switch to on.
 - c. Selected FIST soft key (except in FIST mode).
 - d. Moved laser switch to ON.
 - e. Unstowed prism boresighted knob
 - f. Closed ballistic sight shield doors.
 - g. Located ELRF reticle.
 - h. Adjusted RET DSP knob.
 - i. Adjusted RET BRT knob.
 - j. Aligned ELRF reticle within center of TOW reticle.
 - k. Stowed prism boresighted knob.
 - l. Moved laser switch to OFF.
 - m. Opened ballistic sight shield doors.
- 4. Boresighted the M242 25-mm automatic gun.
 - a. If in FIST mode, deselected FIST soft key.
 - b. Pressed AP SS button.
 - c. Ensured that "AP" appeared on status indicator.
 - d. Adjusted RET or BRT knob for correct brightness of gun reticle.
 - e. Moved turret-traverse, drive-select lever to manual position.
 - f. Moved gun-elevation, drive-select lever to manual position.
 - g. Released turret-travel lock.
 - h. Centered gun reticle on aiming point of target.
 - i. (Helper) installed 25-mm boresight adapter, red streamer, and boresight telescope.
 - j. (Helper) focused boresight telescope on target.
 - k. (Helper) aligned elevation cross hair in boresight scope on aiming point of target.
 - l. (Helper) aligned azimuth cross hair in boresight scope on aiming point of target.
 - m. (Helper) checked accuracy of boresight telescope.
 - n. Aligned gun reticle on aiming point of target.
 - o. (Helper and gunner-observer) switched positions and verified alignment.
 - p. Removed boresight telescope, red streamer, and 25-mm boresight adapter.
- 5. Boresighted the M240C coax machine gun.
 - a. Pressed the 7.62 button.
 - b. Ensured that "7.62" appeared in the status indicator.
 - c. Ensured that the gun reticle aligned on the target's aiming point.
 - d. Moved to the commander's seat.
 - e. (Helper) installed boresight adapter, red streamer, and boresight telescope.
 - f. (Helper) focused boresight telescope on boresight panel.
 - g. (Helper) aligned the azimuth crosshair in the boresight scope reticle on the aiming point of the target.
 - h. (Helper) aligned the elevation crosshair in the boresight scope reticle on the aiming point of the target.
 - i. (Helper) removed boresight telescope, the red streamer, and the boresight adapter.
- 6. Boresighted the nightsight to the daysight.

- a. Moved the sensor select switch to NIGHT.
- b. Aligned the elevation and azimuth crosshairs in the gun's reticle on the target's aiming point.
- c. Moved the sensor-select switch to CLEAR or NEUTRAL.
- d. Ensured that both the TOW's and the gun's day and night reticles aligned on the aiming point of the target.

TASK 11
LOAD AND UNLOAD THE 25-MM HE READY BOX

CONDITIONS

Given a Bradley with the turret positioned at HE load and 75 rounds of 25-mm dummy ammunition.

STANDARDS

The crewmember--

1. Within 6 minutes, loaded 75 rounds in the HE ready box.
2. Within 6 minutes, unloaded 75 rounds from the HE ready box and separated ammunition into five 15-round belts.

EVALUATION PROCEDURES

1. **Administrative Process.** At this task, the evaluator logs information about each crewmember on a roster. He supplies the crewmember with all required materials and equipment, displaying them IAW this manual. He uses the performance measures to record the crewmember's performance. Afterward, he tells the crewmember how well the crewmember performed on this task and directs him to the next task or to further training. One evaluator can test one--and only one--crewmember at a time.
2. **Procedures Used When Personnel Receive a NO GO.** If a crewmember fails to achieve the standards on the performance measures, he earns a NO GO. When this happens, the evaluator explains to the crewmember what he did wrong and how to correct his mistakes. Then, he retests the crewmember IAW local SOP.

PERSONNEL, EQUIPMENT, AND MATERIAL REQUIRED

- Qualified 11B, 12B, 13F, 14R, or 19D, sergeant or above.
- Operational M2, M2A2, M2A2 ODS, M2A3 or M3, M3A2, M3A2 ODS, or M3A3 with BII.
- TM 9-2350-284-10-2, TM 9-2350-252-10-2, or TM 9-2350-294-10-2-1.
- 75 rounds of 25-mm dummy ammunition.
- FM 3-22.1.
- Stopwatch.
- Clipboard with pen.
- One helper, qualified 11B, 12B, 13F, 14R, or 19D, sergeant or below.

PRETEST PREPARATION

1. Position turret at HE load position with travel lock engaged.
2. Place five 15-round belts of 25-mm dummy ammunition on the floor of the hull to the rear of the turret shield door.
3. Inspect HE ready-box door for serviceability; replace all unserviceable or missing parts.

PRETEST CONDITIONS FOR EACH EXAMINEE

Ensure--

1. Turret position is in HE load position.
2. Master power and turret power are both off.
3. HE ready can door is secured.

4. Ammunition selector lever is in AP position.
5. Turret shield door is closed.
6. Ammunition is in five belts of 15 rounds each.

TEST PLANNING TIME

Administration	6 minutes
Test	12 minutes
Total	18 minutes

INSTRUCTIONS TO EXAMINEE

The evaluator will read the following instructions aloud to the examinee:

"Let me have your attention. This task evaluates your ability to load and unload the high-explosive ready box. You have 6 minutes to load the box and 6 minutes to unload it and return the ammunition to five 15-round belts.

"Do you understand these instructions?"

Pause for 5 seconds, then say—

"You have 6 minutes to complete each task."

Pause again, then say--

"Begin."

Start timing at once. If the examinee has not completed each task after the appropriate time, then say loudly enough for him to hear--

"Stop."

If at any time you think that he is going to damage the equipment or injure himself, then say--

"Stop."

PERFORMANCE MEASURES

1. Completed performance measures within 6 minutes.
2. Loaded the HE ready box.
 - a. Inspected belts for misaligned rounds.
 - b. Belted the five 15-round belts together.
 - c. Knocked on turret-shield door and said--

"Loading high explosives."

- d. Opened turret shield door.
- e. Removed HE ready box door.
- f. Hung first five rounds, double-link end first.
- g. Hung 19th, 24th, and 25th rounds.
- h. Counted out 25 rounds, hung 24th and 25th rounds, and continued until rounds were loaded.
- i. Replaced HE ready box door.
- j. Ensured ammunition selector lever was in HE position.

- k. Closed turret shield door and said--
"High explosives loaded."
- 3. Unloaded HE ready box.
 - a. Knocked on turret shield door and said--
"Unloading high explosive."
 - b. Opened turret shield door.
 - c. Removed HE ready box door.
 - d. Removed ammunition.
 - e. Replaced HE ready box door.
 - f. Closed turret shield door and said--
"High explosive unloaded."
 - g. Separated ammunition into five 15-round belts.

TASK 12

LOAD AND UNLOAD THE 25-MM AP READY BOX

CONDITIONS

Given a Bradley with the turret positioned at AP load and 45 rounds of 25-mm dummy ammunition.

STANDARDS

The crewmember--

1. Within 6 minutes, loaded 45 rounds in the AP ready box.
2. Within 6 minutes, unloaded 45 rounds from the AP ready box and separated ammunition into three 15-round belts.

EVALUATION PROCEDURES

1. **Administrative Process.** At this task, the evaluator logs information about each crewmember on a roster. He supplies the crewmember with all required materials and equipment, displaying them IAW this manual. He uses the performance measures to record the crewmember's performance. Afterward, he tells the crewmember how well the crewmember performed on this task and directs him to the next task or to further training. One evaluator can test one--and only one--crewmember at a time.
2. **Procedures Used When Personnel Receive a NO GO.** If a crewmember fails to achieve the standards on the performance measures, he earns a NO GO. When this happens, the evaluator explains to the crewmember what he did wrong and how to correct his mistakes. Then, he retests the crewmember IAW local SOP.

PERSONNEL, EQUIPMENT, AND MATERIALS

- Qualified 11B, 12B, 13F, 14R, or 19D, sergeant or above.
- Operational M2, M2A2, M2A2 ODS, M2A3 or M3, M3A2, M3A2 ODS, or M3A3 with BII.
- TM 9-2350-284-10-2, TM 9-2350-252-10-2, or TM 9-2350-294-10-2-1.
- 45 rounds of 25-mm dummy ammunition.
- FM 3-22.1.
- Stopwatch.
- Clipboard with pen.
- One helper, qualified 11B, 12B, 13F, 14R, or 19D, sergeant or below.

PRETEST PREPARATION

1. Position turret at AP load position with travel lock engaged.
2. Place three 15-round belts of 25-mm dummy ammunition on the floor of the hull to the rear of the turret shield door.
3. Inspect AP ready-box door for serviceability; replace all unserviceable or missing parts.

PRETEST CONDITIONS FOR EACH EXAMINEE

1. Turret is in AP load position.
2. Master power and turret power are both turned off.
3. AP ready-can door is secured.
4. Ammunition selector lever is in M919 position.

5. Turret shield door is closed.
6. Ammunition is in three belts of 15 round each.

TEST PLANNING TIME

Administration	6 minutes
Test	12 minutes
Total	18 minutes

INSTRUCTIONS TO EXAMINEE

The evaluator will read the following instructions aloud to the examinee:

"Let me have your attention. This task evaluates your ability to load and unload the AP ready box. You have 6 minutes to load the AP ready box, and 6 minutes to unload the ready box and return the ammunition to the three 15-round belts. Do you understand these instructions?"

Pause for 5 seconds, then say—

"You have 6 minutes to complete each task."

Pause again, then say--

"Begin."

Start timing at once. If the examinee has not completed each task after the appropriate time, then say loudly enough for him to hear--

"Stop."

If at any time you think that he is going to damage the equipment or injure himself, then say--

"Stop."

PERFORMANCE MEASURES

1. Completed performance measures within 6 minutes.
2. Loaded AP ready box.
 - a. Inspected belts for misaligned rounds.
 - b. Belted the three 15-round belts together.
 - c. Knocked on turret shield door and said--
"Loading armor piercing."
 - d. Opened turret shield door.
 - e. Removed AP ready-box door.
 - f. Hung first round, double-link end first.
 - g. Hung 25th and 26th round.
 - h. Placed single link end of belt and forward ammunition far enough above the forwarder that the rounds stayed above the forwarder.
 - i. Replaced AP ready-box door.
 - j. Ensured ammunition selector lever was in AP position.
 - k. Closed turret shields door and said--
"Armor piercing loaded."

3. Unloaded the AP ready box.
 - a. Knocked on turret-shield door and said--
"Unloading armor piercing."
 - b. Opened turret-shield door.
 - c. Removed AP ready-box door.
 - d. Removed ammunition.
 - e. Replaced AP ready-box door.
 - f. Closed turret-shield door and said--
"Armor piercing unloaded."
 - g. Separated ammunition into three 15-round belts.

TASK 13 IDENTIFY COMBAT VEHICLES

CONDITIONS

Given a classroom with either a 35-mm slide projector screen and a slide tray loaded with forty 35-mm slides of combat vehicles at various angles and in various conditions or a computer with version 8.0 or later of the Recognition of Combat Vehicles (ROC-V) program installed, plus a pencil, paper, and a stopwatch.

STANDARDS

The crewmember identified 36 of the 40 vehicles by nomenclature. Of the 40 slides--

- Half were thermal images.
- 28 showed foreign vehicles used by nonallied forces.
- 15 showed tanks.
- 17 showed IFVs, APCs, or reconnaissance or ATGM vehicles.
- 8 showed trucks, SP artillery, ADA, or engineer vehicles.

EVALUATION PROCEDURES

This task requires the soldier to identify combat vehicles from the front, side, oblique angle, or rear using day and thermal vehicle images. The forty slides selected for testing need not represent 40 different vehicles. The same vehicle may appear up to three times, but each occurrence shows the vehicle from a different angle.

PERSONNEL, EQUIPMENT, AND MATERIALS

- Qualified 11B, 12B, 13F, 14R, or 19D, sergeant or above.
- Forty 35-mm slides of combat vehicles from performance measures.
- Classroom.
- Slide-projector with screen.
- Computer with ROC-V program installed.
- Performance measures (one for each soldier).
- Stopwatch.
- Chair, desk, or clipboard (one for each soldier).
- Pencil (one for each soldier).

PRETEST PREPARATION

The task evaluator selects forty slides from the performance measures. He ensures the slide projector is operational and that the slides are recognizable from all locations in the classroom. Some projectors have an automatic setting for exposure of each slide; if used, this feature must be checked for accuracy.

PRETEST CONDITIONS FOR EACH EXAMINEE

The slide projector will be on, but slides will not be exposed.

TEST PLANNING TIME

Administration	5 minutes
Test	13 minutes 20 seconds
Total	25 minutes

INSTRUCTIONS TO EXAMINEE

The evaluator will read the following instructions aloud to the examinee:

"Let me have your attention. This task evaluates your ability to identify combat vehicles. You must correctly identify 36 of 40 vehicles by nomenclature. You have 10 seconds to view each slide and 10 seconds between slides to write your answer on the performance measures provided. Stay in sequence if you want your answers to count as correct. Do you understand these instructions?"

Pause for 5 seconds, then say—

"You have 20 seconds to complete each task."

Pause again, then say--

"Begin."

Start timing at once. If the examinee has not completed the task after the appropriate time, then say loudly enough for him to hear--

"Stop."

PERFORMANCE MEASURES

Identified vehicle slides No. 1 through No. 40.

1. IFV or APC Reconnaissance Vehicles.
 - a. Light armored vehicle (LAV) family.
 - LAV-25.
 - LAV antitank.
 - LAV 81-mm mortar carrier.
 - b. M2A3- or M3A3-series armored fighting vehicles.
 - M2 or M3.
 - M2A2 or M3A2.
 - M2A2 ODS or M3A2 ODS.
 - M2A3 or M3A3.
 - c. M113-series armored personnel carrier.
 - M113A1.
 - M113A2.
 - M113A3.
 - M577.
 - M901 improved TOW vehicle.
 - d. LVTP-7 (AAV7A1).
 - e. M-88 armored recovery vehicle.
 - f. Saxon.
 - g. Warrior infantry fighting vehicle.
 - h. FV-432.

- i. Marder-series infantry fighting vehicle.
 - Marder 1.
 - Marder 1A2.
 - j. VAB-series.
 - VAB 4x4.
 - VAB 6x6.
 - k. AMX-10P.
 - l. BTR-series.
 - BTR-60PB.
 - BTR-70.
 - BTR-80.
 - m. BTR-152.
 - n. BMP-series infantry fighting vehicle.
 - BMP-1.
 - BMP-2.
 - BMP-3.
 - o. BMD-series airborne combat vehicle.
 - BMD-1.
 - BMD-2.
 - BMD-3.
 - BTR-D.
 - p. BTR-50PK.
 - q. MTLB multipurpose tracked vehicle.
 - r. BRDM-series.
 - BRDM-2 with Sagger.
 - BRDM-2 with Spandrel.
 - BRDM-1.
 - BRDM-2.
 - BRDM-2U.
 - s. Scorpion-series reconnaissance vehicle.
 - Scorpion.
 - Scimitar.
 - t. Fox NBC reconnaissance.
 - u. AMX-10RC.
 - v. EE-9 Cascavel.
2. Trucks, SP artillery, ADA, and engineer vehicles.
- a. HEMTT-series truck.
 - M978 fueler.
 - M977 cargo.
 - b. M998 HMMWV.
 - c. M92582 (5-ton).
 - d. M163 Vulcan.
 - e. M998 Avenger.
 - f. ZSU-23-4.
 - g. ZSU-57-2.
 - h. 2S6.

-
- i. SA-9 Gaskin.
 - j. Gepard.
 - k. M-270 multiple launch rocket system (MLRS).
 - l. M-109 SP artillery series.
 - M-109A6 Paladin.
 - M-992 FAASV.
 - m. 2S1.
 - n. 2S3.
 - o. M60 AVLB.
 - p. M-728 CEV.
 - q. M-9 ACE.
3. Tanks.
- a. T80.
 - b. T80U.
 - c. T90.
 - d. T62.
 - e. T62 modernized.
 - f. T54 and T55.
 - g. T54 and T55 modernized
 - h. PT 76.
 - i. M 1985 (North Korea).
 - j. Type 88 MBT (North Korea).
 - k. M1A1.
 - l. M1A2.
 - m. M60A3.
 - n. Challenger 1.
 - o. Challenger 2.
 - p. Leopard 1.
 - q. Leopard 1A1.
 - r. Leopard 1A4.
 - s. Leopard 2.
 - t. LeClerc.
 - u. Chieftain Mk-5 MBT.

TASK 14
SET UP RADIO (ASIP) FOR DIGITAL COMMUNICATIONS
(M2A2 ODS FBCB2, M3A2 ODS FBCB2, OR M2A3 OR M3A3 ONLY)

CONDITIONS

Given a Bradley with BII and either SINCGARS radio AN/VRC-A or AN/VRC92A.

STANDARDS

Within the time specified, the crewmembers set up the radio system for digital communications.

EVALUATION PROCEDURES

1. **Administrative Process.** At this task, the evaluator logs information about each crewmember on a roster. He supplies the crewmember with all required materials and equipment, displaying them IAW this manual. He uses the performance measures to record the crewmember's performance. Afterward, he tells the crewmember how well the crewmember performed on this task and directs him to the next task or to further training. One evaluator can test one--and only one--crewmember at a time.
2. **Procedures Used When Personnel Receive a NO GO.** If a crewmember fails to achieve the standards on the performance measures, he earns a NO GO. When this happens, the evaluator explains to the crewmember what he did wrong and how to correct his mistakes. Then, he retests the crewmember IAW local SOP.

PERSONNEL, EQUIPMENT, AND MATERIAL REQUIRED

- Qualified 11B, 12B, 13F, 14R, or 19D, sergeant or above.
- Operational M2A2 ODS appliqué, M3A2 ODS appliqué, or M2A3 or M3A3 with BII.
- TM 11-5820-890-10-8 and TM 9-2350-284-10-2 or TM 9-2350-294-10-2-1.
- FM 3-22.1.
- Stopwatch.
- Clipboard with pen.

PRETEST PREPARATION

1. Ensure equipment is operational.
2. Ensure turret is positioned at 6,400 mils.
3. Ensure travel lock is engaged.
4. Ensure turret power is on and vehicle is in combat state.

PRETEST CONDITIONS FOR EACH EXAMINEE

1. Ensure PCKT no longer appears in display when DATA (4) is depressed on the SINCGARS radio.
2. Ensure RT appears in display when RCU key is pressed on SINCGARS radio.
3. Ensure CHAN select switch is set to CUE.
4. Ensure COMSEC has been zeroed and FCTN switch is set to OFF.
5. Ensure MODE switch is set to FH.
6. Ensure COMSEC switch is set to CT.
7. Send digital SPOTREP.

TEST PLANNING TIME

Administration	5 minutes
Test	5 minutes
Total	10 minutes

INSTRUCTIONS TO EXAMINEE

The evaluator will read the following instructions aloud to the examinee:

"Let me have your attention. This task evaluates your ability to set up a SINCGARS radio for digital communications. Do you understand these instructions?"

Pause for 5 seconds, then say—

"You have 5 minutes to complete each task."

Pause again, then say--

"Begin."

Start timing at once. If the examinee has not completed each task after the appropriate time, then say loudly enough for him to hear--

"Stop."

If at any time you think that he is going to damage the equipment or injure himself, then say--

"Stop."

PERFORMANCE MEASURES

1. Completed performance measures within 5 minutes.
2. Set up radio for digital communications.
 - a. Adjusted DIM and VOL as required, using the menu CLR and CHG (change) keys.
 - b. Set CHAN selected to Channel 1 using the menu CLR and CHG (change) keys.
 - c. Adjusted power setting as required for estimated distance:
 - LO=less than 300 meters.
 - M=less than 4 kilometers.
 - HI=less than 8 kilometers.
 - PA=up to 35 kilometers.
 - d. Set FCTN switch to LD (load).
 - e. Loaded COMSEC and FREQ hop data using AN/CYZ.
 - f. Set MODE to FH (frequency hopping) using menu CLR and CHG (change) keys.
 - g. Set COMSEC to CT (cipher text), using menu CLR and CHG (change) keys.
 - h. On the keypad, pressed FREZ then CLR. Display should have been blank. Entered frequency and pressed STO.
 - i. Pressed DATA (4) then CHG (7) until PCKT appeared in display.
 - j. Moved FTCH switch back to SQ ON.
 - k. LCU configuration. Each of the following was unclassified:
 - Connection: RADIO.
 - Protocol: TACFIRE.
 - Modulation: NRZ.

- Baud rate: 4,800.
- Blocked rate: SINGLE.
- Blocked mode: SINGLE.
- Preamble: 2.2.
- Net access delay: OFF.

APPENDIX B

Boresighting

This appendix discusses boresighting procedures. Before zeroing, the crew boresights all weapon systems to ensure they align correctly. As a reminder--

- *Boresighting aligns the sight with the aim point.*
- *Zeroing aligns the sight with the impact point.*

Section I. THEORY AND PRACTICE

Boresighting aligns the ISU OR IBAS and weapon systems to a common point of aim and simplifies the task of zeroing the turret weapon systems (Figure B-1, page B-2). The crew must ensure that boresight kits meet the accuracy standards in this appendix before using them to boresight the weapon systems. They must turn in to battalion maintenance any kits that fail the accuracy test. They perform accuracy tests during semiannual servicing of vehicles, or whenever they detect problems during zeroing. They can swap telescopes and adapters to form complete kits that meet the standards, if needed. Specific boresighting instructions follow:

B-1. VISIBILITY CONDITIONS

During good visibility, boresight the gun's daysight using the convenient-target method. During limited visibility, for all but the A3, use the buddy method to boresight the daysight (TMs 9-2350-252-10-2 and 9-2350-284-10-2). Only after completing this step can you boresight the thermal sight to the daysight. Before boresighting, reset the boresight knobs to zero.

B-2. RESTRICTED AREAS

For restricted or confined areas, such as a motor pool, use the close-in boresight panel to boresight the turret weapons. In such areas, you can boresight the Bradley A3 sights to a point of aim as near as 200 meters.

B-3. PREPARATION

Select the boresight mode from the menu on the CTD. The boresight menu takes you step-by-step through aligning the IBAS, the CIV, and the backup sight's LOS to the weapon systems. Before entering the boresight mode on the CTD, ensure the vehicle is stationary and level. Adjust the IBAS and CIV (brightness, contrast, focus, and polarity), then collimate IAW TM 9-2350-294-10-2-1.

B-4. INDICATIONS

Boresight all turret weapon systems before you fire the crew baseline exercise. Boresight again only if you remove either the 25-mm receiver or the M240C, 7.62-mm coaxial machine gun (the coax), or unless another member of the crew stands on or pulls either weapon system from outside of the vehicle.

Section II. EQUIPMENT-TESTING PROCEDURES

Accurate boresighting is critical in combat situations. The crew must master boresighting procedures and the use of boresighting equipment. Boresighting aligns the sight to the aiming point of the 25-mm gun bore. Zeroing then aligns the sights with the point of round impact. A skilled crew can boresight and zero accurately with only a few sight adjustments and rounds.

B-5. EQUIPMENT

Boresighting the 25-mm gun requires a boresight telescope (NSN 4933-00-867-6607) and one of two 25-mm adapters, depending on the BFV model. The adapter fits into the gun bore, and the telescope fits into the adapter.

a. **Boresight Telescope.** Figure B-1 shows the reticle of the telescope. The reticle has crosshairs, a 2-mil circle, and a 10-mil circle. The azimuth crosshair is the vertical line; the elevation crosshair is the horizontal line. Use the 2-mil circle to test the accuracy of the 25-mm boresight kit.

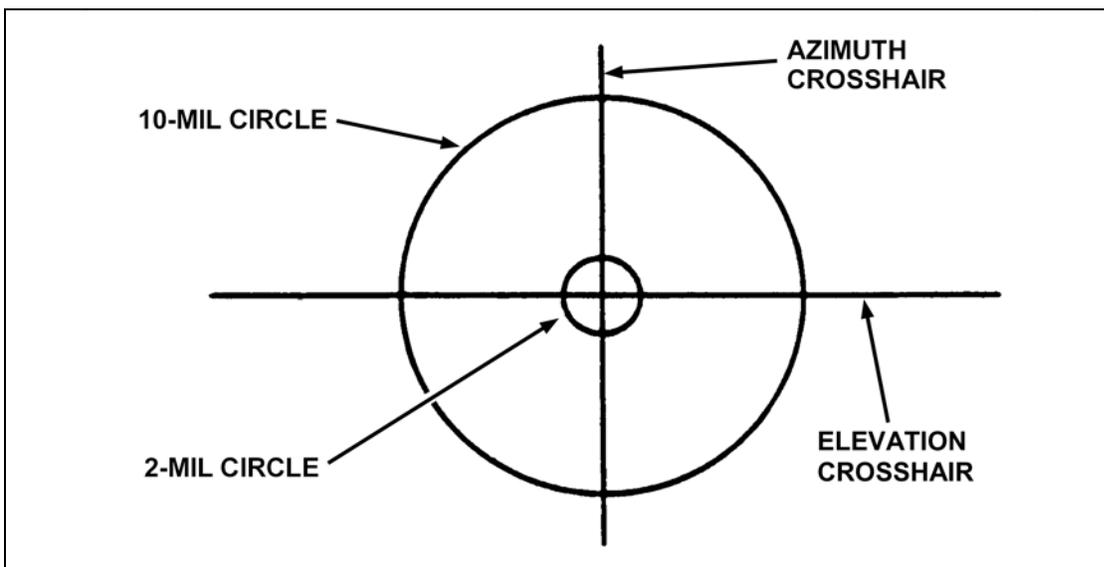


Figure B-1. Reticle for boresight telescope NSN 4933-00-867-6607.

(1) The telescope's 5X magnification allows the viewer to focus on any target between 5 meters and infinity. After you have properly focused the telescope, the aiming point of the reticle stays put, even if you move your head while looking at it.

(2) Adjust the telescope's two focusing rings (Figure B-2) in the following order:

(a) *Reticle-Focus Ring.* Point the telescope at the sky or toward any other evenly lit field of view. This forces you to look at the reticle rather than at a target. To focus, turn the reticle-focus ring until the reticle appears sharp and clear.

(b) *Target Objective-Focus Ring.* TM 9-2350-252-10-2 calls this ring a "vernier focus dial." Regardless of what you call it, to adjust it, turn it back and forth until its reticle aiming point remains the same when you move your head back and forth above the eyepiece.

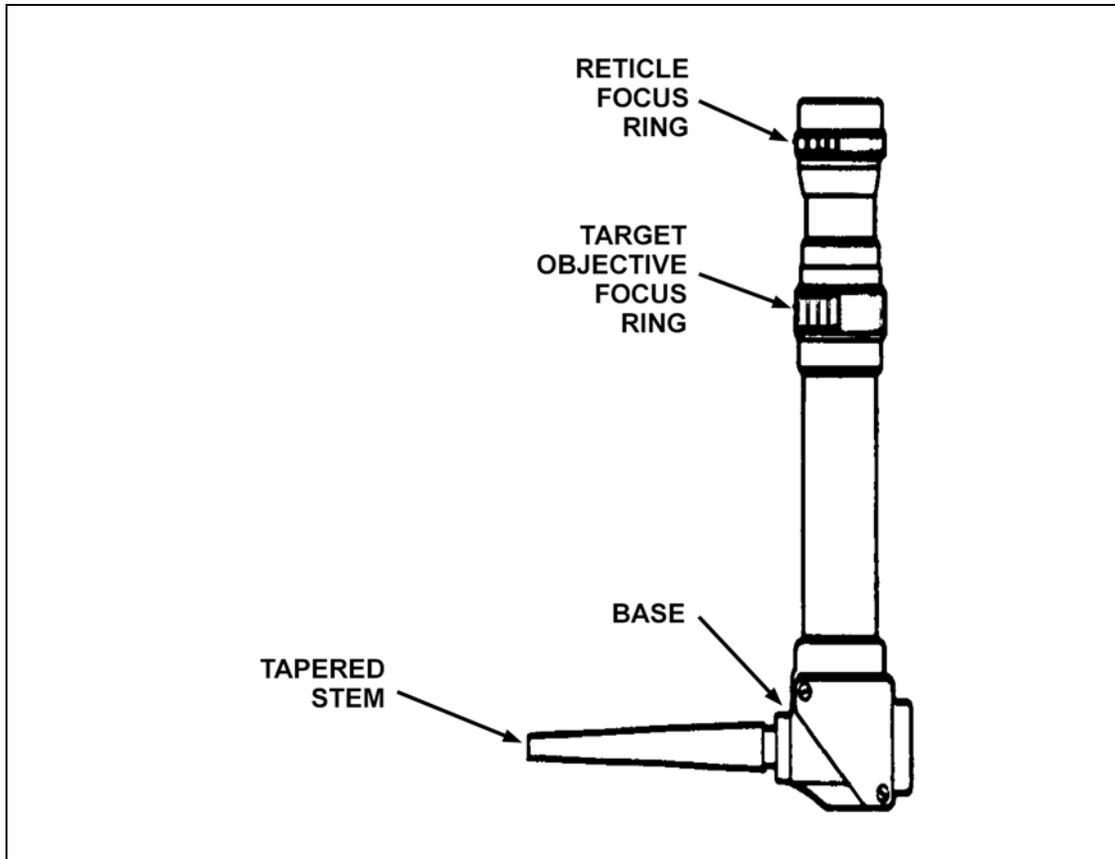


Figure B-2. Reticle-focus and target-objective-focus rings.

(3) Avoid unscrewing or disassembling the telescope itself. It is not waterproof. If it does get wet, dry it at once. Water inside the telescope fogs the view.

(4) A plate on the base of the telescope lists the federal ordnance number and the serial numbers. The serial number is the bottom (last) number listed.

b. **1-1000 Boresight Telescope Assembly and Integral 7.62-mm Adapter.** The tapered stem of the A3 boresight telescope (NSN 1240-01-490-5099, Figure B-3, page B-4) fits a 7.62-mm coax gun bore. The 25-mm adapter (NSN 1240-01-441-5410, Figure B-4, page B-4) fits the 25-mm gun bore. Together, these two parts comprise the boresight telescope assembly (BTA). When used properly, this 12X telescope offers a fast, easy, and accurate way to align the gunner's sight to the axis of the gun bore. Figure B-5, page B-5, shows the reticle, which has a vertical crosshair (for azimuth), horizontal crosshair (for elevation), and a 1-mil circle (for testing the accuracy of the boresight kit).

NOTE: If after five or six rotations you cannot collimate the 25-mm gun using the 1-1000 telescope, then turn in the telescope to unit maintenance.

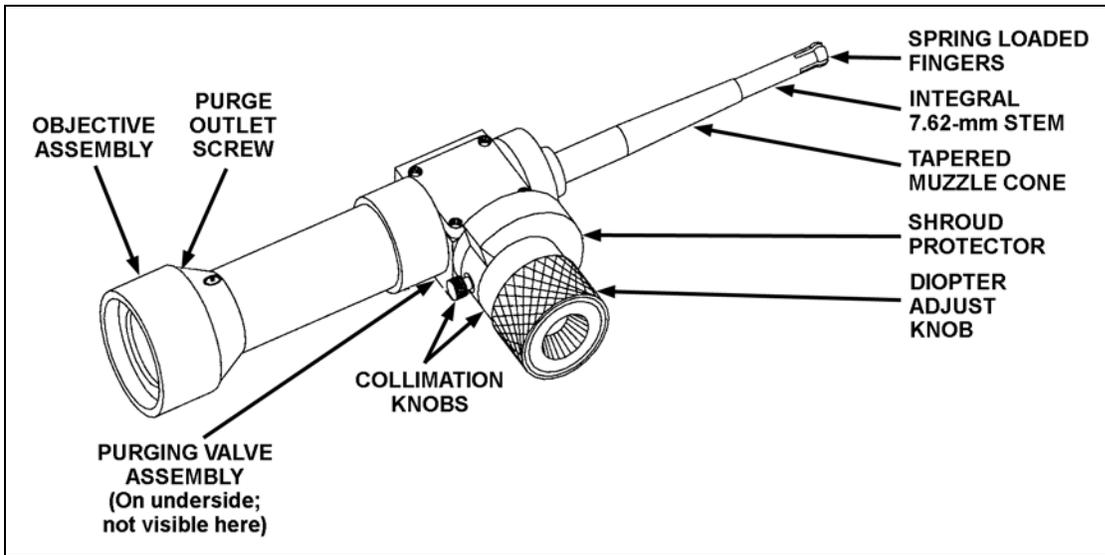


Figure B-3. The 1-1000 boresight telescope.

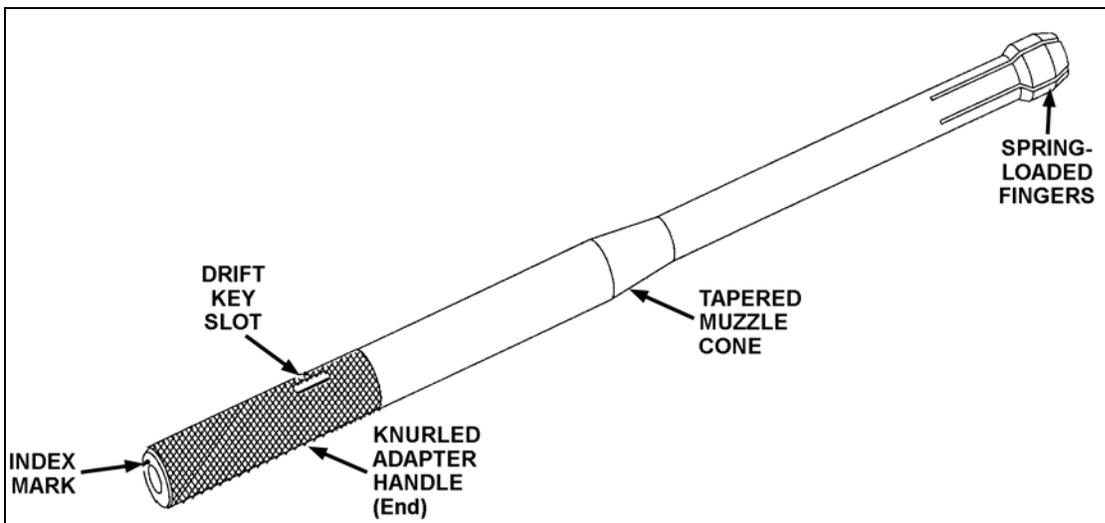


Figure B-4. Adapter for the 1-1000 boresight 25-mm telescope.

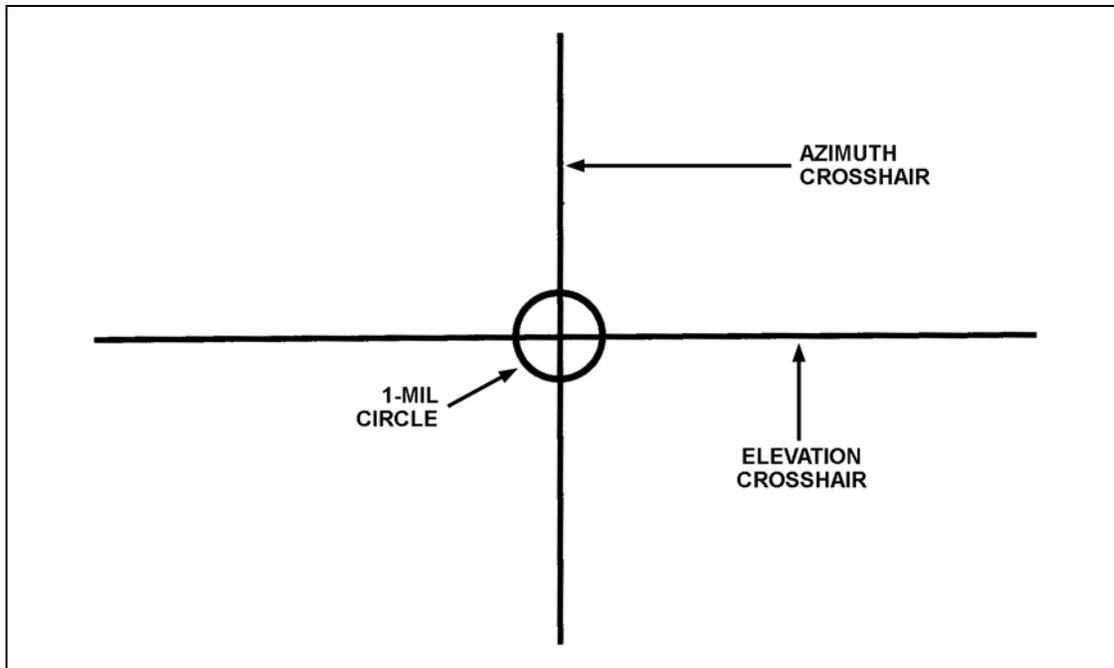


Figure B-5. Reticle for 1-1000 telescope.

(1) **Objective Assembly.** The objective assembly has an objective lens, an objective cell assembly, and a lens cap with a parallax-reduction hole.

(2) **Diopter-Adjustment Knob.** The diopter-adjustment knob allows you to adjust the image to plus or minus 4 diopters.

(3) **Knurled Handle.** Grasp the knurled handle (end) of the 25-mm adapter to install, rotate, or remove it from the gun bore.

(4) **Tapered Muzzle Cone,** Each piece has a tapered muzzle cone to fit the appropriate gun bore.

(5) **Spring-Loaded Fingers.** These center and secure the telescope to the adapter and the adapter to the gun bore.

CAUTION

Only rotate the telescope itself when using it with the 7.62-mm coax, that is, when using it **without** the 25-mm adapter.

When using the 25-mm adapter, do not turn the telescope itself; instead, grasp and rotate the knurled end of the 25-mm adapter.

(6) **Purging Valve Assembly.** The telescope has a valve assembly to purge and charge nitrogen.

(7) **Outlet Port Screw.** This allows for nitrogen purging.

(8) **Index Mark.** Align the red index mark (dot) on the 25-mm adapter with the muzzle face of the gun bore.

(9) **Shroud Protector.** A shroud protects the collimation knobs.

(10) **Collimation Knobs.** Use these knobs (azimuth, elevation) to adjust the reticle during collimation. The light port is exposed in both positions.

(11) **Adapter Interface.** This refers to the juncture of the 7.62-mm stem and the adapter.

(12) **Slotted Hole.** This is where you will insert the drift key if the 7.62-mm stem gets stuck in the adapter.

CAUTION

If the telescope stem gets stuck in the adapter, insert the drift key in the slotted hole. To loosen the stem from the adapter, work the key gently, without forcing it into the slot. Pushing too hard would damage the fingers on the end of the adapter stem.

c. **Older 25-mm Adapter.** Figure B-6 shows the older 25-mm adapter (PN 12524010). The knob inserts into the 25-mm gun barrel. The adapter is fully inserted when the tapered stop contacts the end of the gun barrel. Insert the adapter slowly with a slight twisting motion to keep it from locking in the barrel. The adapter is fully inserted when the tapered stop contacts the end of the gun barrel.

(1) The newer adapter (PN 12524144, Figure B-7) offers improved accuracy over the older model. On the newer one, both the plated knob and plated, tapered stop reduce wear. Although the knob's diameter exceeds that of the bore, slots in the knob allow it to compress (in diameter) to fit into the gun barrel.

(2) The telescope fits into the telescope receptacle on the adapter. When inserting the telescope, hold it at the base without touching the glass lens. Insert the telescope firmly by using a slight twisting motion. If the telescope is stuck in the adapter, gently hit the telescope knockout rod. Hard hits on the rod could damage the telescope shaft.

CAUTION

Be careful--hitting the telescope-knockout rod too hard could damage the telescope shaft.

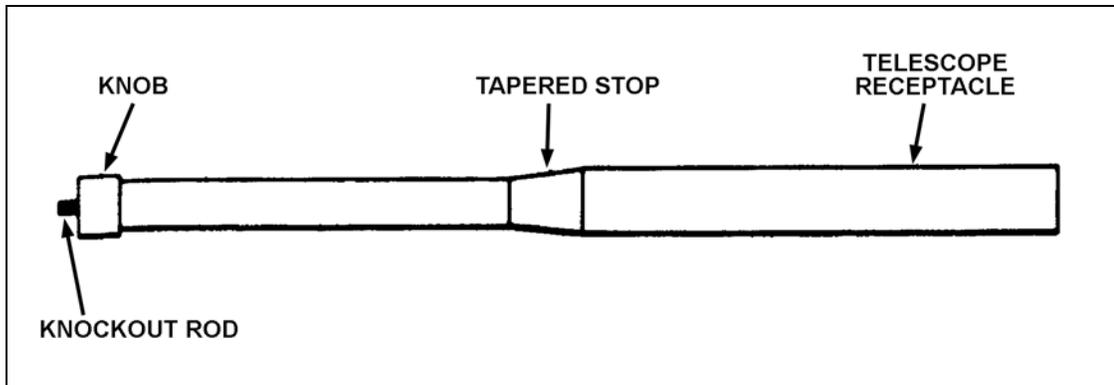


Figure B-6.
Older 25-mm adapter, PN 12524010, fits 25-mm barrel
on all BFVs through A2 ODS.

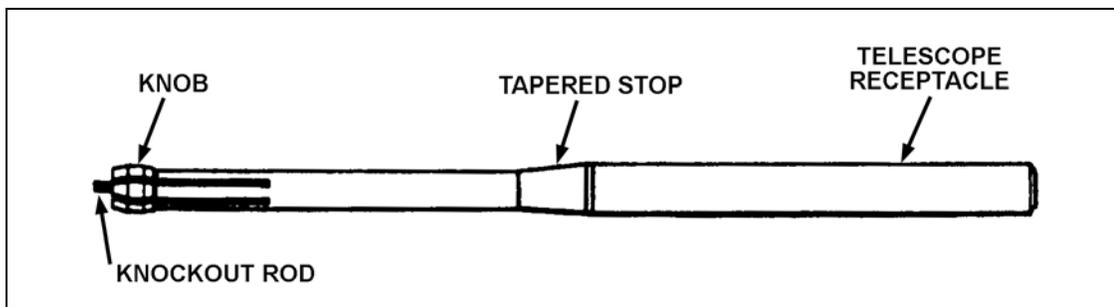


Figure B-7.
Newer 25-mm adapter, PN 12524144, fits 25-mm barrel
on all BFVs.

B-6. KIT ACCURACY TEST

Test the 25-mm kit for accuracy before you boresight the gun with it.

a. To prepare for testing, follow Steps 1 through 18 in the section entitled "Boresight 25-mm Gun" in TM 9-2350-252-10-2.

b. The kit rotation test described in this appendix differs from the turret TM's accuracy test. The TM prescribes two 90-degree rotations of the telescope to test its accuracy. The 180-degree kit-rotation test described in this appendix tests the entire kit.

c. To test the accuracy of the kit, follow these steps rather than those in the technical manual:

- (1) Focus the telescope reticle using the reticle-focus ring.
- (2) Focus on the target using the target objective-focus ring.
- (3) Rotate the telescope so that the eyepiece faces right. If when you rotate the telescope it slips in the adapter, hold both so that it does not.
- (4) Tell the gunner to lay the gun so that the telescope reticle aims at a target with a corner such as a boresight panel or building. Figure B-8, page B-8, shows an 8-foot-square boresight panel at 1,200 meters.

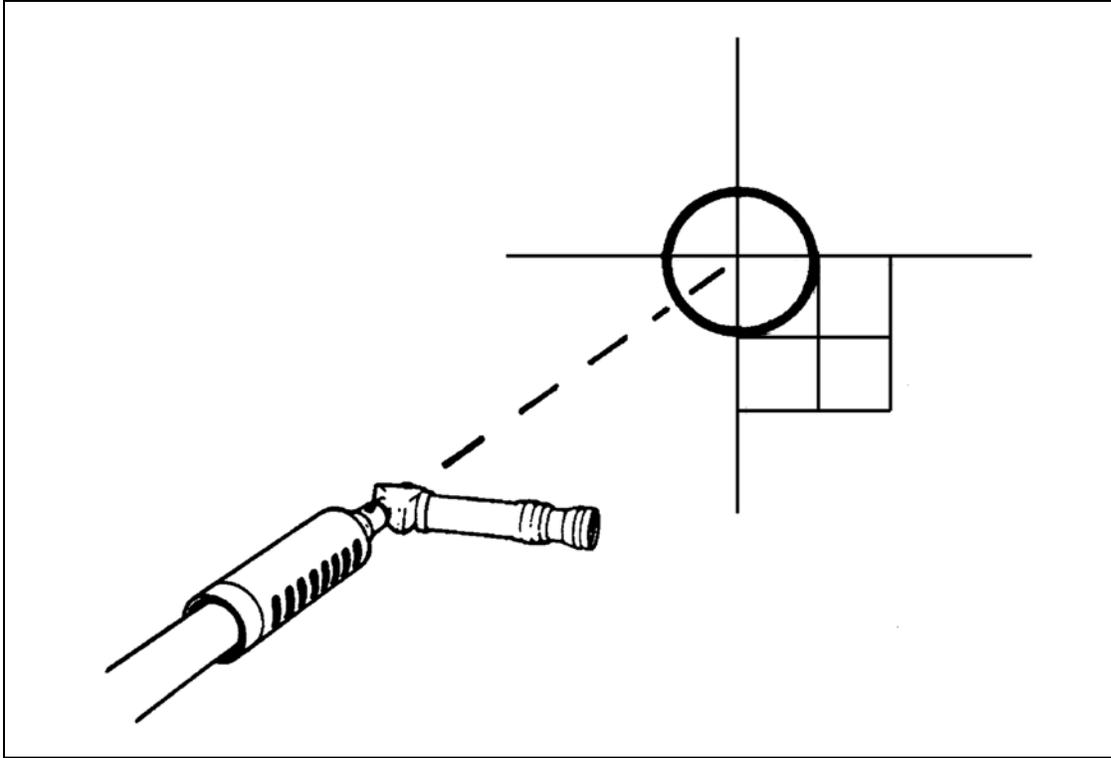


Figure B-8. Telescope reticle aimed at a corner of boresight panel.

(5) Rotate the telescope and adapter together 180 degrees until the telescope faces left (Figure B-9).

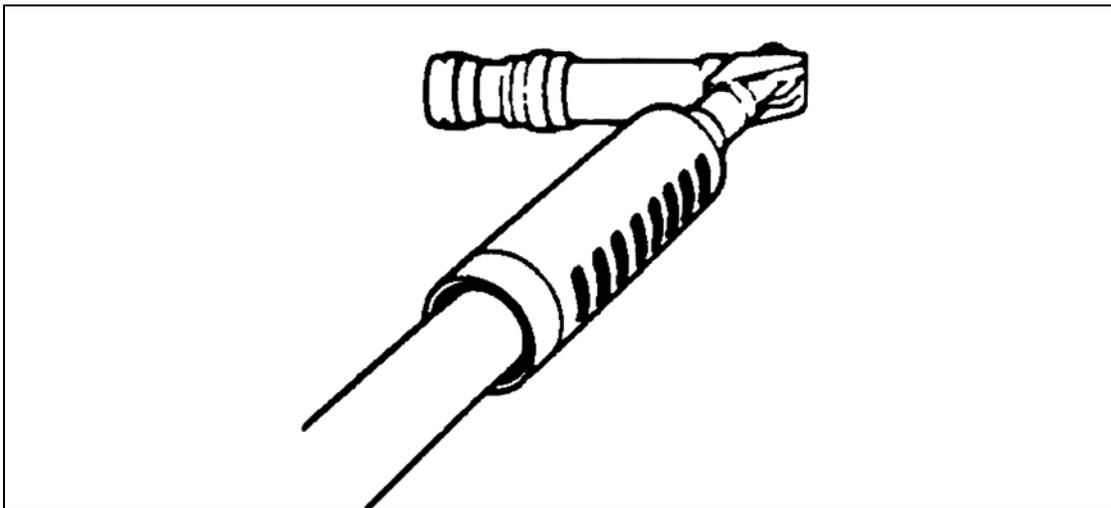


Figure B-9. Telescope facing to the *left*.

(6) Score accuracy. The kit meets standards if the original aiming point stays in or on the 2-mil circle of the telescope reticle (Figure B-10). It fails the standards if the original aiming point moves outside the 2-mil circle.

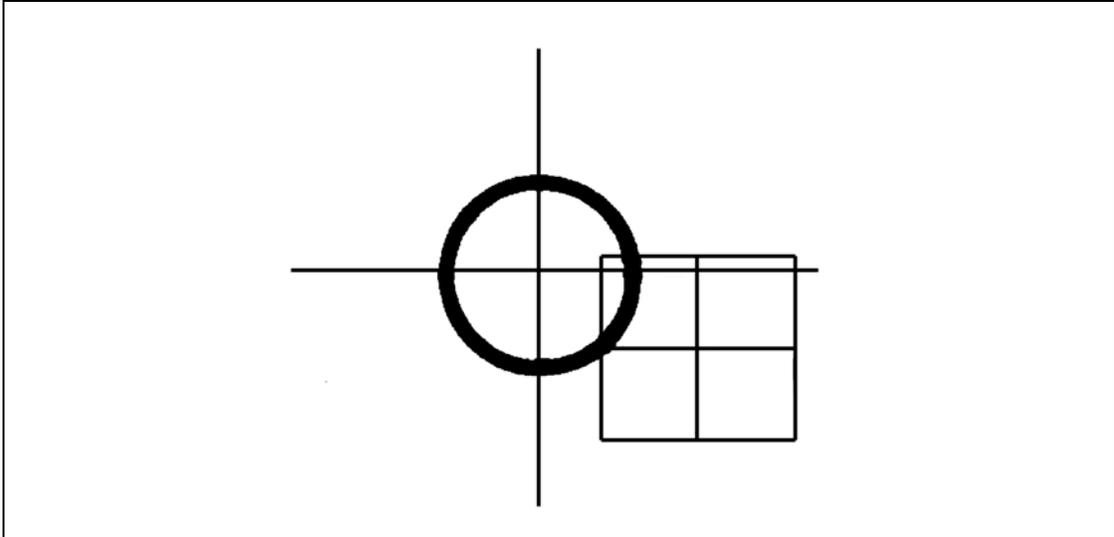


Figure B-10. Aiming point in the 2-mil circle.

B-7. BORESIGHTING THE 25-MM GUN

After identifying an accurate kit, boresight weapons as described in TM 9-2350-252-10-2, beginning with Step 23. Use both the boresight telescope and the 25-mm adapter.

B-8. PREPARATION TO SCREEN EQUIPMENT

A 25-mm boresight kit could be inaccurate due to the telescope, adapter, or both. If a 25-mm kit did not meet standards of the kit-accuracy field test, then test the telescope and 25-mm adapter separately. If a large number of kits fail to meet the standards, then the battalion must screen all of its telescope and 25-mm adapters (Figure B-11, page B-10). Then, it puts each accurate adapter with an accurate telescope to form accurate 25-mm kits. Before screening equipment--

a. **BFV and Testing Personnel.** Use one BFV to test boresight equipment. The 25-mm gun barrel should have fired no more than 5,000 rounds, because gun erosion can affect testing results.

(1) Two master gunners at either company or battalion level should conduct testing. Testers should know boresighting. They should also know how to accurately obtain, record, and score the boresight data. One tester observes aiming points of tested equipment and the other tester records data on a standardized scoresheet (discussed later).

(2) To prevent eyestrain, testers should alternate between testing and recording. Screening all of the boresighting equipment in a battalion may take from three to five days.

- Designate a test BFV and testing personnel.
- Designate a testing area.
- Prepare and position a boresight test panel.
- Learn how to use the scoresheet.
- Aim the 25-mm gun at the center of the boresight test panel.

Figure B-11. Preparations before screening equipment.

b. **Testing Area.** Conduct testing close to where the boresight equipment is stored or secured. This facilitates movement of equipment to and from the test vehicle. You will need a 52-meter line of sight from the end of the 25-mm gun barrel to the test panel. You can stow testing materials and equipment in the test vehicle overnight. This makes setup easier at the beginning of each day.

c. **Boresight Test Panel.** Use a special test panel to test the equipment. The panel is a scoring grid of 2-inch squares. Figure B-12 shows an example panel. Your local TSC must produce the actual-size drawing. With the panel 52 meters from the end of the 25-mm gun barrel, each 2-inch square of the scoring grid, as seen through the boresight telescope, measures 1 mil high and wide. This grid allows the tester to observe the location of the boresight aiming point. The tester then records the aiming point on the scoresheet.

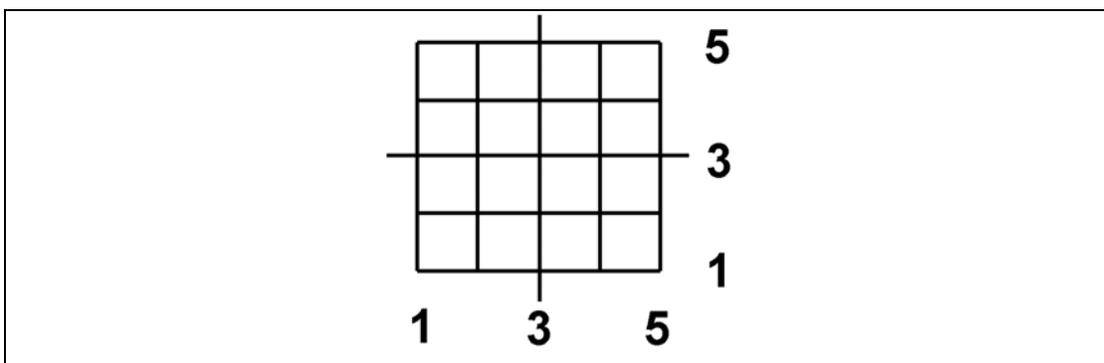


Figure B-12. Example boresight test panel.

(1) The test panel has a white background. Solid 1/8-inch-wide black lines mark squares on the panel. The length of each side of a square is 2 inches (5 centimeters). Numbers measure 1 1/2 to 2 inches tall.

(2) If you waterproof the drawing like a map, you can staple it to a piece of plywood and use it as a test panel. Lean it against a fence or any other rigid structure for support. To keep the wind from knocking it down, tie the panel to the support structure in the upright position. Be sure to locate the panel 52 meters from the 25-mm gun. It need not sit at gun level.

B-9. SCORESHEET

Use DA Form 7523-R to record and score boresight data as well as to screen all equipment--adapters, telescopes, and 25-mm boresight kits. Figure B-13 shows an example completed Bore sight Telescope Accuracy Test.

BORESIGHT TELESCOPE ACCURACY TEST								
For use of this form, see FM 3-22.1; the proponent agency is TRADOC.								
DATE (YYYYMMDD) 20030903	TIME 1030 HRS	TEST TYPE <input type="checkbox"/> TELESCOPE <input checked="" type="checkbox"/> ADAPTER <input type="checkbox"/> KIT						
TESTER SSG MARK ANDREWS		TELESCOPE NO. 9034			ADAPTER NO. 4			
UNIT 1/29TH IN		<input type="checkbox"/> PASS <input checked="" type="checkbox"/> FAIL (Pass requires a GO on both tests)						
TEST 1								
RIGHT AIM POINT COORDINATES	AZ 3 1/4	EL 2 3/4	SCORING GRID 1					
LEFT AIM POINT COORDINATES	AZ 2 1/2	EL 2 1/2						
DIST BETWEEN AIM POINTS (INCHES)			7/16					
DIST BETWEEN AIM POINTS (MILS)			NA					
SCORE (GO is 1 mil or less)	<input checked="" type="checkbox"/> GO	<input type="checkbox"/> NO-GO						
TEST 2								
RIGHT AIM POINT COORDINATES	AZ 3 1/2	EL 2 1/4	SCORING GRID 2					
LEFT AIM POINT COORDINATES	AZ 2 1/4	EL 2 1/4						
DIST BETWEEN AIM POINTS (INCHES)			5/8					
DIST BETWEEN AIM POINTS (MILS)			NA					
SCORE (GO is 1 mil or less)	<input type="checkbox"/> GO	<input checked="" type="checkbox"/> NO-GO						
INCH-TO-MIL CONVERSION CHART								
INCH(ES)	1/8	1/4	3/8	1/2	5/8	3/4	7/8	1
MIL(S)	1/4	1/2	3/4	1	1 1/4	1 1/2	1 3/4	2
DA FORM 7523-R, SEP 2003						APD V1.00		

Figure B-13. Example completed DA Form 7523-R, Bore sight Telescope Accuracy Test.

a. Use the information section at the top of the scoresheet to record your (the tester's) name, when testing occurred, what you tested, and what results you obtained (GO or NO GO). Record test data in the two screening blocks labeled *TEST 1* and *TEST 2*, one for each screening subtest. For equipment to pass the screening test, it must receive a GO on both the subtests.

b. Before testing begins, you must know how to record and plot boresight-aiming points on the scoresheet.

c. Before recording an aiming point, align the telescope reticle with the scoring grid of the test panel. If the reticle is out of alignment, rotate the telescope until you see the correct sight picture (Figure B-14).

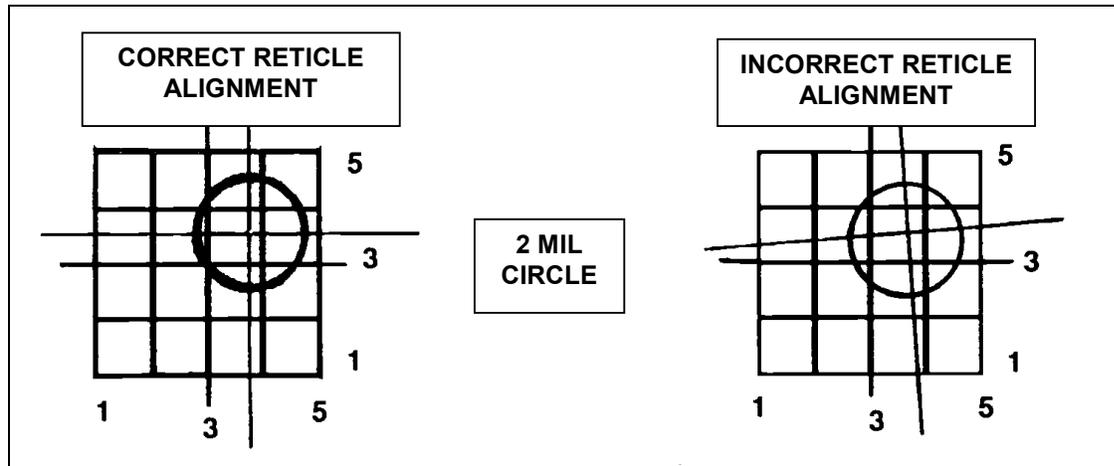


Figure B-14. Reticle alignment.

(1) *Marking the Aiming Point on the Scoring Grid.* One technique for observing and plotting the telescope's aiming point is to draw an "X" on the scoring grid where the telescope reticle aims at the panel (Figure B-15). However, the clutter between the reticle and grid lines can make using this technique difficult.

(2) *Determining Grid Coordinates for Each Aiming Point.* The second technique resembles that of using grid coordinates on a map. Determine grid coordinates for each aiming point using the numbers along the bottom and right sides of the test panel. Read the coordinates to the right and up, starting from the lower left-hand corner of the grid. Take two readings for each aiming point of the telescope: an azimuth (AZ) coordinate and an elevation (EL) coordinate.

(a) Read the right AZ coordinate where the AZ crosshair crosses the scale at the bottom of the grid. In the example shown in Figure B-16, the AZ coordinate is $3 \frac{3}{4}$ mils. Record this in the RIGHT AIM-POINT COORDINATES blank in data section 1 of the scoresheet.

(b) Read the right EL coordinate where the EL crosshair crosses the right side of the grid. In the example shown in Figure B-17, the EL coordinate is $3 \frac{1}{2}$ mils. Record this in the RIGHT AIM-POINT COORDINATES blank in data section 1 of the scoresheet.

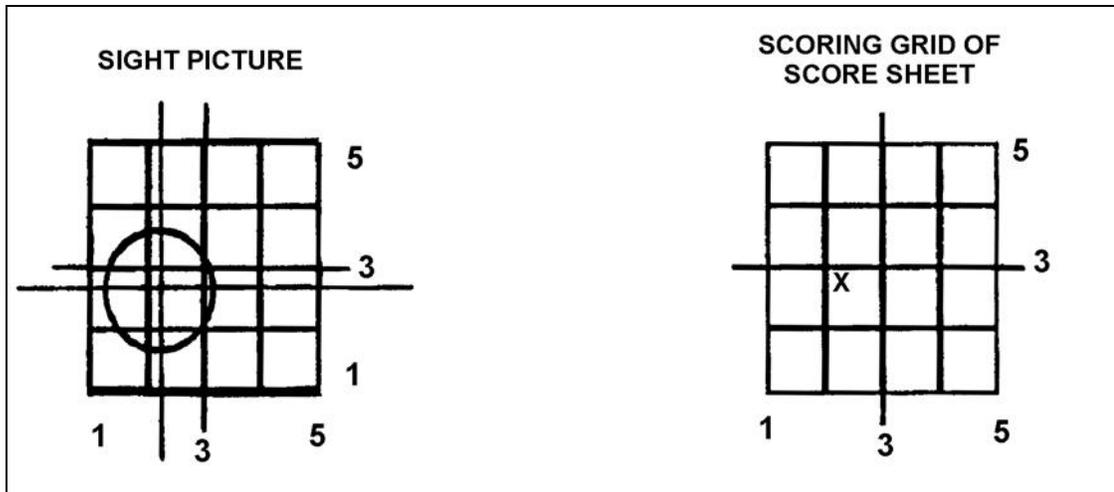


Figure B-15. Sight picture and scoring grid.

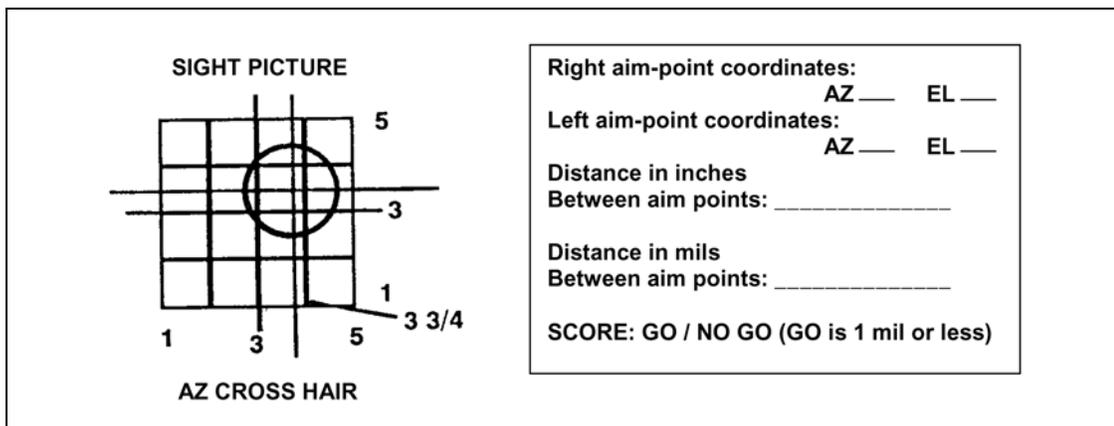


Figure B-16. Azimuth for right aim-point coordinates.

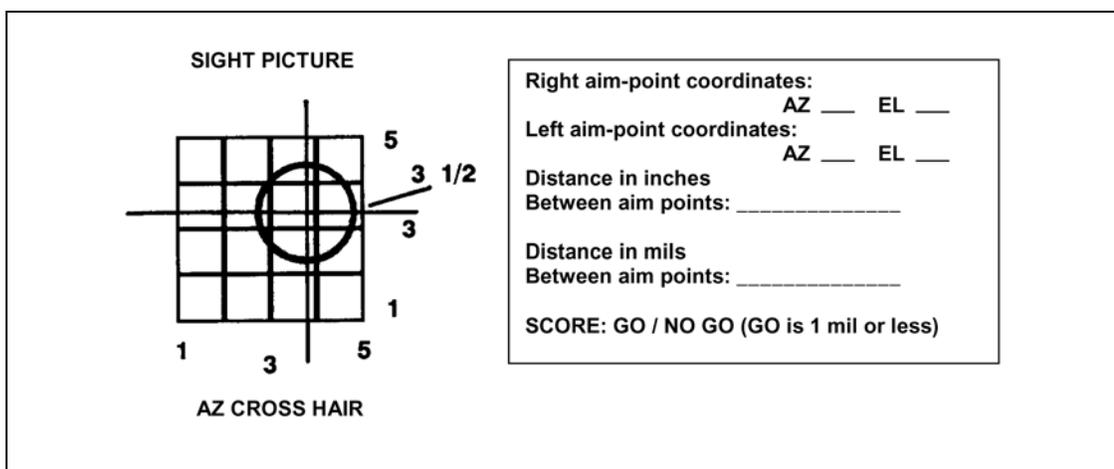


Figure B-17. Elevation for right aim-point coordinates.

(3) **Plotting Aiming Point on Scoring Grid.** Plot the aiming point on the scoring grid of the scoresheet. In this case, go right 3 3/4 mils and up 3 1/2 mils (Figure B-18). You and another tester can practice recording boresight aiming points with this technique by laying the 25-mm gun on different parts of the test panel. Practice observing and recording the AZ and EL coordinates for the same aiming point. You should be able to obtain AZ and EL readings to at least the nearest 1/4 mil. However, taking readings to the nearest 1/8 mil produces optimal testing results and aiming point accuracy.

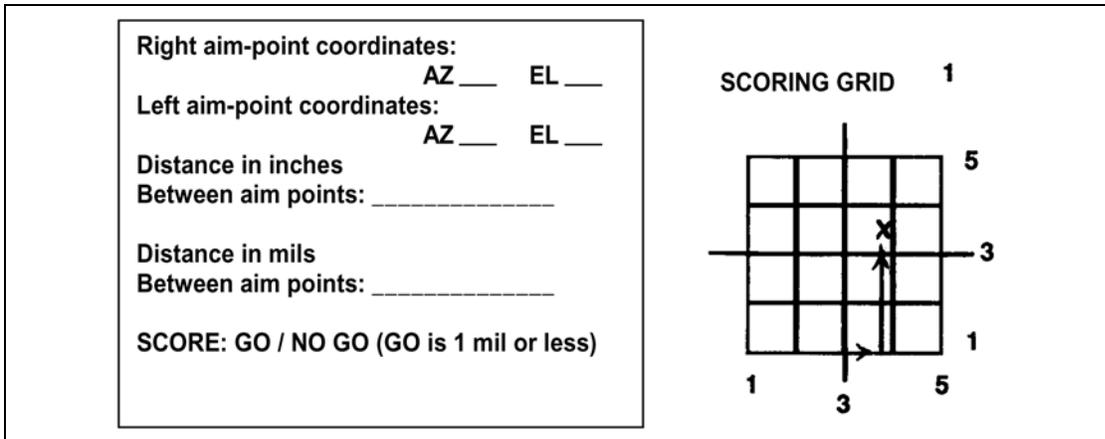


Figure B-18. Plotted aiming point.

e. **Gun Lay.** Before testing begins, aim the gun near the center of the test panel. This increases the likelihood that aiming points will fall on the grid during testing. Aiming points off the grid are difficult to record and score. Lay the gun with boresight equipment and with the turret in manual operational mode. You will need boresight equipment scoresheet and pencil. You can lay a gun accurately with a boresight kit, if you have one, using the following procedures:

- (1) Insert the adapter into the gun barrel.
- (2) Insert the telescope into the adapter with the eyepiece facing up.
- (3) Tell the gunner to lay the gun so that the telescope reticle aims at the center of the panel.
- (4) Focus the telescope (Figure B-19).
 - Focus the reticle using the reticle-focus ring.
 - Focus on the target using the target objective-focus ring.

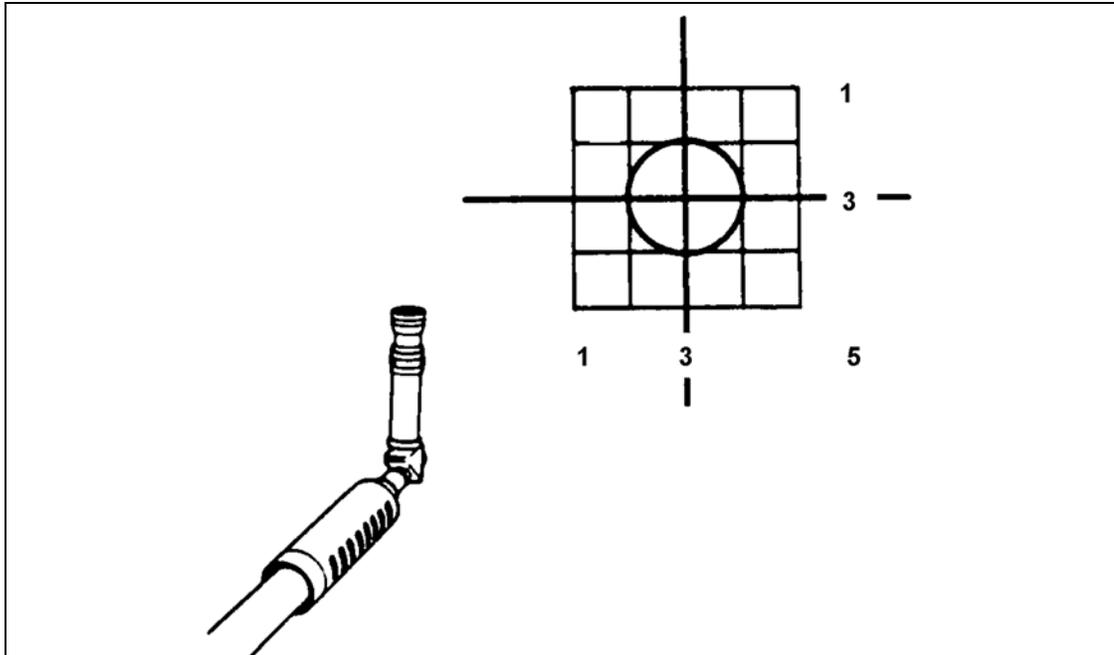


Figure B-19. Reticle aimed at center of panel.

(5) The telescope is now aiming at the center of the target, but if the boresighting equipment is inaccurate, the gun will not be aiming at the center of the target.

(6) Rotate the kit (telescope plus adapter) until the eyepiece faces to the right.

(7) Mark the aiming point on scoring grid 1 (Figure B-20).

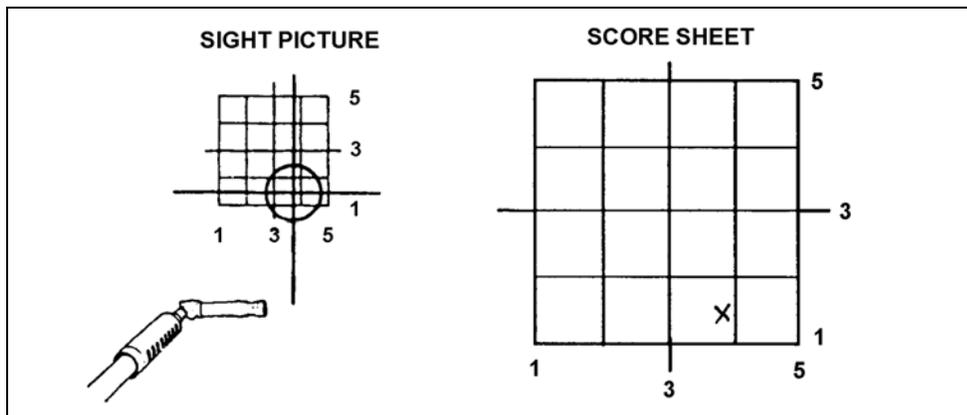


Figure B-20. Kit right aiming point.

(8) Rotate the kit until the telescope eyepiece faces left.

(9) Mark the left aiming point on scoring grid 1 (Figure B-21, page B-16). Taking right and left aiming points is like using a shot group to zero a weapon.

(10) To determine the middle of the two aiming points, so you can estimate where the gun is aiming, lay the gun on the estimated center of the panel.

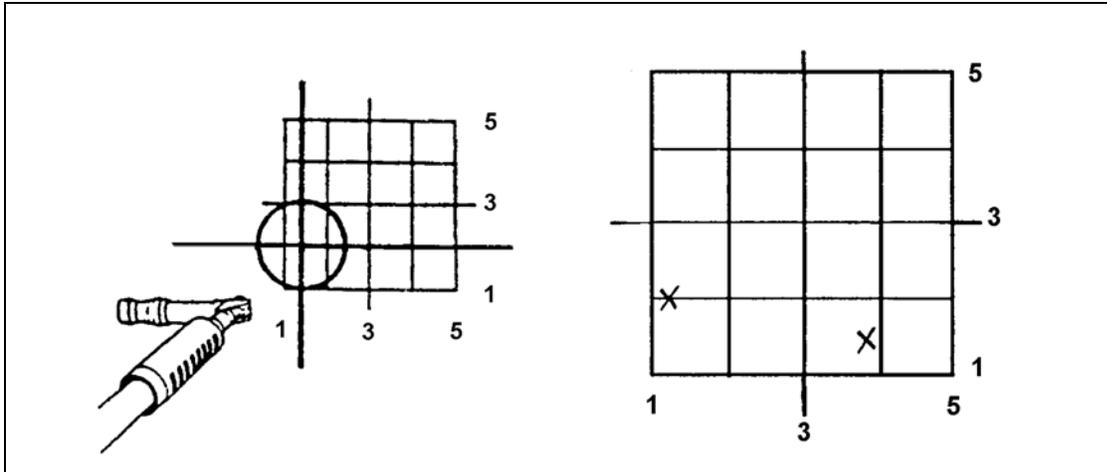


Figure B-21. Kit left aiming point.

- (11) Determine aiming point of gun.
- Draw a line between the two aiming points marked on the scoresheet.
 - Mark the middle of the line. This is where the gun is aiming (Figure B-22).

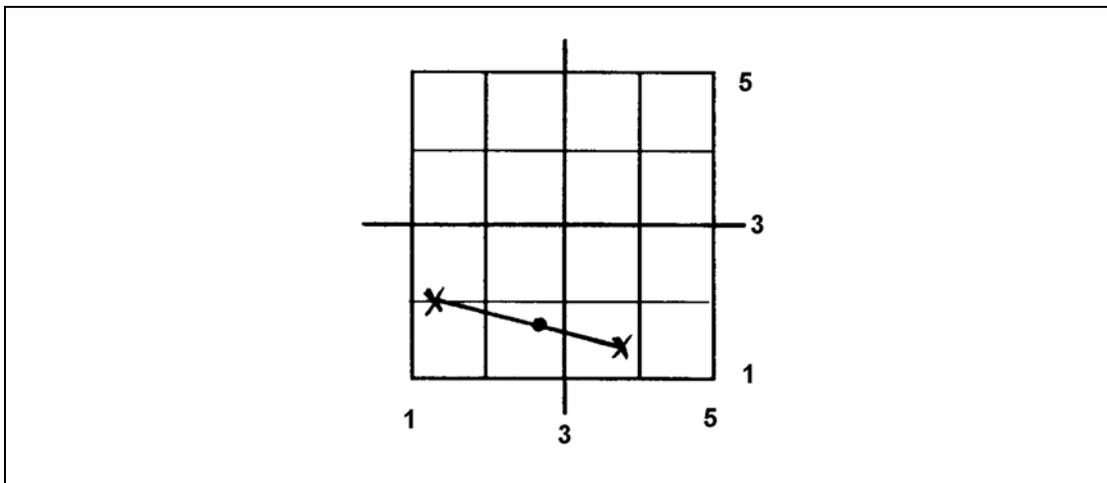


Figure B-22. Aiming point.

- (12) Lay the gun on the estimated center of the panel.
- (13) Draw an arrow from the middle of the line to the center of the panel. The arrow shows the distance and direction of the gun to target center (Figure B-23, page B-17).
- (14) Helper tells the gunner to lay the gun the distance and direction shown by the arrow from the last lay of the telescope (Figure B-24, page B-17).
- (15) The example shows the start and stop points of a gun lay with the telescope starting in the *left* position. In this case, the gun was moved about 1 1/4 mils in the direction of one o'clock. You can lay the gun with the telescope in any position (*left* or *right*), but you must move the gun the distance and direction indicated by the arrow.

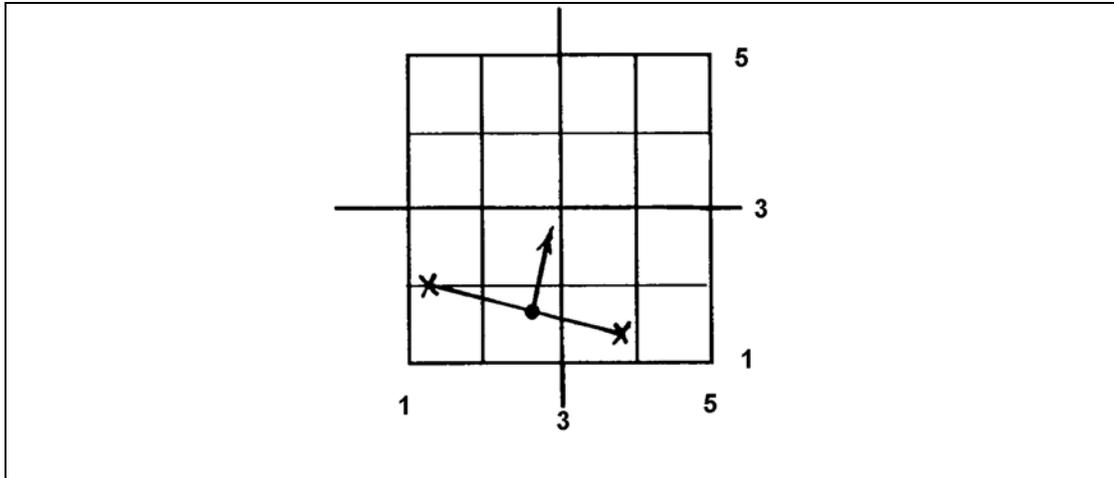


Figure B-23. Distance and direction from center.

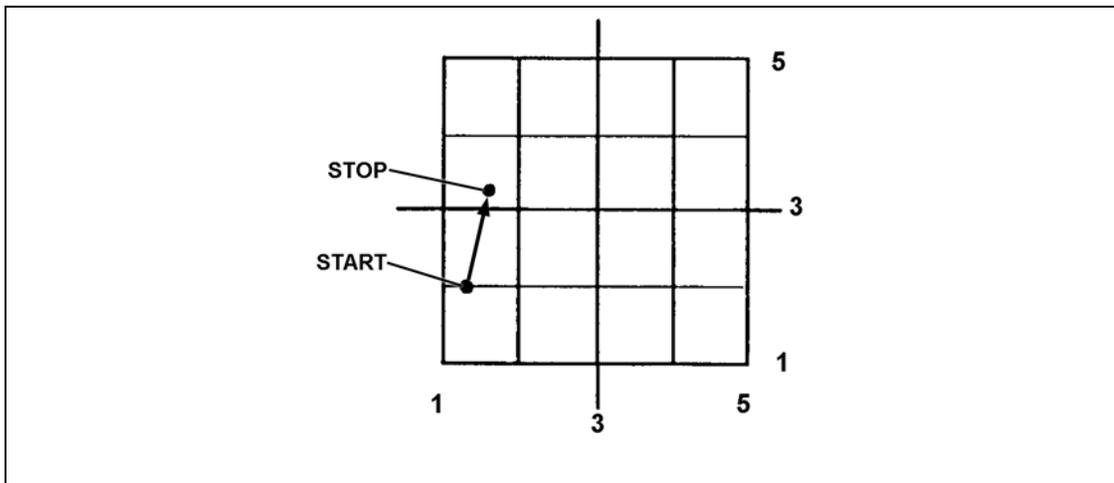


Figure B-24. Adjusted aim point.

B-10. ADAPTER-SCREENING TEST

Adapters are tested first using an accurate telescope. New telescopes usually meet accuracy requirements, so they are preferable for use. A new telescope can be obtained from a new vehicle or from direct exchange for a defective telescope. A new telescope is easy to identify as such if it is still wrapped in shipping material. However, some new telescopes have been unwrapped, but remain unused. These will still have tape over the eyepiece. An inspection for scratches, dirt, and fingerprints on the lens also gives a good estimate of prior use.

a. Mark adapters before screening. Wrap a piece of 1-inch-wide masking tape around the telescope end of the adapter. Make position marks ("A" and "B") on the tape to align the adapter in the barrel and the telescope with the adapter. You can use an adapter-marking template for this (Figure B-25). If you use the template, you can also tape it to your clipboard to hold scoresheets during testing. Place the telescope end of the adapter on the template and on the position marks. Adapters have no permanent identification marks, so you must add them yourself. Then you must mark an identification number for each adapter on the tape. The example adapter shown in Figure B-26 is marked with the number "4."

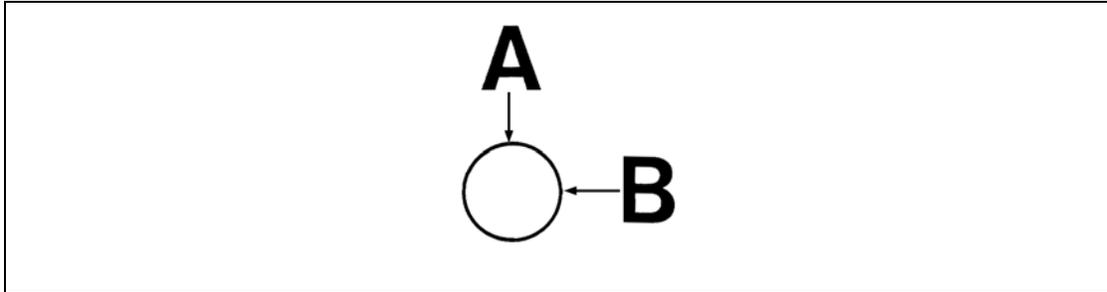


Figure B-25. Adapter-marking template.

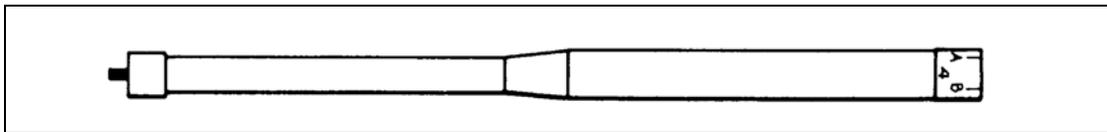


Figure B-26. Marked adapter.

b. Begin testing when you have emplaced the vehicle and panel, aimed the gun at the panel, marked the adapters, and obtained an accurate telescope. The data recorder must have a set of scoresheets and a clipboard.

(1) Before testing each piece of equipment, record the date, time, unit, test type, telescope serial number, adapter number, and your name on the scoresheet. Test type indicates whether tester is checking an adapter, telescope, or kit.

(2) Test the adapters using the same kit-rotation procedure that you used for the kit-accuracy field test. Begin testing with the telescope facing right. Observe and record the reticle's aiming point on the scoresheet. Rotate the adapter and telescope together one-half turn (180 degrees), until the eyepiece faces left. Record this aiming point on the scoresheet.

(3) Test each adapter twice. This provides a more reliable estimate of accuracy. Record data for the first test in the *TEST 1* section of the scoresheet; record data for the second test in the *TEST 2* section. The tests differ only in the adapter's position in the gun barrel. The following describes a sample test:

(a) Insert the 25-mm adapter into the gun barrel with the position mark "A" facing right.

(b) Insert the telescope into the adapter with the eyepiece facing right.

(c) Estimate the AZ and EL coordinates for the aiming point. For this example, the AZ coordinate is 3 3/4, and the EL coordinate is 2 3/4 (Figure B-27).

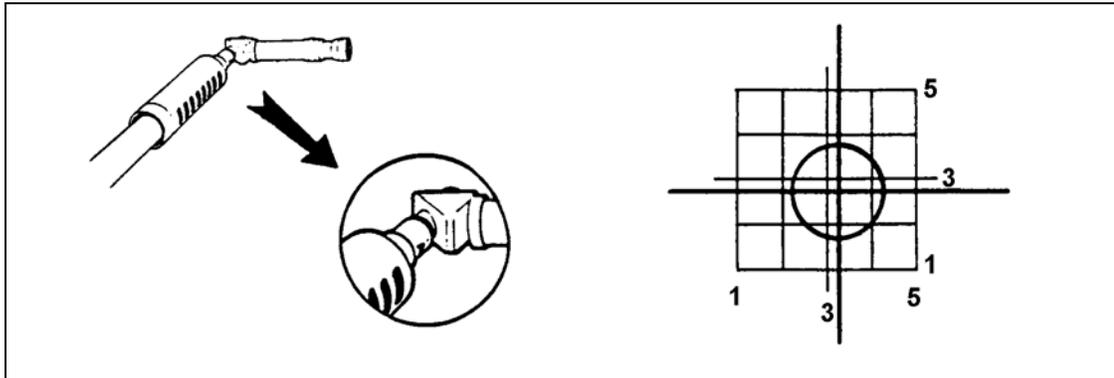


Figure B-27. Azimuth and elevation with adapter to the right, at mark "A."

(d) Record the AZ and EL coordinates in the RIGHT AIM-POINT COORDINATES block of scoring grid 1 on the scoresheet.

(e) Plot the right aiming point for TEST 1 on scoring grid 1 (Figure B-28).

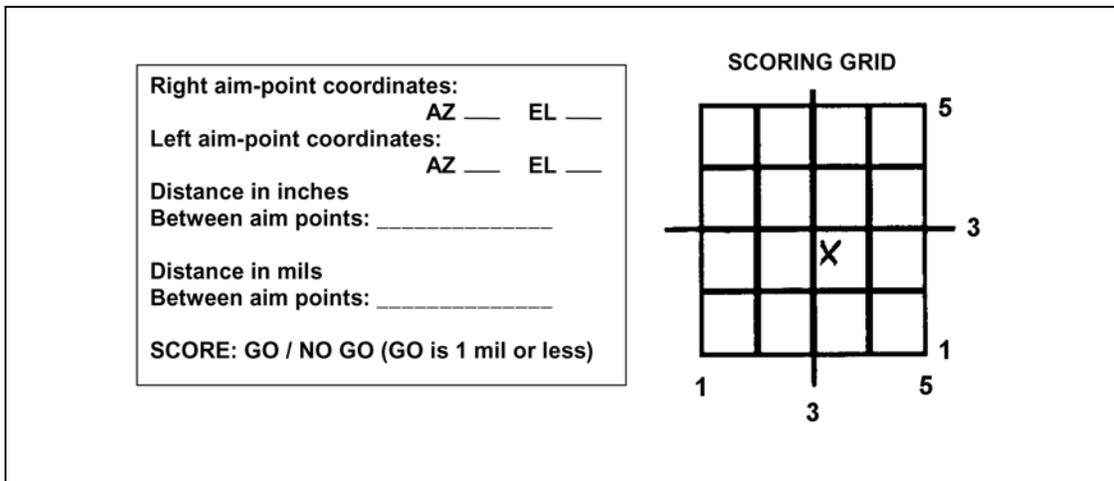


Figure B-28. Right aiming point as recorded on scoresheet.

(4) Ideally, plot an aiming point after recording its AZ and EL coordinates in the data section on the scoresheet. Two testers collect data and record the aiming points.

(a) The tester observing the aiming point reads the AZ and EL coordinates to the other tester, who records them on the scoresheet.

(b) Using the AZ and EL data on the scoresheet, the observer plots the aiming point on the scoring grid.

(c) The observer compares the scoresheet and sight picture to check the accuracy of the recorded aiming point data.

(5) Now that the testers have taken *TEST 1*'s right reading, they must take the left reading. During kit rotation, maintain the position of the telescope in the adapter. If

the telescope slips in the adapter while rotating the kit, make sure that the adapter's position mark "A" faces left before you record the aiming point.

(a) Rotate both the telescope and the adapter until the eyepiece faces left (Figure B-29).

(b) Record the AZ and EL coordinates of the aiming point in the LEFT AIM-POINT COORDINATES blank in data section 1 of the scoresheet. In the example, the AZ coordinate is 2 1/2, and the EL coordinate is 2 1/2.

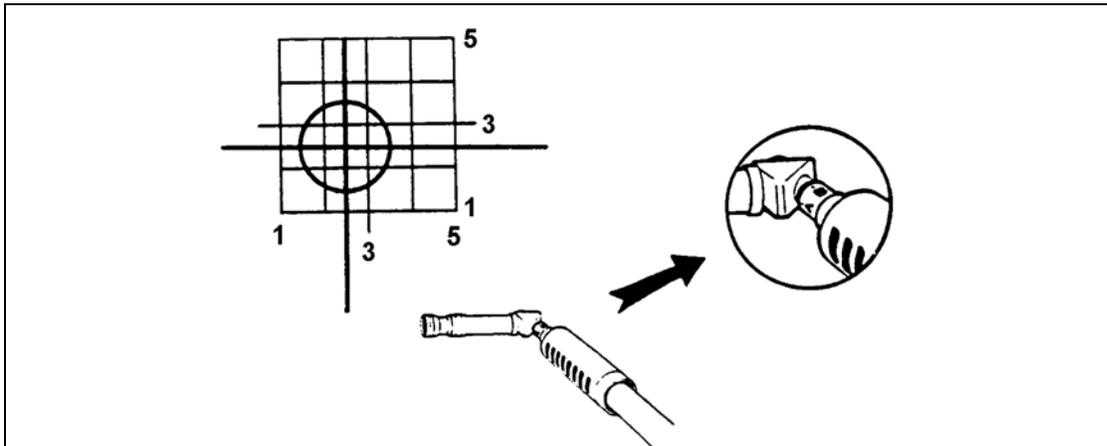


Figure B-29. Azimuth and elevation with adapter to the left, at mark "A."

(c) Plot the left aiming point for *TEST 1* on the scoring grid 1 (Figure B-30).

<p>Right aim-point coordinates: AZ ____ EL ____</p> <p>Left aim-point coordinates: AZ ____ EL ____</p> <p>Distance in inches Between aim points: _____</p> <p>Distance in mils Between aim points: _____</p> <p>SCORE: GO / NO GO (GO is 1 mil or less)</p>	<p>SCORING GRID</p>
--	----------------------------

Figure B-30. Left aiming point as recorded on scoresheet.

(6) *TEST 1* of the adapter is now complete. Conduct *TEST 2* just like *TEST 1*, except that, before testing, you must align the telescope with the adapter's position mark "B."

(a) Rotate the adapter until mark "B" faces right.

(b) Rotate the telescope to the right. In this example, the AZ coordinate reads $3 \frac{1}{2}$, and the EL coordinate reads $2 \frac{1}{4}$ (Figure B-31).

(c) Estimate and record the AZ and EL coordinates in the RIGHT AIM-POINT COORDINATES item in the TEST 2 section of the scoresheet.

(d) Plot the right aim point on scoring grid 2 (Figure B-32).

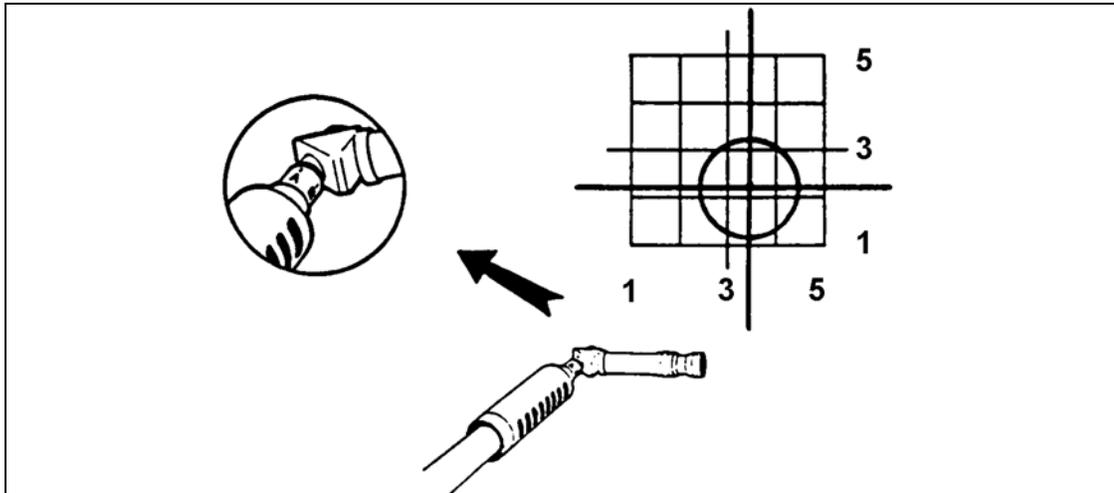


Figure B-31. Azimuth and elevation with adapter to the right, at mark "B."

<p>Right aim-point coordinates: AZ ___ EL ___ Left aim-point coordinates: AZ ___ EL ___ Distance in inches Between aim points: _____ Distance in mils Between aim points: _____ SCORE: GO / NO GO (GO is 1 mil or less)</p>	<p>2 SCORING GRID</p>
---	--

Figure B-32. Right aim point coordinates, TEST 2.

(e) Rotate both the adapter and telescope to the left. Position the adapter's "B" mark so that it faces left. AZ and EL coordinates should read $2 \frac{1}{4}$ and $2 \frac{1}{4}$, respectively (Figure B-33, page B-22).

(f) Estimate and record the AZ and EL coordinates in the LEFT AIM-POINT COORDINATES blank in data section 2 of the scoresheet.

(g) Plot the left aim point on scoring grid 2 (Figure B-34, page B-22).

(7) You have now collected all of the data for one adapter. Continue testing until you have tested all of the adapters from one company. Testing one adapter takes about two to four minutes, so you can test thirteen adapters in about an hour. Test the adapters one company at a time until you have tested all of the equipment in the battalion, then score the adapters.

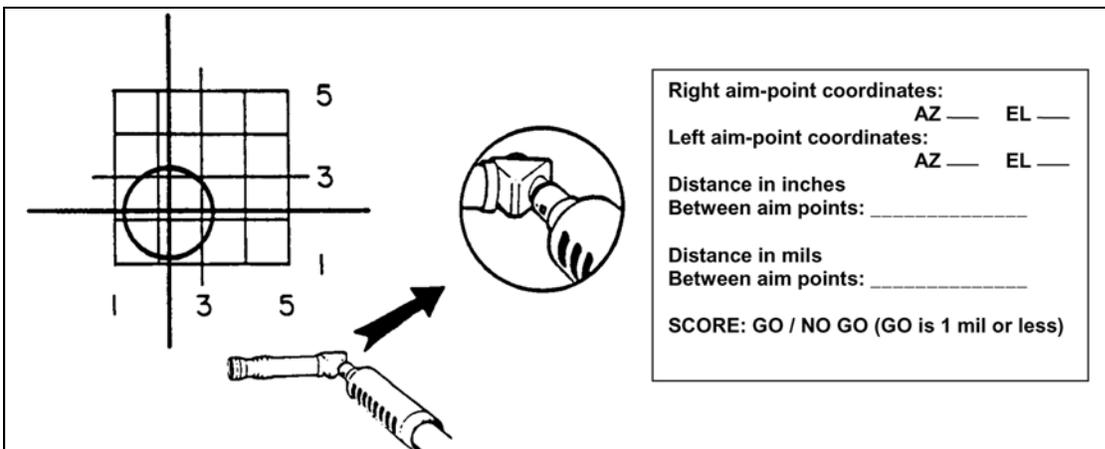


Figure B-33. Azimuth and elevation with adapter to the left, at mark "B."

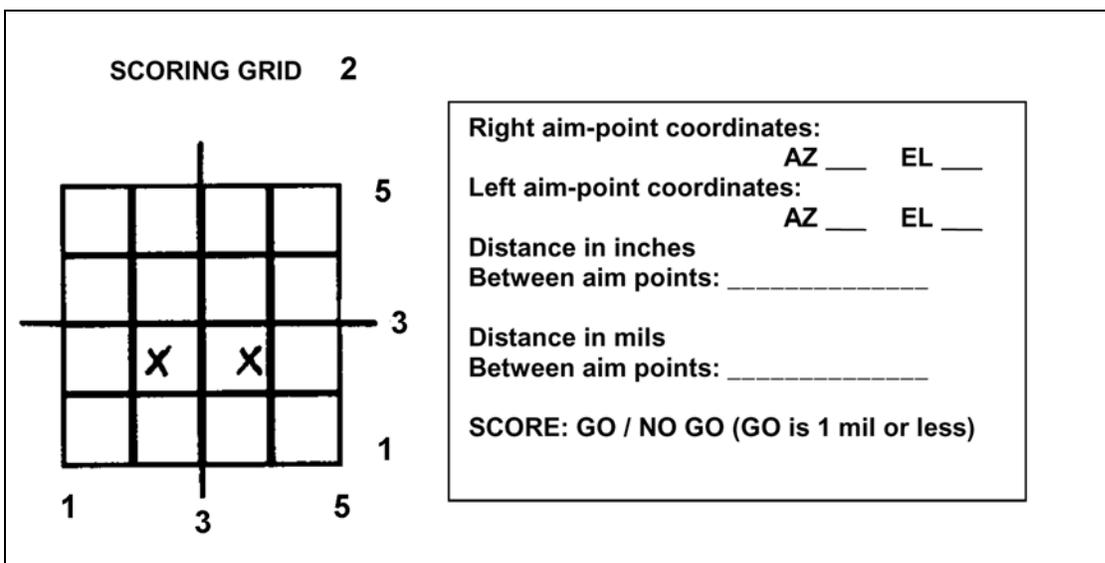


Figure B-34. Left aiming point, TEST 2.

c. The distance between the two aiming points is the criterion used to measure accuracy during one iteration of a test. For the adapter to receive a GO, the distance between the telescope's two aiming points must measure 1 mil or less. On the scoring grid, 1 mil equals 1/2 inch. Use a standard ruler to measure the distance between points. For an adapter to score a GO, the distance must measure no more than 1/2 inch. To pass the screening test, it must score a GO on both Tests 1 and 2. The following steps for scoring the adapter are based on the previous example:

- (1) Use a ruler that has markings every 1/16 of an inch. A 1/16-scale allows measurement to the nearest 1/8 mil of the scoresheet.
- (2) Measure the distance between the two aiming points marked on scoring grid 1. The distance in this example is 7/16 inch.
- (3) Record the measured distance in the DISTANCE BETWEEN AIM POINTS block of data section 1.
- (4) Score *TEST 1*.
 - Circle GO in data section 1 if distance is 1/2 inch or less.
 - Circle NO GO in data section 1 if distance is more than 1/2 inch.
- (5) Record distance in mils between aim points (Figure B-35). See the conversion chart in Table B-1.

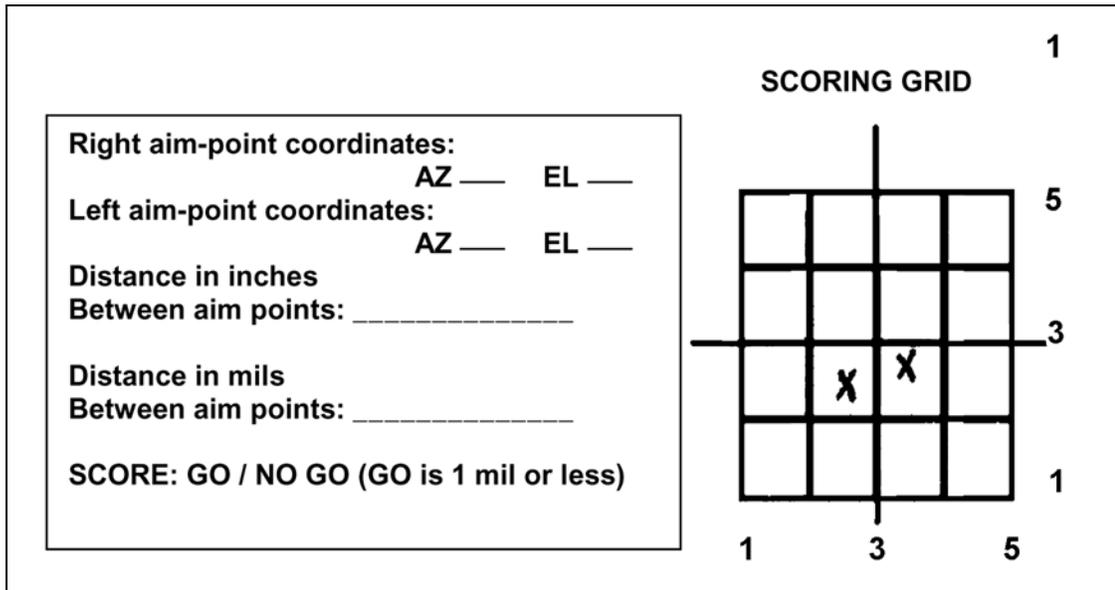


Figure B-35. Distance between aim points, *TEST 1*.

INCHES	1/8	1/4	3/8	1/2	5/8	3/4	7/8	1
MILS	1/4	1/2	3/4	1	1 1/4	1 1/2	1 3/4	2

Table B-1. Inch-to-mil conversion chart.

- (6) Measure the distance between aiming points marked on scoring grid 2. The distance in this example is 5/8 inch. Record this distance in the DISTANCE BETWEEN AIM POINTS block in data section 1.
- (7) Score *TEST 2* (Figure B-36, page B-24).
 - Circle GO in data section 1 if distance is 1/2 inch or less.
 - Circle NO GO in data section 1 if distance is more than 1/2 inch.

<p>Right aim-point coordinates: AZ ___ EL ___</p> <p>Left aim-point coordinates: AZ ___ EL ___</p> <p>Distance in inches Between aim points: _____</p> <p>Distance in mils Between aim points: _____</p> <p>SCORE: GO / NO GO (GO is 1 mil or less)</p>	<p>SCORING GRID 2</p>
--	---

Figure B-36. Distance between aim points, TEST 2.

(8) Score the screening test.

(a) Circle PASS at top of scoresheet if telescope received a GO on both *TEST 1* and *TEST 2*.

(b) Circle FAIL at top of scoresheet if one or both tests yield a score of NO GO. Figure B-13 shows an example completed scoresheet for this data. In this figure, the adapter received a GO score for *TEST 1* and a NO GO for *TEST 2*. Therefore, the adapter in the example failed the screening test.

B-11. TELESCOPE-SCREENING TEST

After adapter screening, telescopes are paired with a highly accurate adapter and are tested for accuracy. The most accurate adapter is the one proven by testing to have the shortest distance between right and left aiming points.

a. Each telescope has a serial number stamped on the base plate near the shaft. Mark the serial number on a piece of tape, then apply the tape to the 7.62-mm boresight kit container. This simplifies the task of sorting accurate and inaccurate telescopes after testing.

b. Test telescopes using telescope-rotation procedures. After inserting the adapter into the gun barrel, insert the telescope with the eyepiece facing to the right. Observe and record the aiming point on the scoresheet. Rotate the telescope only until the eyepiece faces to the left. The telescope meets the standards if the aiming point changes 1 mil or less after you rotate the telescope. To pass the screening test, each telescope must meet the standard on two iterations of it. The following describes the screening procedure for telescopes. Because you record data for, plot, and score the telescope test the same as you did for the adapter test, this list need not repeat the sample data:

(1) Record date, time, tester, unit, telescope serial number, adapter assigned number, and test type in information section of scoresheet.

- (2) Insert an accurate 25-mm adapter into the gun barrel with the position mark facing up.
- (3) Insert telescope into adapter with the eyepiece facing right (Figure B-37).
- (4) Record AZ and EL coordinates in the RIGHT AIM-POINT COORDINATES item in the *TEST 1* section of the scoresheet.
- (5) Plot the right aim point on the scoring grid.

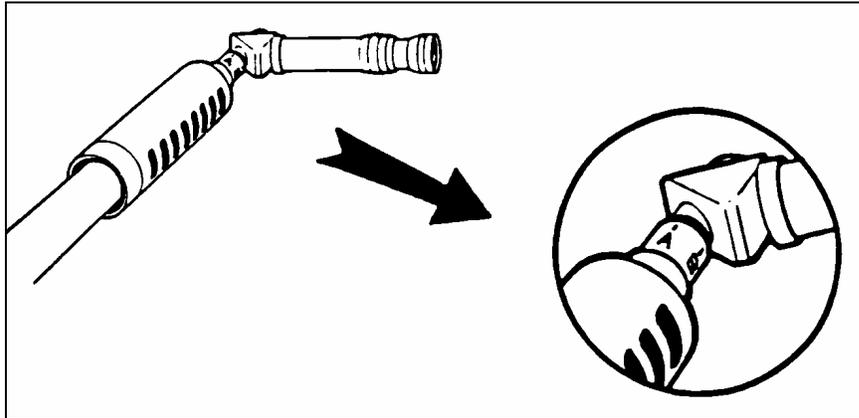


Figure B-37. Mark "A" facing up, telescope to the right.

- (6) Rotate only the telescope 180 degrees so that the eyepiece faces left. Ensure that the adapter's mark "A" faces up (Figure B-38, page B-26).
- (7) Record the AZ and EL coordinates in the LEFT AIM-POINT COORDINATES item in the *TEST 1* section of the scoresheet.
- (8) Plot the left aim point on scoring grid 1. *TEST 1* is now complete. *TEST 2* is like *TEST 1* except that the adapter's mark "B" faces up.
- (9) Rotate the adapter until the "B" faces up.
- (10) Rotate the telescope to the right. Ensure "B" still faces up.
- (11) Record right aim point in data section 2.
- (12) Plot right aim point on scoring grid 2.
- (13) Rotate telescope to the left. Ensure that "B" faces up.
- (14) Record aim point in the LEFT AIM-POINT COORDINATES item in the *TEST 2* section of the scoresheet.
- (15) Plot left aim point on scoring grid 2. You have now tested one telescope. Continue until you have tested all of the telescopes in the battalion.

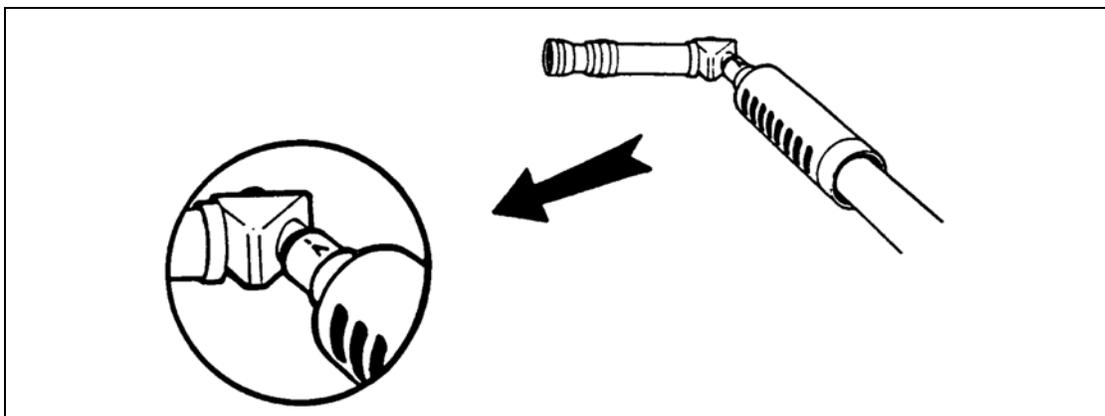


Figure B-38. Mark facing up, telescope to the left.

c. Score the telescopes after you collect the accuracy data for all telescopes. Score them the same as you did the adapters. Score a "GO" on an iteration of the test procedure when the distance between right and left aiming points measures no more than 1/2 inch on the scoring grid. To pass the screening test, the telescope must earn a GO score on both iterations. It fails if it receives a NO GO on either one. Circle PASS or FAIL in the information section of the scoresheet.

B-12. ACCURATE BORESIGHT KITS

The objective is to form accurate 25-mm boresight kits from accurate telescopes and 25-mm adapters. The crew screens kits using the same procedures and standards used for the adapters: namely, they use the kit-rotation procedure with a 1-mil standard. They pair and test individual adapters and telescopes that meet the required standards, then they issue accurate kits to the squad.

a. You can only form accurate kits from pairs of accurate adapters and telescopes. If the number of accurate telescopes exceeds the number of accurate adapters, then start kit testing with the telescopes, specifically, start with the ones that have the least distance between the left and right readings.

b. After you form an accurate kit, *keep it together*. Use an electrical etching tool to mark the telescope's serial number on the adapter.

B-13. QUALITY DEFICIENCY REPORTS

The battalion master gunner reports telescopes and 25-mm adapters that fail the screening tests on the quality deficiency report form (Standard Form 368). He can complete a separate QDR for each defective piece of equipment, but completing one form for all defective or inaccurate telescopes and another for all defective or inaccurate adapters is easier. Figure B-39, shows an example completed QDR reporting defective and inaccurate telescopes. This form is available electronically. Users can complete it electronically, copy it from the back of the book and complete it manually, or some of each. For example, the battalion master gunner can complete common data electronically and print copies to finish later manually.

a. **Telescope.** The battalion master gunner reports defective or inaccurate telescopes using the QDR (Standard Form 368), as follows:

- (1) **Block 1a.** Enter your unit designation, address (including zip code), and the DODAC for the defective equipment.
 - (2) **Block 1b.** Enter your name and duty phone number, then, in the same block, sign your name to signify that you completed the QDR.
 - (3) **Block 2a.** Enter the name and address of the manager who will receive the QDR.
 - (4) **Blocks 2b and 2c.** Leave blank.
 - (5) **Block 3.** This block has exactly twelve places. In the first six, enter the DODAC again; in the next two, enter the last two digits of the calendar year; in the last four places, enter how many QDRs you are submitting for your unit at this time.
 - (6) **Block 4.** Enter the dates when the equipment was examined and tested.
 - (7) **Blocks 5 and 6.** Enter on this form the NSN and nomenclature from the boresight telescope's data plate.
 - (8) **Block 7.** Enter the telescope's manufacturer.
 - (9) **Block 8.** Enter the part number, which you will find on the telescope's base plate.
 - (10) **Block 9.** Enter the serial, lot, batch number, or any of these that you know for the telescope adapters.
 - (11) **Blocks 10a and 10b.** Enter "UNKNOWN."
 - (12) **Block 11.** If telescopes are either new or repaired, check the appropriate box in *Block 11*.
 - (13) **Block 12.** Enter manufacturing and repair dates, if you know them.
 - (14) **Block 13.** Enter "NA."
 - (15) **Block 14.** Check the NO square.
 - (16) **Block 15.** Complete *Block 15a* if appropriate. In *Block 15b*, enter the number of items that were examined and tested. In *Block 15c*, enter the total number of telescopes that were found defective or inaccurate. Complete *Block 15d* if appropriate.
 - (17) **Block 16.** In *Block 16a(1)*, enter the BFV's NSN. In all the other parts of *Block 16*, enter "NA."
 - (18) **Blocks 17 and 18.** Enter "UNKNOWN."
 - (19) **Block 19.** Check UNKNOWN.
 - (20) **Block 20.** Enter the letter "O," since defective items were detected and reported at the organizational level.
 - (21) **Block 21.** Check and write "45" in the blank for HOLDING EXHIBIT FOR ___ DAYS, so that defective items will be held 45 days pending disposition instructions.
 - (22) **Block 22.** This is the most important block--here you describe the problem in detail. Be sure to write what data suggests or indicates that a problem exists, for example, "excessive ammunition expenditure during zeroing." Here you must also describe how the equipment was examined or tested to detect the problem, for example, telescope rotation test, and the results of testing. If you need more space, include another sheet, and write the report control number on it to indicate that it goes with your completed Standard Form 368 (Figure B-39, page B-28).
- b. **Adapter.** Instructions for filling out a QDR for a defective or inaccurate adapter follow (Figure B-40, page B-29). Since this is a separate QDR from the one reporting telescopes, this report will have its own control number:

- (1) **Blocks 1 and 2.** Complete the same as for telescopes.
- (2) **Block 8.** The part number depends on the design of the adapter.
- (3) **Blocks 9 through 21.** Complete as described for telescopes.
- (4) **Block 22.** Complete this, the most important part of the QDR, as described for telescopes, but write in how many adapters you are reporting as defective (from *Block 4*).
 - c. **Repair.** Either depot maintenance or the manufacturer must repair boresight kits, depending on the deficiency.

PRODUCT QUALITY DEFICIENCY REPORT				<input type="checkbox"/> CATEGORY I <input checked="" type="checkbox"/> CATEGORY II	
1a. FROM (Originator) Commander, 1/29th IN ATTN: Bn Master Gunner, SFC John C. Smith Fort Benning, GA 31905 W33RQH		2a. TO (Screening point) Commander, US AMCCOM ATTN: AMSMC-QAD Rock Island, IL 61299			
1b. NAME, TELEPHONE NO. AND SIGNATURE SFC John C. Smith AV 835-4101		1c. DATE	2b. NAME, TELEPHONE NO. AND SIGNATURE		2c. DATE
3. REPORT CONTROL NO. W33RQH004	4. DATE DEFICIENCY DISCOVERED May-Jun 86	5. NATIONAL STOCK NO. (NSN) 4900-00-867-6607	6. NOMENCLATURE 5X Boresight Telescope		
7a. MANUFACTURER/CITY/STATE Lenzar Optics Corp.		7b. MFRS. CODE	7c. SHIPPER/CITY/STATE		8. MFRS. PART NO. Lenzar P/N 85-0111-9520-4
9. SERIAL/LOT/BATCH NO. See Block 22	10a. CONTRACT NO.	10b. PURCHASE ORDER NO.	10c. REQUISITION NO.	10d. GBL NO.	
11. ITEM <input type="checkbox"/> NEW <input type="checkbox"/> REPAIRED/OVERHAULED	12. DATE RECD. MFRD. RE-PAIRED, OR OVERHAULED N/A	13. OPERATING TIME AT FAILURE N/A	14. GOVERNMENT FURNISHED MATERIAL <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO		
15. QUANTITY a. RECEIVED		b. INSPECTED 60	c. DEFICIENT 17	d. IN STOCK 60	
16. DEFICIENT ITEM WORKS ON/WITH	a. END ITEM (Alone, mouser, etc.) Fighting Vehicle, Infantry, M2 NSN 2350-01-048-5920	(1) TYPE/MODEL/SERIES	(2) NOMENCLATURE	(3) PART NO.	(4) SERIAL NO.
17. UNITY COST \$ Unknown	14. ESTIMATED REPAIR COST \$ Unknown	18a. ITEM UNDER WARRANTY <input type="checkbox"/> YES <input type="checkbox"/> NO <input checked="" type="checkbox"/> UNKNOWN	19b. EXPIRATION DATE N/A		
20. WORK UNIT CODE/EIC (Navy and Air Force Only.) 0					
21. ACTION/DISPOSITION <input checked="" type="checkbox"/> HOLDING EXHIBIT FOR 45 DAYS <input type="checkbox"/> RELEASED FOR INVESTIGATION <input type="checkbox"/> RETURNED TO STOCK <input type="checkbox"/> DISPOSED OF <input type="checkbox"/> REPAIRED <input type="checkbox"/> OTHER (Explain in Item 22)					
22. DETAILS (Describe, to best ability, what is wrong, how and why, circumstances prior to difficulty, description of difficulty, cause, action taken, including disposition, recommendations. Attach copies of supporting documents. Continue on separate sheet if necessary.) 1. First indication of trouble was excessive ammunition expenditure during numerous zeroings of the 25-mm gun. 2. Deficiencies were detected during inspection and testing of boresight equipment. 3. Eleven telescopes were unserviceable or had operational problems as follows: A. Water/condensation in the telescopes: S/Ns 1043, 1484, 2134, & 2088A. B. Eyepiece disassembled or assembled incorrectly: S/Ns 1050, 1176, 1807, & 2234. C. Telescope dirty inside: S/N 2022, 3464, & 1240. 4. Accuracy was tested by rotating the telescope 180-degrees in a 25-mm adapter. 5. Six telescopes not meeting the standard had S/Ns of 1190, 1775, 2086, 2110, 2173, & 2254.					
23. LOCATION OF DEFICIENT MATERIAL					
24a. TO (Action Point)			25a. TO (Support Point) (Use Items 26 and 27 if more than one)		
24b. NAME, TELEPHONE NO. AND SIGNATURE		24c. DATE	25b. NAME, TELEPHONE NO. AND SIGNATURE		25c. DATE
26a. TO (Support Point)			27a. TO (Support Point)		
26b. NAME, TELEPHONE NO. AND SIGNATURE		26c. DATE	27b. NAME, TELEPHONE NO. AND SIGNATURE		27c. DATE
368-102 NSN 7540-00-133-5541		STANDARD FORM 368 (REV. 10-85) GENERAL SERVICES ADMINISTRATION (FPMR 101-26.8)			

Figure B-39. Example completed SF 368 (telescopes).

PRODUCT QUALITY DEFICIENCY REPORT				<input type="checkbox"/> CATEGORY I		<input checked="" type="checkbox"/> CATEGORY II	
1a. FROM (Originator) Commander, 1/29th IN ATTN: Bn Master Gunner, SFC John C. Smith Fort Benning, GA 31905 W33RQH				2a. TO (Screening point) Commander, US AMCCOM ATTN: AMSMC-QAD Rock Island, IL 61299			
1b. NAME, TELEPHONE NO. AND SIGNATURE SFC John C. Smith AV 835-4101			1c. DATE	2b. NAME, TELEPHONE NO. AND SIGNATURE			2c. DATE
3. REPORT CONTROL NO. W33RQH005		4. DATE DEFICIENCY DISCOVERED May-Jun 86	5. NATIONAL STOCK NO. (NSN) 1005-01-120-0449		6. NOMENCLATURE 25-mm Boresight Adapter Assembly		
7a. MANUFACTURER/CITY/STATE Unknown		7b. MFRS. CODE Unknown	7c. SHIPPER/CITY/STATE Unknown		8. MFRS. PART NO. 12524010		
9. SERIAL/LOT/BATCH NO. See Block 22		10a. CONTRACT NO. Unknown	10b. PURCHASE ORDER NO.	10c. REQUISITION NO.		10d. GBL NO.	
11. ITEM <input type="checkbox"/> NEW <input type="checkbox"/> REPAIRED/OVERHAULED		12. DATE RECD. MFRD. RE-PAIRED, OR OVERHAULED		13. OPERATING TIME AT FAILURE 60	14. GOVERNMENT FURNISHED MATERIAL <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO		
15. QUANTITY		a. RECEIVED	b. INSPECTED	c. DEFICIENT	d. IN STOCK		
		60	60	42			
16. DEFICIENT ITEM WORKS ON/WITH		a. END ITEM (Aircraft, motor, etc.) Fighting Vehicle, Infantry, M2 NSN 2350-01-048-5920				(2) SERIAL NO. N/A	
		b. NEXT HIGHER ASSEMBLY N/A	(1) NATIONAL STOCK NO. (NSN) N/A	(2) NOMENCLATURE N/A	(3) PART NO. N/A	(4) SERIAL NO. N/A	
17. UNIT COST \$ Unknown		18. ESTIMATED REPAIR COST \$ Unknown	19a. ITEM UNDER WARRANTY <input type="checkbox"/> YES <input type="checkbox"/> NO <input checked="" type="checkbox"/> UNKNOWN		19b. EXPIRATION DATE		
20. WORK UNIT CODE, ETC. (Navy and Air Force Only.)							
21. ACTION/DISPOSITION <input checked="" type="checkbox"/> HOLDING EXHIBIT FOR 45 DAYS <input type="checkbox"/> RELEASED FOR INVESTIGATION <input type="checkbox"/> RETURNED TO STOCK <input type="checkbox"/> DISPOSED OF <input type="checkbox"/> REPAIRED <input type="checkbox"/> OTHER (Explain in Item 22)							
22. DETAILS (Describe, to best ability, what is wrong, how and why, circumstances prior to difficulty, description of difficulty, cause, action taken, including disposition, recommendations. Attach copies of supporting documents. Continue on separate sheet if necessary.) 1. First indication of trouble was excessive ammunition expenditure during numerous zeroings of the 25-mm gun. 2. Deficiencies were detected during inspection and testing of boresight equipment. 3. Adapter accuracy was tested using the kit rotation procedure. The tested adapter and an accurate telescope were rotated 180 degrees in the gun. The standard required a change in aiming point of no more than 1 mil. 4. A total of 42 adapters did not meet the accuracy standard. 5. Adapters not meeting standards were marked with identification numbers. They will be held for 45 days pending disposition instructions.							
23. LOCATION OF DEFICIENT MATERIAL							
24a. TO (Action Point)				25a. TO (Support Point) (Use Items 26 and 27 if more than one)			
24b. NAME, TELEPHONE NO. AND SIGNATURE		24c. DATE		25b. NAME, TELEPHONE NO. AND SIGNATURE		25c. DATE	
26a. TO (Support Point)				27a. TO (Support Point)			
26b. NAME, TELEPHONE NO. AND SIGNATURE		26c. DATE		27b. NAME, TELEPHONE NO. AND SIGNATURE		27c. DATE	
368-102 NSN 7540-00-133-9541				STANDARD FORM 368 (REV. 10-85) GENERAL SERVICES ADMINISTRATION (FPMR 101-26.8)			

Figure B-40. Example completed SF 368 (adapters).

Section III

BORESIGHTING AND WEAPON CHECKS WITH THE CLOSE-IN PANEL

This section describes how a crew uses the close-in boresight panel. It then describes how they use the panel to boresight the BFV turret weapons in a restricted or confined area like the motor pool.

B-14. DESCRIPTION OF PANEL

Five of the reference crosses bear the labels TOW, ISU, AUX, 25-MM, and COAX. A sixth, "T"-shaped reference is made of metal to allow boresighting of the thermal sight. The panel's background color is white. The ISU cross and "T" are black; and the TOW, 25-MM, COAX, and AUX crosses are orange.

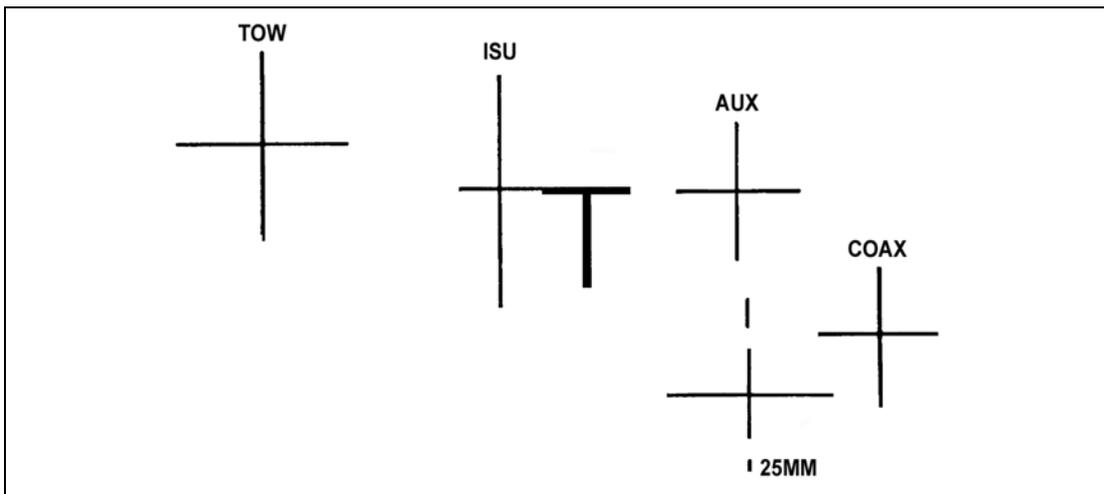


Figure B-41. Close-in panel.

B-15. WEAPON CHECKS

The close-in boresight panel also tests backlash, equilibrator, drift, and boresight retention. These tests allow the BFV crew to identify weapon system errors that decrease firing accuracy as well as to learn their weapons. Before firing live, while they are still in the motorpool, the crew tests backlash, equilibration, and drift.

B-16. PANEL PLACEMENT

Depending on the positioning of vehicles and the panel in the motor pool, the company might be able to boresight the vehicles of an entire battalion with one panel. Figure B-42 shows an overhead view of panel placement and location of vehicles. They place the panel from 0 to 25 meters above ground level, even atop a building or on the side of a tower.

- a. Vehicles must sit within 30 meters right or left for direct-line distances between 100 and 120 meters. Between 120 and 150 meters, they can sit as far away as 50 meters to the right or left.

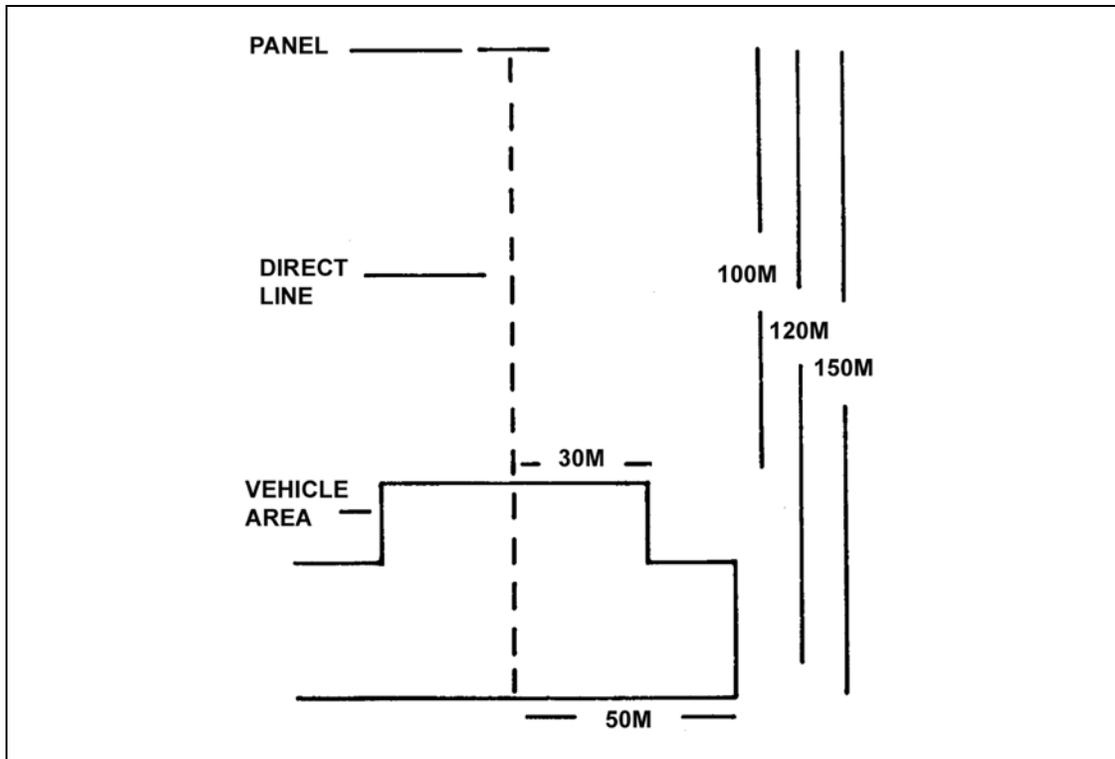


Figure B-42. Panel placement.

b. Determine direct-line distance when the panel is first placed in the motor pool. Insert a boresight kit into the 25-mm gun of a vehicle positioned on a direct line with the panel. Align the boresight reticle with the 25-mm cross on the panel. Use ranging gaps in the 25-mm cross to determine the panel's distance. Vehicles are at a correct distance if the 2-mil circle of the boresight reticle is on the edge, or in the gaps of the 25-mm cross. Figure B-43 shows examples of vehicles located at the correct distances for boresighting.

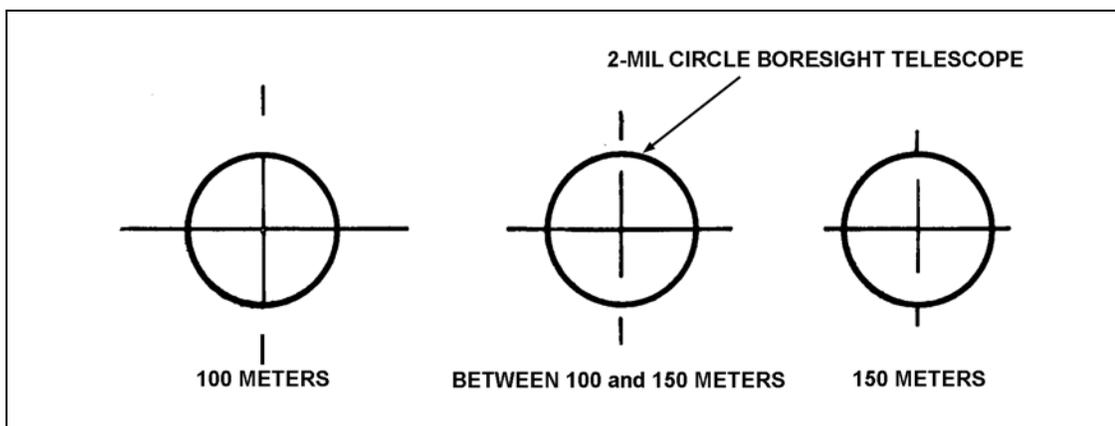


Figure B-43. Correct distance alignment for boresighting.

B-17. PREPARATION

Crews should know the boresight procedures described in TM 9-2350-252-10-2. All turret weapons must be mounted and operational. A boresight kit and turret tool kit is required. Crews use the following checklist to prepare for boresighting with the close-in boresight panel:

- Master power ON.
- Turret power ON.
- Night vision switch ON.
- Turret, gun, and TOW select levers in POWER (to raise TOW launcher).
- TOW launcher raised.
- Turret azimuth selection lever in MANUAL.
- Gun elevation selection lever in MANUAL.
- TOW elevation drive selection lever in POWER.
- Day and thermal ballistic sight cover doors open.
- Sensor select switch set on NEUTRAL.
- Range control knob set at "0."
- Reticle brightness turned all the way to the right.
- Magnification set on HI.
- AP or HE selected on weapons control panel.
- Status indicator displays ammunition and range index.
- Gun reticle displayed.
- Turret travel lock disengaged.

B-18. WEAPONS AND SIGHT ALIGNMENT

The crew aligns weapons and sight as follows:

- a. Perform the boresight kit accuracy test before aligning the sight and weapon.
- b. To control backlash, lay the 25-mm gun so that the gun-lay pattern ends in elevation.
 - (1) (Helper) rotate the telescope until the eyepiece faces upward.
 - (2) (Helper) align the boresight reticle with the 25-mm cross on the panel.
- (a) Tell gunner to align the top of the 10-mil circle of the boresight reticle with the 25-mm cross on the panel (Figure B-44).
- (b) Tell gunner to align the boresight reticle with the 25-mm cross on the panel (Figure B-45).

NOTE: Traverse the turret, or elevate or depress the gun, only after aligning the TOW weapon system.

- c. Align the ISU day reticle. The neutral sensor-select setting works better on bright, sunny days.
 - (1) Move the sensor select switch to CLEAR or NEUTRAL for the best view of the ISU reticle and panel.
 - (2) Align the ISU reticle with the ISU cross on the panel using the AZ and EL boresight adjustment knobs.

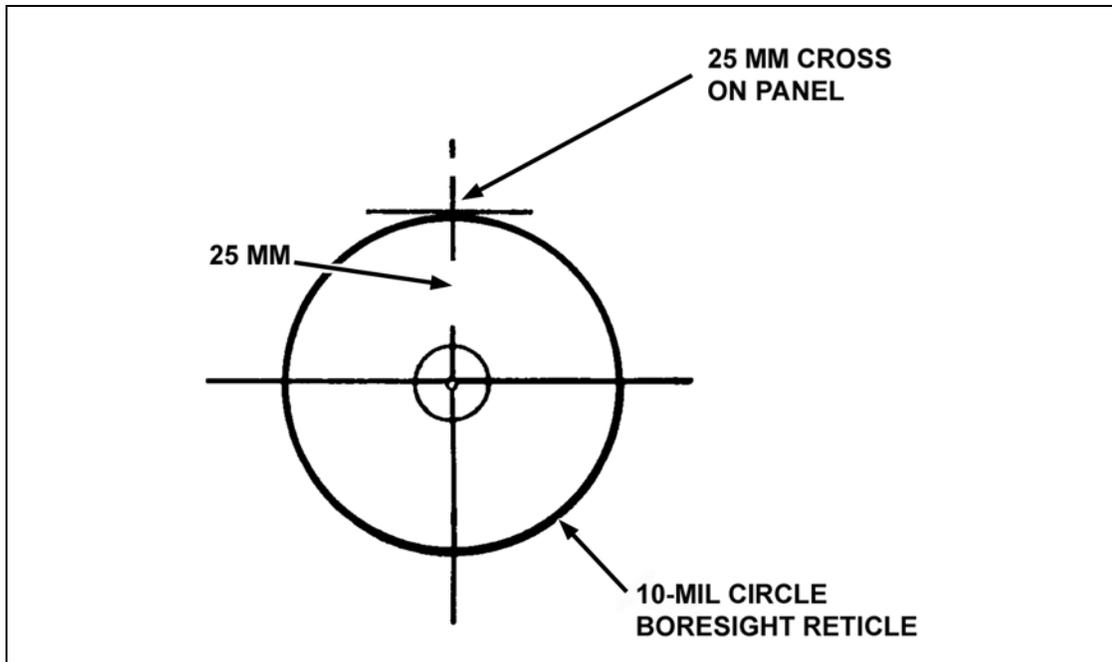


Figure B-44. 10-mil circle aligned with the 25-mm cross.

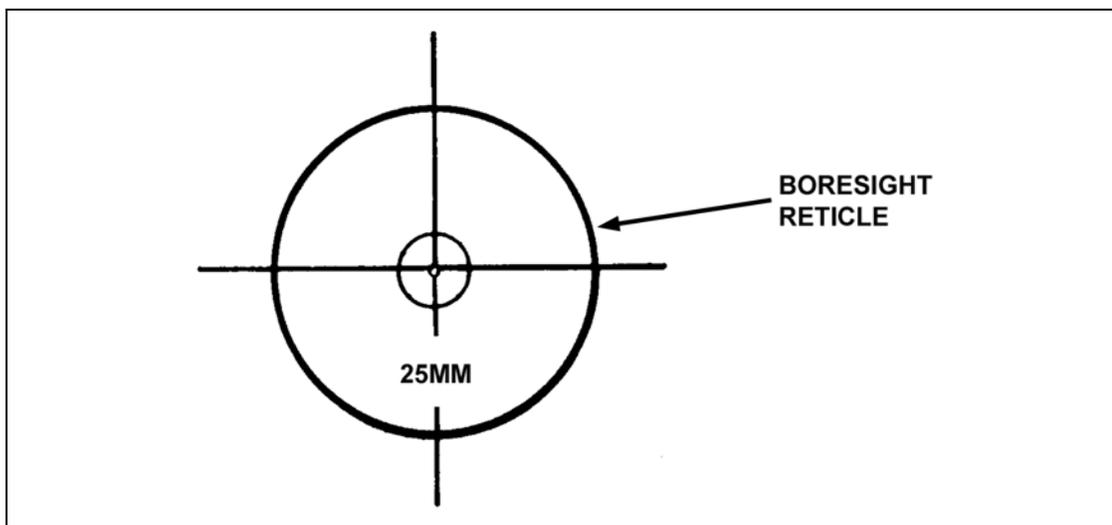


Figure B-45. Boresight reticle aligned with the 25-mm cross.

(3) Adjust the browpad (Figure B-46, page B-34). When the panel is 100 to 150 meters away, head movement on the browpad changes the aim of the reticle. For example, moving the head to the left shifts the aim to the left. Correct adjustment of the browpad is important.

- (a) Move head to the left until the sight begins to black out. Note the aiming point of the reticle; this aiming point is called the left limit.
- (b) Move head to the right and note the right limit of the reticle.
- (c) Move head up and note the upper limit of the reticle.
- (d) Move head down and note the lower limit of the reticle.

(e) Adjust the browpad so that the reticle appears centered between the left, right, upper, and lower limits.

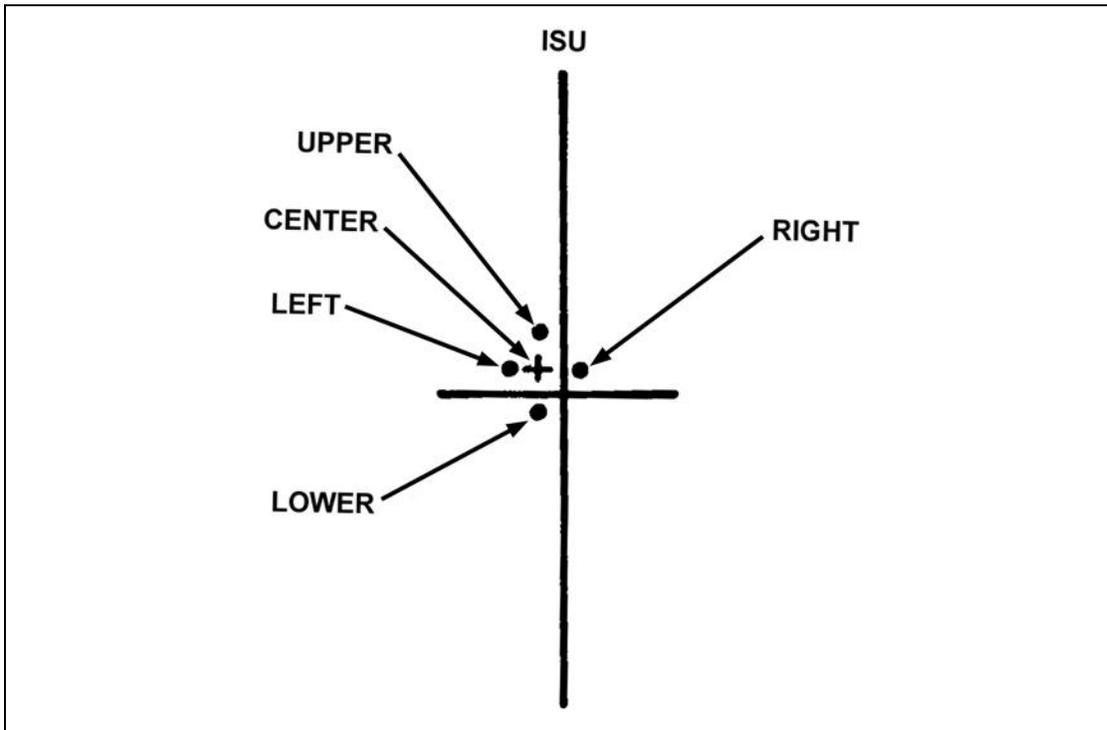


Figure B-46. Reticle centered between left, right, and lower limits.

(f) If after adjusting the browpad the ISU reticle is no longer aligned with the ISU cross, realign the reticle using the AZ and EL boresight knobs.

d. Align the auxiliary sight.

(1) Focus sight with the eyepiece diopter.

(2) If necessary, align the cross of the auxiliary sight with the AUX cross on the panel.

(a) Loosen locknut.

(b) Adjust thumbscrews (Figure B-47) to align the level (horizontal) line of the reticle crosshair with the level line of the AUX cross on the panel.

(c) Tighten the locknut.

(d) Loosen horizontal adjustment lock screw by about one-half turn to the left.

(e) Turn the horizontal adjustment screw to align the vertical line of the reticle crosshair with the vertical line of the AUX cross on the panel.

(f) Tighten the horizontal adjustment lock screw (Figure B-48).

e. Align the 7.62-mm coax machine gun.

(1) Select ammunition.

(a) Press the 7.62 button on the weapon control box.

(b) Ensure that "7.62" appears on the status indicator.

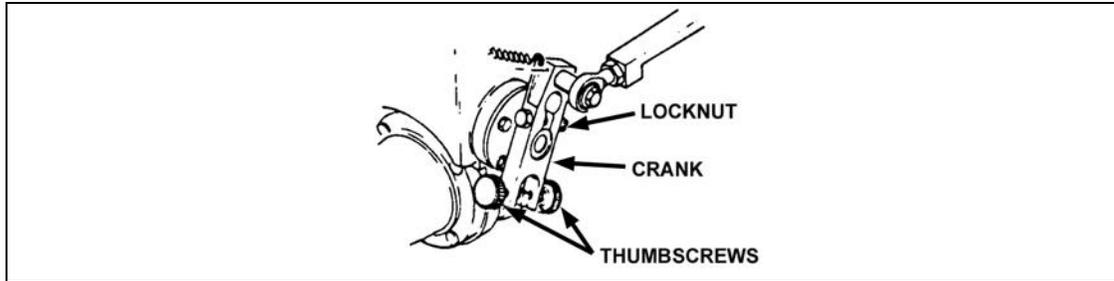


Figure B-47. Locknut, crank, and thumbscrews.

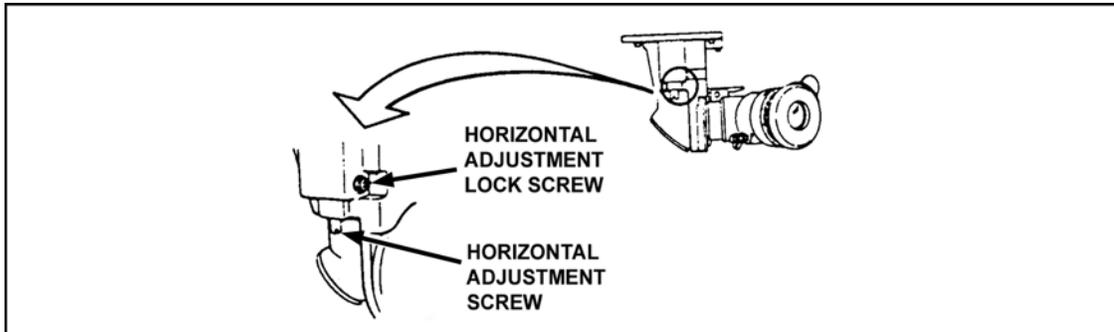


Figure B-48. Horizontal adjustment lock screw and horizontal adjustment screw.

(2) (Helper) insert the 7.62-mm adapter and boresight telescope into the coaxial machine gun. He then tells the gunner to align the boresight reticle with the COAX cross on the panel.

(a) Tell the gunner to use the AZ knob on the gun to align the boresight AZ crosshair (vertical) with the vertical line on the COAX cross.

(b) Tells the gunner to use the EL knob on the gun to align the boresight EL crosshair (horizontal) with the level line on the COAX cross.

f. Align the ISU night reticle.

(1) Move sensor select switch to NIGHT.

(2) Use black hot to make the ISU reticle more visible on the "T" of the panel, so set the polarity switch (PLRT) to that (black hot--BH).

(3) Adjust the thermal sight until you can see the "T" clearly:

- Turn the CON knob all the way to the right.
- Turn the BRT knob all the way to the left.
- Turn the BRT knob to the right until you can see the "T" on the panel.
- Focus on the "T" using the focus ring.
- Turn the CON knob left about one-quarter turn.
- Turn the BRT knob to the right until the "T" becomes clearer.
- Repeat focus ring, CON knob, and BRT knob adjustments, if necessary.

(4) Align the ISU reticle with the "T" on the panel using the night boresight EL and AZ knobs (Figure B-49, page B-36).

g. Align the TOW weapon system.

(1) Move the sensor select switch to CLEAR or NEUTRAL.

(2) Place the 25-mm gun elevation select lever in the POWER mode.

- (3) Place the TOW elevation lever in the MANUAL mode.
- (4) (Helper) insert the boresight telescope into the alignment hole between the TOW launcher bores.
- (5) Press the TOW button.
- (6) Check that the TOW indicator light goes out when the self-test finishes.
- (7) Ensure that "TOW" appears on the status indicator.
- (8) (Helper) align the boresight reticle with the TOW cross on the panel.
 - (a) Tell gunner to traverse to align the boresight AZ crosshair (vertical) with the vertical line of the TOW cross.
 - (b) Tell gunner to elevate or depress to align the boresight EL crosshair (horizontal) with the level line of the TOW cross.
- (9) Align the TOW reticle EL crosshair (horizontal) with the level line on the ISU cross of the panel using the TOW boresight screw.
- (10) Traverse to align the TOW reticle with the ISU cross on the panel (Figure B-50).
- (11) Determine launcher alignment error.
 - (a) Observe the aiming point of the boresight reticle on the TOW cross of the panel.
 - (b) Estimate distance (mils) between the boresight reticle and TOW cross using the 2-mil circle of the boresight reticle.
- (12) Adjust the launcher if the error is more than 1 mil.

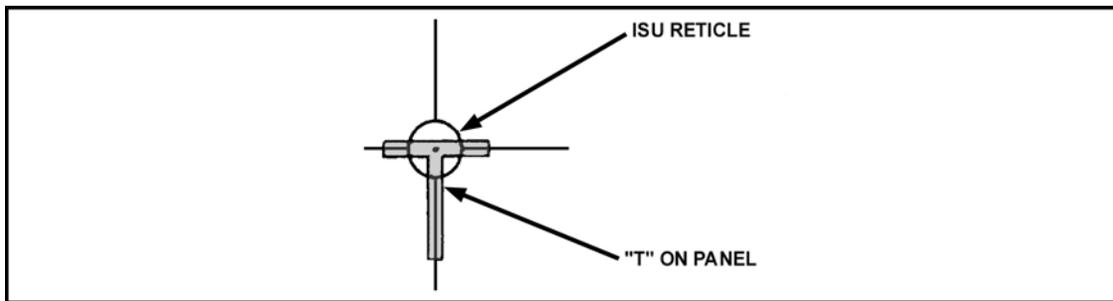


Figure B-49. ISU reticle aligned with "T."

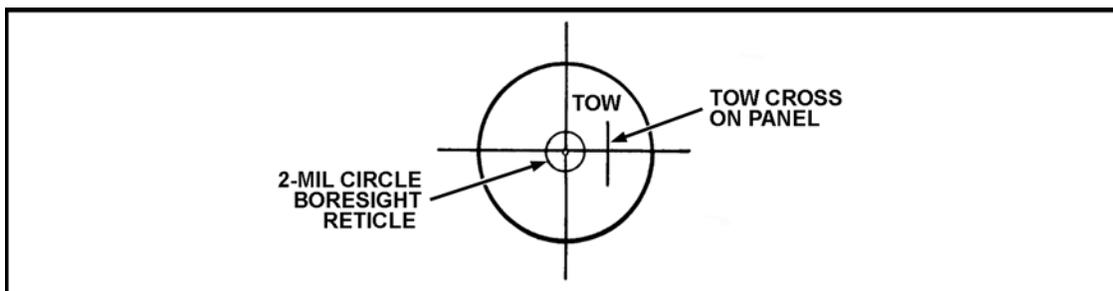


Figure B-50. Alignment of TOW cross and 2-mil circle.

B-19. BACKLASH TEST

When the direction of gun elevation is reversed, such as when the gun is depressed after being elevated, the sight may not immediately move with the gun. This slack between the sight and gun is called backlash. Backlash is controlled during boresighting by using a gun-lay ending in elevation. To prevent gunnery errors due to backlash, gunners should

also engage targets using a gun lay ending in elevation. This paragraph describes the separate backlash-testing procedures for the ISU and auxiliary sight.

a. **Boresight.** Before testing the backlash, boresight the 25-mm gun, ISU day reticle, and auxiliary sight as previously described. Set the weapon, sight, and turret controls the same as at the start of boresighting.

b. **Measurement of ISU Backlash.** If necessary, select AP-SS on the weapon control box. Avoid moving or removing the 25-mm boresight kit until you complete backlash testing.

(1) Insert the 25-mm adapter and boresight the telescope in the 25-mm gun. If necessary, focus the telescope.

(2) Use the gun and turret handwheels to align the ISU reticle with the ISU cross on the panel.

(3) Use the gun handwheel to depress the gun until the top of the ISU reticle touches the bottom of the ISU cross on the panel (Figure B-51).

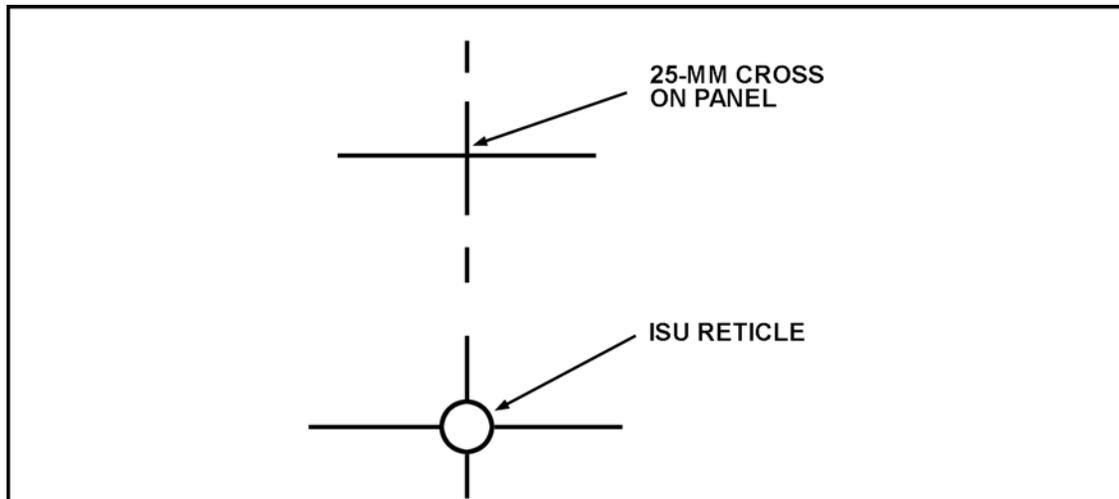


Figure B-51. Position of ISU reticle below the 25-mm cross.

- (4) Elevate the gun to align the ISU reticle with the ISU cross on the panel.
- (5) (Helper) note the aiming point of the boresight reticle.
- (6) Elevate the gun. Use the gun handwheel to elevate the gun until the bottom of the ISU reticle touches the top of the ISU cross on the panel.
- (7) Depress the gun to align the ISU reticle with the ISU cross on the panel.
- (8) (Helper) note the aiming point of the boresight reticle.
- (9) Measure backlash. Helper--
- Note the location of the boresight reticle and the 25-mm cross.
 - Use the 2-mil circle of the boresight reticle to estimate the distance (in mils) between aiming points observed in elevation and depression. The backlash measures 1.5 mils for the example shown in Figure B-52, page B-38.
 - Notify unit maintenance if backlash measures more than 2 mils.

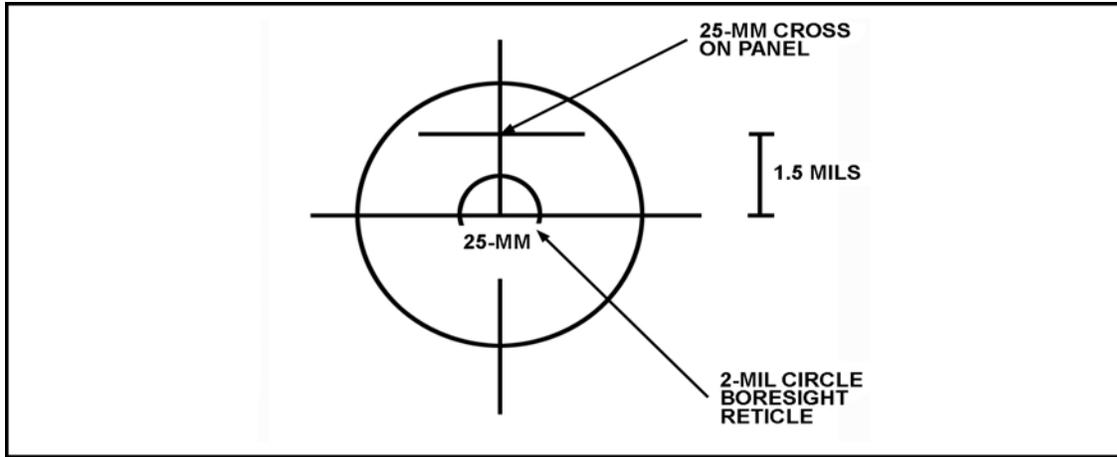


Figure B-52. Distance between aiming points.

c. **Measurement of Auxiliary Sight Backlash.** Insert the 25-mm adapter and boresight telescope into the 25-mm gun.

(1) Align the auxiliary sight reticle with the AUX cross on the panel using the turret and gun handwheels.

(2) Use the gun's handwheel to depress the gun until the top of the auxiliary sight reticle touches the bottom of the AUX cross on the panel (Figure B-53).

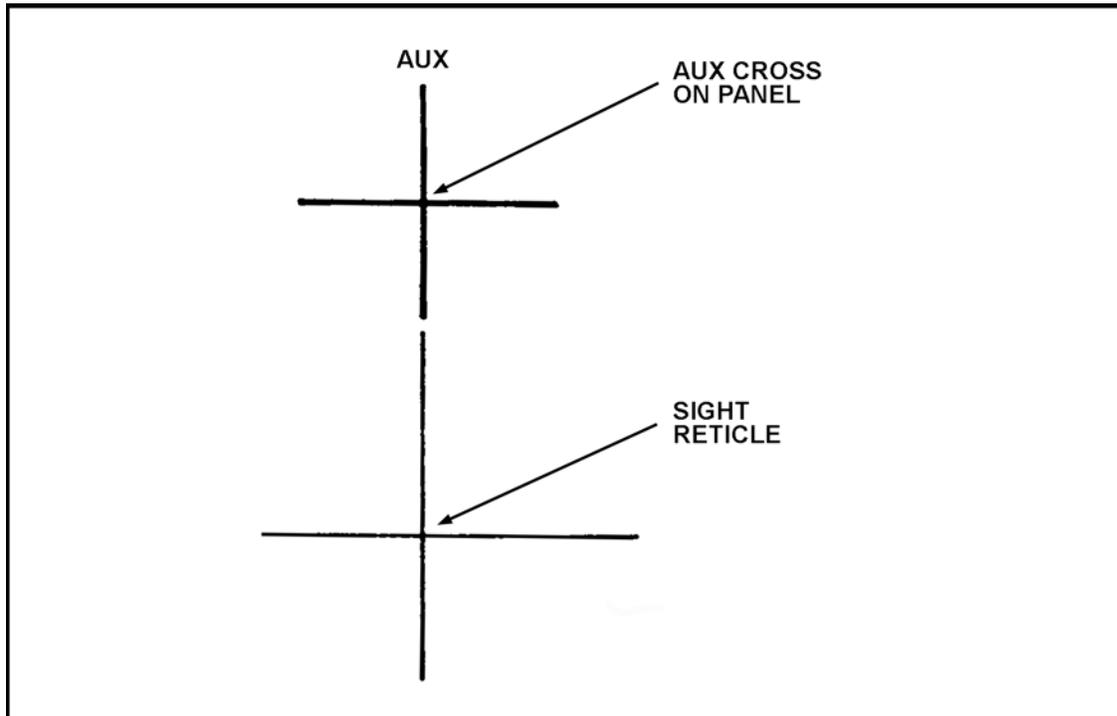


Figure B-53. Auxiliary sight reticle positioned below the AUX cross.

(3) Elevate the gun to align the auxiliary sight reticle with the AUX cross on the panel.

(4) (Helper) note the aiming point of the boresight reticle.

(5) Use the gun handwheel to elevate the gun until the bottom of the auxiliary sight reticle touches the top of the AUX cross on the panel (Figure B-54).

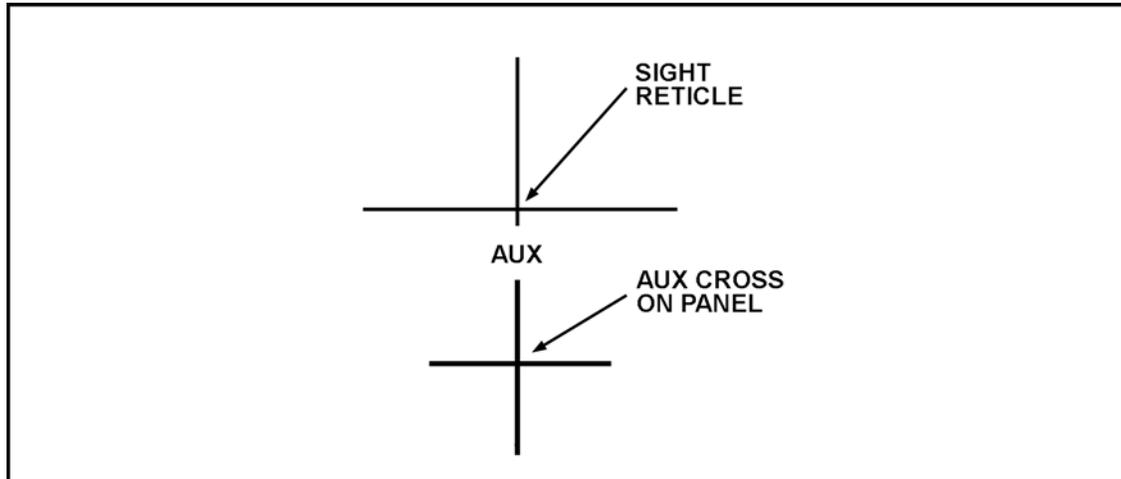


Figure B-54. Auxiliary sight reticle positioned above the AUX cross.

(6) Depress the gun to align the auxiliary sight reticle with the AUX cross of the panel.

(7) (Helper) note the aiming point of the boresight reticle.

(8) Measure backlash as described for the ISU.

B-20. EQUILIBRATOR TEST

When the ISU reticle is laid on target in power mode, the aiming point should not change when the gunner releases the palm switches. If when he releases the switches the sight and the gun drop, then the weapon might have a faulty equilibrator. This test follows boresighting and the backlash test. Turret and gun select levers remain on POWER during this test.

a. Using the gunner's handstation, align the ISU reticle with the ISU cross on the panel.

b. Release the palm switches.

c. Notify unit maintenance if the ISU circle and ISU cross fail to align after the gunner releases the palm switches. Either a faulty equilibrator or a faulty gun elevation brake can cause the weapon to fail the equilibrator test.

B-21. DRIFT TEST

Drift is tested after the equilibrator test. Switch settings and vehicle conditions are the same as at the end of the equilibrator test. With stabilization on, the gunner depresses the palm switches. The BFV remains stationary throughout the test, and the 25-mm and coax reticle may drift away from the aiming point no more than 0.1 mil per second. To conduct a 5-second drift test--

a. Turn stabilization on. Stabilization indicator light should come on.

- b. Press the drift button. Conduct the test within the one minute after you press the drift button.
- c. Using the gunner's handstation, align the ISU reticle with the ISU cross on the panel.
- d. Start the five-second test.
 - (1) (Helper) use your watch to signal the start of the test.
 - (2) (Gunner) press the palm switches, while keeping the handstation in the NEUTRAL position.
- e. Stop the test.
 - (1) (Helper) signal end of five-second test.
 - (2) (Gunner) release palm switches on helper's signal.
- f. Score the drift.
 - (1) The drift standard is met if the ISU cross of the panel falls on or within the 1-mil circle in the ISU reticle (Figure B-55).
 - (2) Notify unit maintenance if the ISU cross of the panel falls outside the 1-mil circle of the ISU reticle.

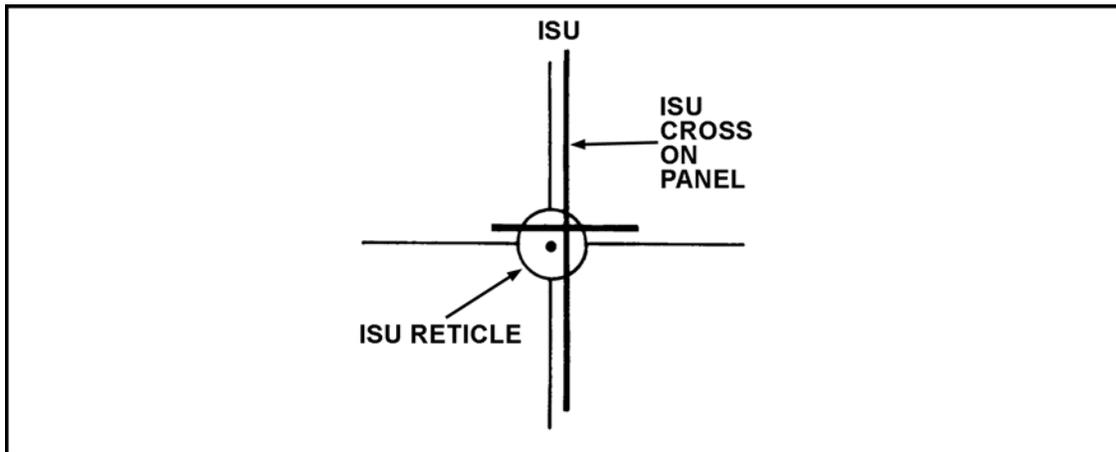


Figure B-55. Drift within 1-mil circle.

B-22. BORESIGHT-RETENTION TEST

After the 25-mm gun and ISU are boresighted, sight alignment should change no more than 0.25 mil for vehicle operation up to 50 miles. This holds true only as long as the ambient temperature remains within 54 degrees, plus or minus, from what it was when boresighting occurred. If boresight retention requirements are met, the weapon can be boresighted in the motor pool and the vehicle moved to a fighting position without having to re-boresight before zeroing.

- a. Test vehicles to ensure that they meet boresight retention requirements. Use your most accurate boresighting equipment to test boresight retention. Due to the extent of boresight equipment errors, the retention standard for field-testing is strictly held to 1 mil.
- b. You can measure boresight retention during a tactical road march or any other movement exercise that requires no adjustment of the boresight knobs. You can measure it after moving any distance; you need not travel 50 miles!

c. Boresight retention testing helps crews learn what conditions typically affect boresight retention on their vehicle. They must know this so they can determine when to re-boresight their weapons.

- (1) Obtain a 25-mm boresight kit that passes the kit accuracy test.
- (2) Prepare, lay the 25-mm gun, and align the ISU day reticle as described in previously.
- (3) Tape the covers of the boresight knobs to prevent accidental movement or adjustment.
- (4) Record distance traveled and temperature variations during the vehicle operations. For example, record extreme temperatures and precipitation.
- (5) Test boresight retention.
 - (a) Return vehicle to same position it was in when the weapons were last boresighted.
 - (b) Prepare to test boresight retention as previously described.
 - (c) Insert the boresight kit into the 25-mm gun.
 - (d) Align the ISU reticle with the ISU cross on the panel using a gun lay pattern ending in elevation.
 - (e) Determine boresight retention. The weapon meets the 1-mil field standard if the 25-mm cross on the panel falls on or within the 2-mil circle on the boresight telescope (Figure B-56). The weapon fails to meet the standard if the 25-mm cross on the panel falls outside the 2-mil circle on the boresight telescope.

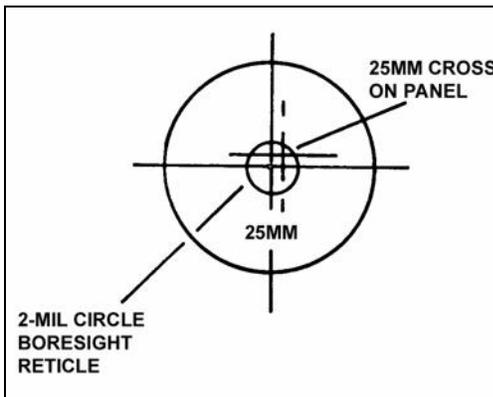


Figure B-56. Boresight retention met.

B-23. PANEL CONSTRUCTION

The panel can be constructed locally.

- a. **Panel Dimensions and Features.** The close-in boresight panel is 4 feet by 8 feet. Measure the location of the center of each cross from the lower left corner of the panel (Table B-2, page B-42).

REFERENCE CROSS						
DIRECTION	TOW	ISU	T	AUX	25-MM	COAX
Right	19	41	49	63	64	74
Up	35	31	31	31	14	19

Table B-2. Distance (in inches) between crosses and lower lefthand corner of close-in boresight panel.

(1) The lines of all crosses, except the "T," measure 1/2 inch long. The 1-inch lines of the "T" are made of steel. They are screwed onto the panel to enhance the image for thermal boresighting. Lines are either black or orange. Crosses viewed through a black reticle (boresight telescope and auxiliary sight) are orange. The two references, ISU and "T," are black when viewed through the 25-mm reticle (Table B-3).

REFERENCE CROSS						
FEATURE	TOW	ISU	T	AUX	25-MM	COAX
Color	Orange	Black	Black	Orange	Orange	Orange
Width (Inches)	1/2	1/2	1	1/2	1/2	1/2

Table B-3. Cross colors and line widths.

(2) Table B-4 shows the length of each arm on the crosses. The 8-inch upper and lower lines of the 25-mm cross have ranging gaps from 4 to 6 inches from the center of the cross.

REFERENCE CROSS						
ARM	TOW	ISU	T	AUX	25-MM	COAX
Upper	8	10	0	6	8	8
Lower	8	10	8	6	8	6
Right	8	4	4	6	6	6
Left	8	8	4	6	6	6

Table B-4. Length of lines on crosses.

b. **Supplies.** If the names of crosses are not painted on, then use 3-inch vinyl stick-on letters to spell TOW, ISU, AUX, 25-MM, and COAX. You will need--

- 1 each--plywood, exterior, 4- by 8-foot sheet, 3/4-inch, A/C or B/C grade.
- 1 each--sheet steel, 1-inch wide, 15 1/2-inches long.
- 4 each--screws, wood, flat-head, size 6, length 3/4 inches.
- 1 each--white paint primer, exterior, quart (oil or alkyd base).
- 1 each--white paint, exterior, quart (latex or oil base).
- 1 each--black paint, exterior, pint (latex or oil base).
- 1 each--orange paint, exterior, pint (latex or oil base).

- 1 each--paint thinner or brush cleaner.
 - 1 each--package of medium-grit sandpaper.
- c. **Equipment.** You will also need the following equipment:
- 1 each--straightedge, 8 feet long.
 - 2 each--C-clamps.
 - 1 each--framing square.
 - 1 each--tape measure at least 8 feet longer.
 - Several--paint pads, 6 inch or 8 inch; or paint brushes; or both.
 - 1 each--paint brush, 3/8 inch.
 - 1 each--router.
 - 1 each--bit, router, straight, 1/2 inch.
 - 1 each--power drill.
 - 1 each--bit, drill, 1/4 inch.
 - 1 each--jigsaw.
 - 1 each--pencil.

d. **Procedures.** If you can measure, paint, and use a jigsaw, router, and drill, then you can construct the panel yourself. Use a router to cut grooves for the crosses. This simplifies painting them, because all you have to do is to paint in the grooves:

- (1) Sand the front, back, and edge of the plywood to remove dirt and grease.
- (2) Mark the words "LOW, LEFT" on the lower left-hand corner of the panel.
- (3) To mark the TOW cross, use a pencil and the 8-foot long straightedge (Figure B-57, page B-44).
 - (a) Mark 19 inches to the right "A" of the lower left edge of the panel. (Table B-2 shows that the TOW cross is 19 inches from the left edge of the panel.)
 - (b) Mark 19 inches to the right "B" of the upper left edge of the panel.
 - (c) Draw a line connecting the two marks made at "A" and "B."
 - (d) Mark (C) 35 inches up from the bottom edge of panel (along 8-foot side).
 - (e) Mark (D) 35 inches up from the lower right edge of the panel at "D."
 - (f) Draw a line connecting the two marks made at "C" and "D."
 - (g) Mark "E," "F," "G," and "H" at a distance of 8 inches from the center of the cross formed by the lines drawn. Table B-4 shows the length of each arm.
- (4) Mark the ISU, AUX, 25-MM, and COAX crosses as follows:
 - (a) Using the data from the RIGHT direction row of Table B-2, mark the vertical lines of the crosses as previously described for the TOW cross.
 - (b) Using the data from the UP direction row of Table B-2, mark the horizontal lines of the crosses as previously described for the TOW cross.
 - (c) Mark the length of each arm of each cross using the data from Table B-4.
- (5) Rout each cross as follows:
 - (a) Set the router's depth shallow, at either 1/32 inch or 3/64 inch. This keeps the router from cutting through the first layer of the plywood.
 - (b) Clamp the straightedge to the wood to make a jig (guide) for the router.
 - (c) Use the router to cut grooves between the tick marks for the lines of the cross.
- (6) Apply a coat of primer to the front, back, and edge of the panel. Avoid letting the paint build up in the grooves. Let the primer dry.
- (7) Apply a coat of white paint to the entire panel. Let the paint dry.

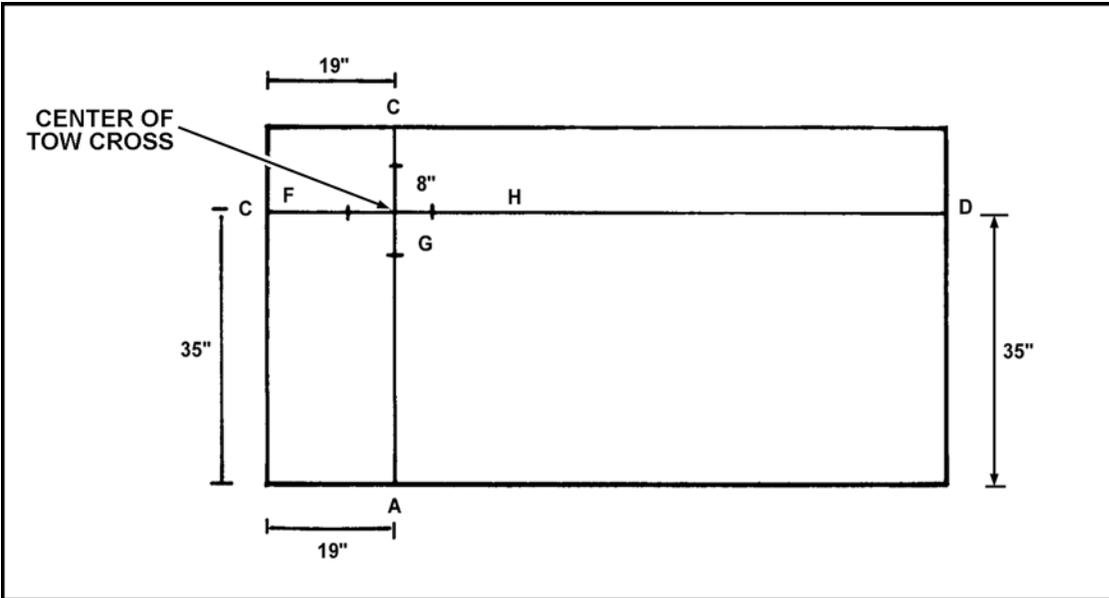


Figure B-57. Position of TOW cross.

(8) Paint the crosses using a 3/8-inch paintbrush and colors described in Table B-3. Let this paint dry also.

(9) Make the "T" as follows:

(a) Use a jigsaw and cut the steel strip into two sections, one 8 inches long and the other 7 1/2 inches long.

(b) In each section, drill a 1/4-inch hole 1 1/2 inches from each end, so each section will have two holes in it.

(c) Apply a coat of primer to each section. Let the primer dry.

(d) Apply a coat of black paint to each section. Let the paint dry.

(10) Mount the "T" as follows:

(a) Lay a straight edge along the right arm of the ISU cross.

(b) Start at the edge of the right arm and draw a 9-inch line along the straightedge.

(c) Align the 8-inch strip of steel on the line. The left edge of the strip must touch the right edge of the right arm of the ISU cross.

(d) Mount the strip using two wood screws.

(e) Center the 7 1/2-inch strip crossways beneath the 8-inch strip to form the letter "T."

(f) Mount the 7 1/2-inch strip using two more wood screws.

(11) Label the crosses using vinyl letters and numbers. Apply labels as shown in Figure B-41.

APPENDIX C

Zeroing

Zeroing the 25-mm gun allows the gunner to confirm the weapon system's boresight and to adjust the sight reticle relative to the impact of the round. Whereas boresighting aligns the ISU line of sight and the weapon systems point of aim, zeroing allows finer alignment (TM 9-2350-252-10-2, TM 9-2350-284-10-2, and TM 9-2350-294-10-2).

C-1. PROCEDURES FOR ZEROING THE 25-MM, ODS AND BELOW

After boresighting the 25-mm gun, zero it manually. Zero the Bradley on a level surface. Zero the 25-mm gun at 1,200 meters and the coax at 800 meters. Use the most accurate ammunition available. Avoid switching between HE and AP ammunition, because that changes superelevation in the ISU. (If any problems with superelevation occur during firing, notify unit maintenance.) Both the gunner and the BC must observe the strike of the round through their respective primary sights. To fire a round, lay the reticle on the target and squeeze the manual trigger switch. If the round strikes within the center of the reticle circle, the 25-mm gun is zeroed. If the round does not strike within the center of the reticle circle, adjust the boresight control knobs to align the reticle with the round impact. Then, re-lay the reticle and fire another round. Repeat this procedure until either the 25-mm gun is zeroed or three rounds are fired. If the three rounds are fired before the gun is zeroed the gun, then the master gunner must check the system to determine if the problem is mechanical. After zeroing the 25-mm gun to the daysight, leave the gun aimed at the same point on the target. The crew will adjust the nightsight and auxiliary sight reticles to the daysight's point of aim. This does not require the crew to fire any more zeroing rounds.

NOTE: After zeroing, record the boresight control knob numbers. Then, should something jostle the weapon boresight control knobs, the crew can simply reset them.

C-2. PROCEDURES FOR ZEROING THE COAX, ODS AND BELOW

The gunner and BC should work together to zero the coax. Fire a short burst of 10 to 15 rounds and use your primary sight to observe the impact of the tracer. The BC watches through his sight extension. After the tracer impacts, the BC moves the azimuth and elevation knobs to adjust the impact to the reticle aiming point. Repeat this procedure until the coax is zeroed.

NOTE: After zeroing, Bradley ODS crews must ensure that they realign the reticles of the laser range-finder and of the gun.

C-3. PROCEDURES FOR ZEROING, A3 ONLY

Zero the Bradley A3 on a level surface. Zero the 25-mm to a target at 1,200 meters and the coax to a target at 800 meters in front of and at the same elevation as the vehicle. Once the vehicle is zeroed, the vehicle's computer will remember the zero until someone changes it or until the system suffers a catastrophic memory loss. The Bradley A3 crew can save their calculations in vehicle records or commander notes. Then, to avoid having to boresight and zero again in the future, they can simply verify their calculations before range operations.

NOTE: If procedures in this manual differ from CTD procedures, follow the CTD procedures.

a. **Zero IBAS to 25-MM Gun.** To zero the gun in the daytime, refer to the A3 zero screens on the CTD (Figure C-1).

(1) If the crew cannot zero the 25-mm gun within three rounds, notify the master gunner.

(2) Do not press CONTINUE. This would close the 25-mm screen, which would in turn cause the A3 system to move to the next screen during zeroing procedures, leaving the 25-mm improperly zeroed.

1. Use the DVO (preferred) or the TV or FLIR (using FLIR or TV switch on the GHS to select TV or FLIR) for best viewing.
2. Select HI MAG (NFOV) using the HI/LO switch on the GHS.
3. Center the TAS reticle on the target using the T&E handwheels.
4. Range target using the laser range finder, or enter range manually on the GSCP.
5. Repeat Step 3 if required.
6. Cycle a ghost round.
7. Have the commander observe the impact of the round.
8. Fire one tracer round at the target.
9. Ensure the TAS reticle still aligns with the zero target. Re-aim as needed.
10. Press AIM POINT.
11. Center the TAS reticle at the impact point using the CHS or the GHS.
12. Press CALCULATE.
13. To use the new values, press SAVE. Repeat Steps 7 through 14 until you have zeroed the 25-mm gun or until you have fired three rounds.
14. Center the TAS reticle on the target using the T&E handwheels.

Figure C-1. Steps for zeroing IBAS to 25-mm gun.

b. **Zero Auxiliary Sight to 25-mm.** To verify the zero using the backup sight (AUX), follow the steps shown in Figure C-2. If you cannot align the auxiliary sight to the 25-mm within two rounds, notify the unit master gunner.

1. Verify that the TAS reticle aligns with the zero target.
2. Check that backup sight reticle's center vertical line aligns with the target. (To move reticle in azimuth, loosen horizontal adjustment lockscrew and turn horizontal adjustment screw. Use screwdriver)
3. Align reticle so that the AP range line aligns with the target at the appropriate range. (To move reticle in elevation, loosen locknut on elevation lever and adjust thumbscrews. Use wrench and socket.)
4. Verify that the TAS reticle and the AUX reticle range line are both on target.
5. Have commander observe round impact point.
6. Fire one confirmation tracer round at the zero target.
7. If round does not hit the target, verify TAS reticle is center mass of zero target.

Figure C-2. Steps for zeroing the auxiliary sight to the 25-mm gun.

c. **Zero Auxiliary Sight to Coax.** To zero the coax, use the checklist shown in Figure C-3.

Press CONTINUE.

1. Ideally, use the DVO. If you use the TV FLIR, do so only at night.
2. Select HI MAG (NFOV) using the HI/LO switch on the GHS.
3. Using the T&E handwheels, center the AUX sight on the target. Use the HE range line (the outer, broken range lines) for the range displayed in the DVO (800-meter target).
4. Range the target using the laser range finder, or manually index it on the GSCP.
5. Using the T&E handwheels, center the AUX sight on the target using the HE range lines for the range displayed in the DVO (800 meters) .

Make the following adjustments with the coax knobs, not with the AUX sight:

6. Have the commander observe the round impact.
7. Fire one burst of 10 to 15 rounds at the target.
8. Open the coax access doors. Manually move the coax azimuth and elevation knobs. This will move the strike of the rounds to center mass of the coax zero target.
9. Repeat Steps 5 through 8 until you zero the coax. If you cannot zero the coax in three bursts, notify the unit master gunner.

Figure C-3. Steps for zeroing auxiliary sight to the coax.

d. **Zero Coax to TAS.** To zero the coax to the TAS, use the checklist shown in Figure C-4.

1. Ensure that the AUX reticle still aligns with the zero target. Re-aim as needed.
2. Press AIM POINT.
3. Center the TAS reticle on the point of round impact using the CHS or the GHS.
4. Press CALCULATE.
5. To use the new values, press SAVE.
6. Verify the coax zero through the TAS by firing a burst at the zero target.

Figure C-4. Steps for zeroing the coax to TAS.

C-4. CONFIRMATION

The crew zeroes during BT VI, Crew Practice 2. They confirm the zero during BT VII, Crew Practice 3, and BT VIII, Crew Qualification. Confirming the zero allows them to ensure the vehicle's weapon systems have retained their zero. Normally, confirmation only requires firing one or two rounds. During confirmation, the crew might need to make some adjustments. If so, they follow the steps previously described. Environmental parameters and TAS alignment are critical to accuracy of the Bradley A3 weapon system. The crew aligns the TAS and adjusts for applicable environmental parameters IAW TM 9-2350-294-10-2-1.

APPENDIX D
**Prefire Checks, Malfunctions,
and Postfire Checks**

This appendix discusses prefire checks, malfunctions, and post-fire checks. Before zeroing, the crew boresights all weapon systems to ensure they align correctly before firing. They also conduct a thorough prefire check to ensure that the turret and all turret weapon systems operate properly. This prevents many of the common malfunctions that can occur during firing. If a malfunction does occur, the crew tries to clear it. If they cannot, they report the malfunction to the master gunner. After firing the weapon systems, the crew conducts a postfire check.

D-1. PREFIRE CHECKLIST

Before conducting live fire, the crew performs prefire checks.

- a. The crew uses a checklist similar to that shown in Figure D-1, page D-2, and to the turret PMCS outlined in TM 9-2350-252-10-2 or TM 9-2350-284-10-2 to reduce vehicle problems on the firing range.
- b. Bradley A3 crews can make a prefire checklist using the example shown in Figures D-2A and D-2B, pages D-3 and D-4; and in the PMCS provided in TM 9-2350-294-10-2-1.
- c. Figures D-3A and D-3B, pages D-5 and D-6, show the Linebacker prefire checklist.

PREFIRE CHECKLIST		BUMPER NO. _____	DATE _____
INITIALS			
GNR	BC		
<input type="checkbox"/>	<input type="checkbox"/>	1. Ensure that the 25-mm gun is clear.	
<input type="checkbox"/>	<input type="checkbox"/>	2. Ensure that before-operation PMCS has been completed on the hull and the turret.	
<input type="checkbox"/>	<input type="checkbox"/>	3. Ensure that the barrel is locked in (grab it and twist, remove the muzzle brake plug).	
<input type="checkbox"/>	<input type="checkbox"/>	4. Ensure that the receiver is locked in, and that the breech is properly lubricated.	
<input type="checkbox"/>	<input type="checkbox"/>	5. Ensure that the bolt and track are lubricated, and that the track hook latch is locked.	
<input type="checkbox"/>	<input type="checkbox"/>	6. Ensure that the bolt is locked in sear.	
<input type="checkbox"/>	<input type="checkbox"/>	7. Ensure that the manual SAFE is on.	
<input type="checkbox"/>	<input type="checkbox"/>	8. Verify the timing and install the feeder.	
<input type="checkbox"/>	<input type="checkbox"/>	9. Ensure that the BPI is locked in sear.	
<input type="checkbox"/>	<input type="checkbox"/>	10. Ensure that the straight drive shaft is locked in.	
<input type="checkbox"/>	<input type="checkbox"/>	11. Ensure that the power cable is properly attached and securely fastened.	
<input type="checkbox"/>	<input type="checkbox"/>	12. Ensure that the feeder handle locks in place without resistance.	
<input type="checkbox"/>	<input type="checkbox"/>	13. Ensure that the AP and HE feed and link-eject chutes are secure (front, back, top and bottom)	
<input type="checkbox"/>	<input type="checkbox"/>	14. Ensure that the sear retractor is in the outmost position (flush with receiver).	
<input type="checkbox"/>	<input type="checkbox"/>	15. Ensure that the feed shaft stops neither protrude nor bend.	
<input type="checkbox"/>	<input type="checkbox"/>	16. Ensure that the feed-select solenoid operates manually.	
<input type="checkbox"/>	<input type="checkbox"/>	17. Manually cycle the 25-mm gun in AP and HE.	
<input type="checkbox"/>	<input type="checkbox"/>	18. Ensure that the feed-select solenoid operates properly in power mode (select AP and HE SS, LO, HI).	
<input type="checkbox"/>	<input type="checkbox"/>	19. Power cycle the 25-mm gun in AP and HE. Use the gunner's, BC's, and manual handwheel triggers. Ensures that the gun fan activates when you squeeze each trigger.	
<input type="checkbox"/>	<input type="checkbox"/>	20. Manually check the turret's ability to elevate, depress, and traverse.	
<input type="checkbox"/>	<input type="checkbox"/>	21. Elevate and traverse the gun. Traverse the turret 360 degrees in normal and fast turret modes.	
<input type="checkbox"/>	<input type="checkbox"/>	22. Raise and lower the TOW launcher. Ensure that the launcher elevates and depresses properly.	
<input type="checkbox"/>	<input type="checkbox"/>	23. Ensure that the ISU operates properly: <ul style="list-style-type: none"> a. Clean the optics (the eyepieces and outside lenses). b. Ensure that the correct reticle appears when you select AP, HE, TOW, and the coax. c. Ensure that the superelevation changes as you rotate the range-select knob. d. Ensure that the ammunition and range settings are correct. e. Ensure that you can focus the thermal sight in high magnification. f. Ensure that the defogger is operating. 	
<input type="checkbox"/>	<input type="checkbox"/>	24. Ensure that you can null the drift out of the system.	
<input type="checkbox"/>	<input type="checkbox"/>	25. Boresight the 25-mm gun, the coax, the TOW, the auxiliary sight, and the laser range finder, as required.	
<input type="checkbox"/>	<input type="checkbox"/>	26. Ensure that the NBC system operates.	
<input type="checkbox"/>	<input type="checkbox"/>	27. Ensure that the 25-mm's ready boxes upload with no more than two rounds above the forwarder.	
BC'S CHECKS			
<input type="checkbox"/>	<input type="checkbox"/>	1. Ensure that the coax is clear and that the barrel is securely locked in the receiver.	
<input type="checkbox"/>	<input type="checkbox"/>	2. Ensure that the azimuth and elevation knobs turn freely.	
<input type="checkbox"/>	<input type="checkbox"/>	3. Install the coax. Ensure that it locks with the front and rear pins.	
<input type="checkbox"/>	<input type="checkbox"/>	4. Ensure that the coax feed chute fastens at both ends.	
<input type="checkbox"/>	<input type="checkbox"/>	5. Charge the coax. Check the chamber and manually ride the bolt forward.	
<input type="checkbox"/>	<input type="checkbox"/>	6. Power cycle the coax from the BC's, gunner's, and manual handwheel triggers.	
<input type="checkbox"/>	<input type="checkbox"/>	7. Charge the coax ready box and place it on SAFE.	
<input type="checkbox"/>	<input type="checkbox"/>	8. Ensure that the coax ready box is on board.	
<input type="checkbox"/>	<input type="checkbox"/>	9. Check communications. <ul style="list-style-type: none"> a. Ensure that the red, yellow, and green flags are on board. b. Conduct radio checks: <ul style="list-style-type: none"> • Administration net. • Firing net. 	
BC: SIGN _____		GUNNER: SIGN _____	

Figure D-1. Example format for prefire checklist.

BRADLEY A3 GUNNER'S PREFIRE CHECKLIST

BUMPER NO. _____ DATE _____

INITIALS _____

1. Ensure that the preoperational PMCS has been completed on the hull and turret.
2. Ensure that the receiver is locked in.
3. Ensure that the barrel is locked in (grab the barrel and twist; remove the muzzle brake plug).
4. Ensure that the bolt and track are lubricated and locked in the receiver.
5. Ensure that the bolt is locked in sear.
6. Ensure that the manual safe is on.
7. Ensure that the BPI is locked in sear.
8. Ensure that the straight drive shaft is locked in.
9. Ensure that the AP and HE quick-release link guides are locked in (top and bottom).
10. Ensure that the AP and HE feed and link-eject chutes are secure (front, back, top, and bottom).
11. Ensure that the manual sear retractor is out (flush with receiver).
12. Ensure that the feed shaft stops are neither protruding nor bent.
13. Ensure that the weapon's power cable is properly attached and securely fastened.
14. Ensure that the feeder handle locks in place.
15. Ensure that the feed-select solenoid operates properly in the manual mode.
16. Ensure that the sear light is on, but not flashing.
17. Manually cycle the 25-mm gun in AP and HE.
18. Ensure that the feed-select solenoid operates properly in power mode (select AP and HE SS, LO, HI).
19. Power cycle the 25-mm gun in AP and HE. Use the gunner's hand station (GHS) and the manual handwheel triggers. Ensure that the fans activate (and operate for about 75 seconds) after one trigger pull.
20. In the power mode, using the GHS, elevate and depress the gun, and traverse the turret.
21. Raise and lower the TOW launcher. Check the SCB to ensure the TOW launcher UP indicator lamp lights. Check with the driver to ensure the launcher UP indicator lamp lights up on his instrument panel.
22. Adjust the IBAS biocular display's brightness and contrast.
23. Adjust the IBAS Day TV's (DTV's) focus in WFOV and NFOV.
24. Ensure that the direct-view optic (DVO) is focused.
25. Adjust the FLIR's focus, gain, and level in WFOV and NFOV.
26. Adjust and ensure symbology is present in the gunner's biocular display, with no flashing "M."
27. Select the FLIR's polarity and zoom.
28. Ensure that all of the reticles for the DTV, FLIR, and DVO are adjusted for the desired brightness.
29. Ensure that the TAS is nulled and aligned.

GUNNER: PRINT OR TYPE NAME _____ SIGN _____

Figure D-2A. Example format for Bradley A3 gunner's prefire checklist, Part 1.

LINEBACKER PREFIRE CHECKLIST	
BC GNR	
<input type="checkbox"/>	STINGER SUBSYSTEM (continued) Rotate the SCB to launcher-up.
<input type="checkbox"/>	COMMUNICATIONS Ensure that the jump, administrative, and fire frequencies are set on all radios. Ensure that the master control station is programmed. Ensure that the FFCS are set correctly. Conduct an external communications check on each radio. Ensure that the jump cable is properly installed on the radio. Ensure that the jump leads are connected to the binding post on the master control station. Ensure that the line and accent switches are in the ON position. Conduct a "false jump" test using an alternate frequency. Conduct an internal communications check with CVCs. Ensure jump frequency is selected and radio is off until tower informs you to select it.
<input type="checkbox"/>	FAAD EQUIPMENT
<input type="checkbox"/>	EPLRS Initialize the RT. Ensure that the RT enters the net.
<input type="checkbox"/>	FAAD PLGR Ensure that the battery has been removed. Ensure that all cables are properly connected. Turn on the PLGR and ensure that cryptography loads. Initialize the PLGR. Ensure that the PLGR operates in FOM 1.
<input type="checkbox"/>	HTU Initialize the HTU. Verify PLGR: RCV/GOOD POSN. Verify SNSR BRDCST: receiving. Verify command and control links: status receiving.
<input type="checkbox"/>	DCS
<input type="checkbox"/>	DCB Turn to RUN and observe the BIT. Verify CAL errors are plus or minus 2.
<input type="checkbox"/>	DCS PLGR Ensure that the battery has been removed. Ensure that all cables are properly connected. Turn on the PLGR and ensure that cryptography has been loaded. Initialize the PLGR. Ensure that the PLGR is operating in FOM 1.
<input type="checkbox"/>	M6 HULL Verify that the PMCS has been performed.
VEHICLE COMMANDER: _____ PRINT OR TYPE NAME	
SIGN _____	

Figure D-3B. Example format for Bradley Linebacker prefire checklist Part 2.

D-2. MALFUNCTIONS

Malfunctions cost a lot of firing time on BFV ranges. Crew error causes most malfunctions. Crews must know the possible reasons for a typical malfunction to occur, this way they can take the necessary steps to correct the malfunction(s) and continue with training. As a precaution, the crew performs standard misfire procedures before correcting any error. If they are not sure that the 25-mm is clear, they can use the cleaning rod to ensure that it is.

DANGER

WHEN A MALFUNCTION OCCURS, ALWAYS PERFORM MISFIRE PROCEDURES BEFORE TAKING ANY OTHER CORRECTIVE ACTION.

a. **25-mm Gun.** If none of these steps corrects the malfunction, notify the master gunner or maintenance personnel.

(1) If the gun did not cycle, check the following:

- Is the ARM-SAFE-RESET switch on SAFE?
- Is the ammunition selected?

(2) If the gun cycled to misfire, check the following:

- Is the manual safety switch set to SAFE?
- Is the tension released from the ammunition belt?
- Is the gun out of ammunition?

(3) If the gun cycled, but not to SEAR or MISFIRE, check for the following. Then, use the hand crank to manually cycle the gun back to SEAR, and try again:

- Is the tension released from the ammunition belt?
- Is the sear retractor out?
- Is the straight drive shaft down?

(4) If you cannot clear a weapons malfunction IAW the TM, then you must clear it by removing the feeder and physically inspecting the chamber for unfired ammunition.

(5) If the straight drive shaft has dropped after a malfunction, remove the feeder from the receiver and visually check the weapon for unfired ammunition.

(6) The 25-mm ammunition can doublefeed if the protective nose caps are broken, cracked, or missing; or if a weapon stoppage occurs and is cleared improperly.

b. **M240C 7.62-mm Coaxial Machine Gun.** If none of these steps corrects the malfunction, notify the master gunner or maintenance personnel.

(1) If the bolt did not go forward, check the following:

- Is the ARM-SAFE-RESET switch set to SAFE?
- Is the manual safety switch set to SAFE?
- Is the LO AMMO OVRD light flashing?
- Is the coax solenoid plug connected?
- Is the ammunition selected?

(2) If the bolt did go forward, check the following:

- Is the ammunition belt seated in the feed tray?
- Is there a round or casing stuck in the chamber?
- Is the machine gun out of ammunition?

c. **M257 Smoke Grenades.** When smoke grenades fail to launch, perform immediate action, then—

(1) Use the vehicle intercom system to tell the driver to move the vehicle to a safe area. Ensure the driver moves it at least 125 meters from the nearest vehicle, building, person, or equipment.

(2) Move the grenade launch switch to ON.

(3) Fire the smoke grenades.

- (4) Look for the smoke through the periscopes.
 - (5) Move the smoke grenade-launcher switch to OFF.
 - (6) Open the commander's hatch cover.
 - (7) Check the smoke grenade launcher for misfired smoke grenades.
 - (8) Have helpers leave the vehicle.
 - (9) Move the turret power switch to OFF.
 - (10) Move the master power switch to OFF.
 - (11) Remove the smoke grenades from the side where the misfire occurred.
 - (12) Tell the gunner that the smoke launchers are clear; have helpers clear the turret area.
 - (13) Move the smoke grenades to a well-marked spot at least 200 meters from the nearest vehicle, person, or equipment.
 - (14) Notify the chain of command of the exact location, type, and number of smoke grenades that malfunctioned.
 - (15) Notify unit maintenance that the M257 smoke grenade launchers on the vehicle malfunctioned.
- d. **Turret Drive.** If none of these steps corrects the malfunction, notify the master gunner or maintenance personnel.
- (1) If the turret will not traverse, check the following:
 - Is the turret travel lock locked?
 - Is the drive motor in manual?
 - Is the turret drive on? If so, turn it off for 30 seconds, then back on.
 - (2) If the gun will not elevate or depress, check the following:
 - Is the drive motor in manual?
 - Is the turret drive on? If so, turn it off for 30 seconds, then back on.
- e. **Communications.** If you lose communications, check the following:
- Is the master control station power light on?
 - Are the radio cable connections loose?
 - Has BIT failed on the master control station?
 - Is the CVC cord disconnected?
 - Does the VIC1 FBCB2 display a green status?

D-3. POSTFIRE CHECKS

After firing, the crew clears all weapon systems and removes all ammunition residue from the exterior of the vehicle. Leaders verify that crews clear all weapon systems IAW AR 385-63. On training ranges, range safety officers verify that crews have cleared all weapon systems. Postfire checks prevent many accidents.

DANGER

AFTER FIRING, ENSURE ALL WEAPONS ARE CLEAR.

APPENDIX E

Urban Operations

Both the worldwide shift from rural to urban societies, and the requirement to switch between combat and SASO, have changed US Army doctrine. When he can, the enemy will try to offset standoff and precision fire by drawing the fight to urban areas. Urban operations (UO) are military actions planned and conducted where man-made terrain affects tactical options.

This appendix discusses the principles of urban operations and provides TTP for employing the BFV in urban areas.

E-1. CONSIDERATIONS

The commander must treat any urban area as a terrain complex. He must know the characteristics of each type of urban terrain and how it will affect his units and weapons. He must also understand the advantages and disadvantages that urbanization offers, and how it will affect tactical operations.

- a. Urban sprawl complicates adherence to the following principles:
 - (1) Battalions task-organize around the brigade.
 - (2) Units below battalion operate as part of the battalion TF rather than alone.
 - (3) The battalion tries to avoid costly, time-consuming UO by isolating and bypassing built-up areas.
- b. The commander can conduct urban combat operations to capitalize on the area's strategic or tactical advantages or to deny these advantages to the enemy. Major urban areas represent their country's power and wealth in the form of industrial bases, transportation complexes, economic institutions, and political and cultural centers. Denying or capturing these can boost morale enough to decide the success or failure of the larger conflict. Villages and small towns are often caught up in a battle due to their nearness to major avenues of approach or because they sit on lines of communications needed for ground combat operations.

E-2. TASKS

The primary tasks of the Bradley fighting vehicle in an urban environment are to suppress enemy fires and breach exterior walls. The vehicles' armor-piercing rounds can easily penetrate brick structures, and they can penetrate concrete up to 16 inches thick. They also work well against sandbag-reinforced and earthen structures.

- a. **Elevation and Depression.** The 25-mm's elevation ranges from about -10 to +60 degrees.
- b. **Visibility.** The crew has limited visibility to the sides and rear and no visibility to the top.
- c. **Ammunition.** The 25-mm AP, HE, and even TP-T rounds can be used effectively against enemy-occupied buildings and fortifications.
- d. **Fields of Fire.** Figure E-1, page E-2, compares the BFV's and the M1 tank's fields of fire on urban terrain. The BFV can engage a target nine to ten stories high at 20 meters, whereas an M1 tank requires 90 meters.

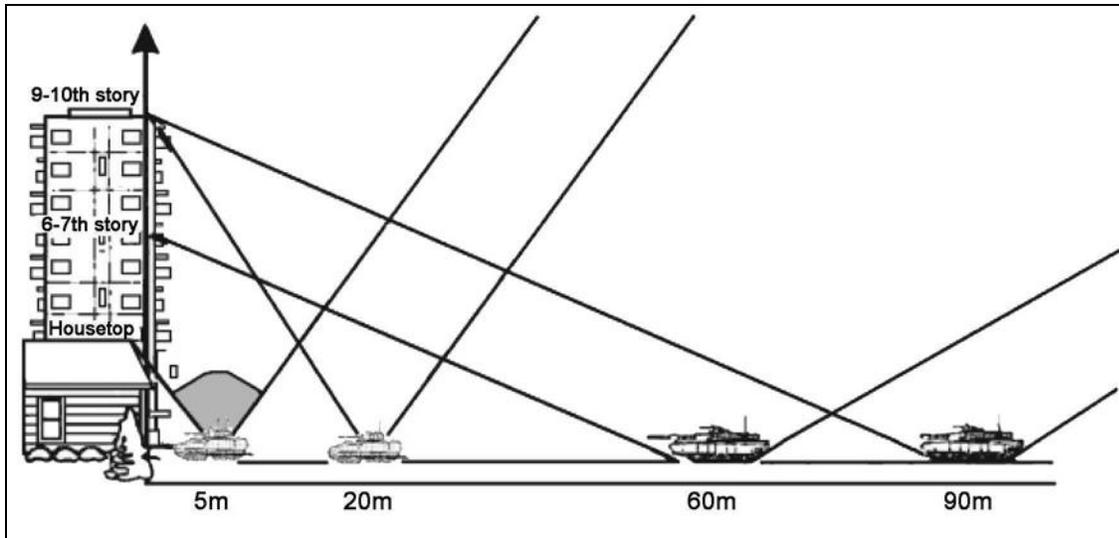


Figure E-1. Comparison of M1 and BFV fields of fire.

e. **Breach of a Wall.** Figure E-2 shows one way to breach a wall using the 25-mm main gun. TP-T is the best ammunition for this job.

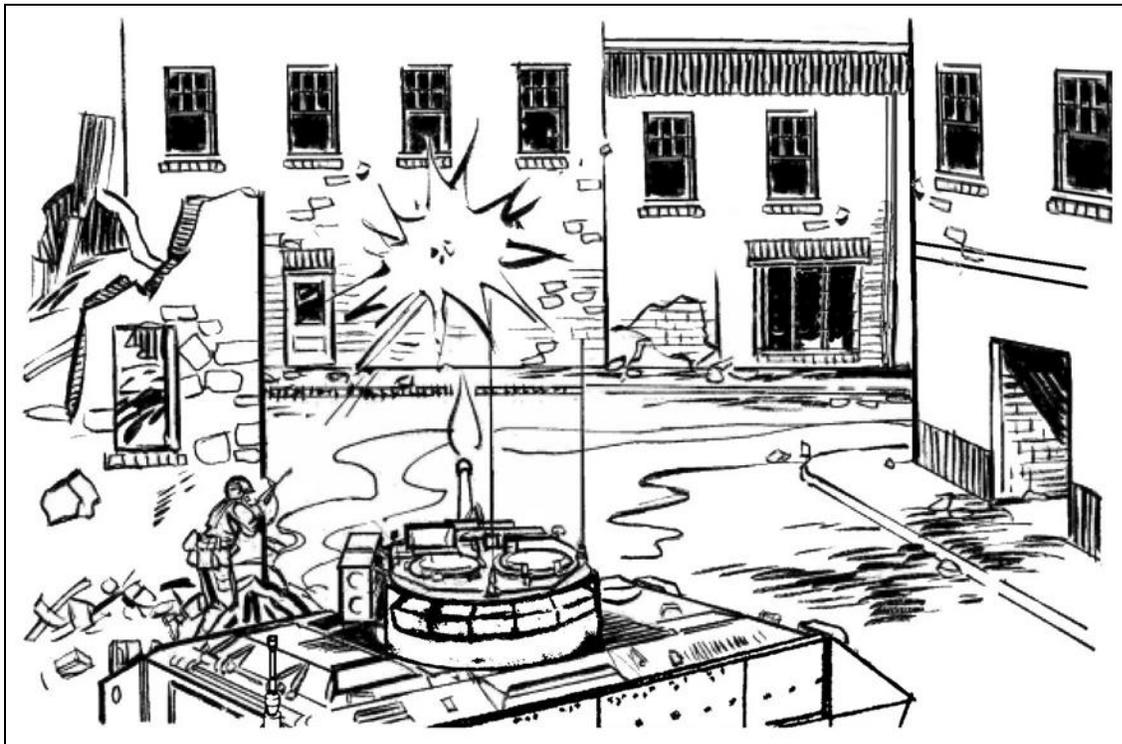


Figure E-2. Circular fire pattern used to breach wall.

f. **Support of Infantry Assault.** When using the BFV weapon systems to support the infantry assault, leaders *must* consider the effects of the explosion on the Infantry soldiers on the ground. These effects include fragmentation, the discarding sabots, and overpressure.

E-3. TARGET ACQUISITION

Urban areas present units with unique target-acquisition challenges. For example, urban areas often favor the defender's ability to acquire targets. This makes offensive target acquisition extremely important, because whoever fires first could win the engagement. Whether halted or moving, units and soldiers must try to acquire targets continuously. Urban terrain affects target acquisition as follows:

- a. They tend to perform the six steps of target acquisition (search, detect, locate, identify, classify, and confirm) much faster in an urban environment than they would elsewhere.
- b. Buildings mask movement and the effects of direct and indirect fires. Intact and rubble structures cover and conceal both attackers and defenders.
- c. Closed hatches reduce situational awareness (ODS and below), but the BC maintains it by using his CIV (M2A3 only).
- d. The driver has an increased role in UO target acquisition. Acquiring targets is most challenging when traveling past narrow side streets and alleys. The driver must watch the left side of the vehicle, because a threat could appear there first.

E-4. SEARCH

Urban battlefields are three dimensional. Soldiers must use all of their senses to detect a threat. Just as on other types of terrain, patrols and OPs help locate enemy forces.

a. **Target-Acquisition Devices.** Soldiers searching the urban battlefield should use all available devices (binoculars, image-intensifiers, thermal sights, GSR, REMs, PEWS, and field-expedient early warning devices) to acquire targets, because no single device can meet every need. The BFV's ISU and IBAS serve as excellent combat multipliers in modern urban combat. For example, the IBAS, the CIV, and the second-generation FLIR make the M2A3's hunter-killer technique especially effective. M2A3 gunners search for targets on major streets, ensuring that the bottom of the IBAS picture (in WFOV) allows them to see just a few feet in front of the vehicle, and that the top of the IBAS picture (also in WFOV) allows them to see the first floor of buildings. Using the CIV, the BC can simultaneously scan upper-level floors, rooftops, and narrow side streets and alleys, while protected from sniper fire.

b. **Observation.** The unit develops and implements clear observation SOP. To ensure all-round and up-down (three-dimensional) security, leaders must clearly explain observation duties to crewmembers. Soldiers quickly learn to recognize the sights, smells, sounds of their urban battlefield, and to distinguish targets. On the M2A2 and below, the BC uses binoculars and the naked eye to search aboveground, including rooftops and upper floors. At the same time, the gunner searches street and lower levels. On the M2A3, the BC uses the CIV to search from inside the vehicle, safe from sniper fire. On all BFVs, the driver scans the street to the vehicle's front and, as previously stated, to the left when the vehicle passes alleys and side streets. To increase survivability during observation, the crew keeps all hatches closed or in the "popup" position.

c. **Movement.** Because attackers and defenders might have short distances between them, the crew should stop often to scan their sector. They must choose their routes carefully, using buildings and rubble to mask their movement. Crews who encounter a threat while crossing a major road or intersection can back up and use a building as protection while they prepare to engage the threat. However, they might be able to bound through the road or intersection and hand off the target by radio to the next BFV. In the case of two FBCB2-equipped BFVs, the first one could bound through a major road or intersection, then digitally hand off the target to the next one. The crew or section uses the same movement techniques in urban areas as on open terrain (traveling, traveling overwatch, and bounding overwatch), except the overwatching element also watches the upper floors.

d. **Observation Posts.** In selecting OPs, the commander considers the military aspects of urban terrain. For example, upper-floor OPs offer better vantage points than do street-level OPs. However, leaders should avoid obvious positions such as water towers or church steeples.

E-5. TARGET DISCRIMINATION

Target discrimination, the act of quickly distinguishing combatants from noncombatants and engaging the combatants, is vital in urban combat. US forces try to prevent casualties among noncombatants. Selective engagement is less important in areas without noncombatants. However, even in such areas, gunners can always mistake a friendly soldier for an enemy. Unless crews are well-trained in fire discrimination and control, and practice firing discipline, urban combat can result in unintentional casualties among noncombatants. Distances in urban environments are ever-changing. During short halts or as time permits, M2A3-equipped crews should continuously check the focus, level and gain, and brightness and contrast on the IBAS. This is how crews learn to discriminate friend from foe using the IBAS. Finally, commanders must recognize the stress that discriminating targets causes soldiers, and take steps to prevent and relieve it.

E-6. TARGET ENGAGEMENT

At ground level, structures and obscurants (smoke, dust, and airborne debris) reduce the ranges of observation and fields of fire. Most urban engagements consist of close (within 100 meters), violent firefights. Victory, perhaps even survival, depends on correct identification of friend and foe, strict fire control, precise fire, quick reflexes, and impeccable teamwork. Short ranges restrict the use of TOWs. In most urban firefights, "Danger close" is the norm for indirect fires.

NOTE: The laser range finders on ODS and A3 models require a range of at least 200 meters. However, the M2A3 crews can index 100 meters and the M2A2 ODS crews can index 0 or 200 meters. Then, if they happen to acquire a target that exceeds the indexed range, they can always lase to the target.

E-7. MUTUAL SUPPORT IN THE OFFENSE

In UO, commanders can task-organize light infantry companies with the mechanized infantry platoons. While the rifle squads provide local security for the BFVs, the BFVs provide critical fire support to the dismounted element. In the M2A3-equipped unit, the squad leader's display (SLD) gives the rifle squad excellent situational awareness before they dismount the vehicle. For example, before they even leave the vehicle, they can determine potential routes and entry points to buildings.

a. **Killing Zones.** Streets and alleys are natural firing lanes and killing zones. Because of this, all vehicular traffic is greatly restricted and canalized, and subject to ambush and short-range attack. The wide elevation ranges (about -10 to +60 degrees) on the 25-mm gun and 7.62-mm coax machine gun give the BFV a target engagement advantage over tanks.

b. **Movement.** When moving on a large enough street, each BFV remains buttoned up, hugs the buildings on one side of the street, and covers the opposite side of the street. With its IBAS, CIV, and second generation FLIR, the M2A3 BFV provides the excellent fields of view needed in urban terrain. This helps the crew detect signals from the dismounted element.

c. **Elements and Missions.** The BFV platoon has one mounted element and one dismounted element. Based on the company commander's guidance and the factors of METT-TC, the BFV platoon leader determines how to deploy these elements. When supporting a light infantry company, the dismounted element provides local security for the mounted element.

d. **Antitank Guided Missiles.** The BFV lacks adequate armor protection to withstand medium to heavy ATGM fire. Thus, it is normally employed after ATGM positions have been cleared or on terrain that dominates the city. There it can provide support or suppress enemy fires. In urban areas, LAWs, AT4s, Dragons, and Javelins provide much of the BFV platoon's short-range antiarmor fires; BFV TOWs provide long-range antiarmor fires; and the BFV's cannon (25-mm) and its machine guns provide direct-fire support. Especially when ATGMs can engage BFVs from rooftops, commanders must implement tactical control measures to increase BFV survivability.

e. **Offensive Task Organization.** During offensive operations, the BFV platoon normally supports the light infantry company team. Because BFVs need dismounted support, the company team commander generally keeps the dismounted and mounted

elements together. If he needs the dismounted element for another task, he must leave sufficient local security with the BFVs to protect them from an enemy counterattack or antiarmor ambush.

(1) **Assault Tasks.** A light infantry company team commander can task the BFV platoon to perform assault tasks. If so, he must again leave sufficient dismounted personnel to protect them.

(2) **Support Tasks.** The tasks most likely assigned to a BFV platoon supporting a light infantry company in UO are those assigned to the support element. When supporting a light infantry company in the urban offense, the BFV platoon usually provides direct-fire support and other aid as needed to support the assault element. When leading the support element, the BFV platoon leader commands and controls his platoon and other support element assets. Some of the platoon's support tasks follow:

(a) Use the 25-mm gun, the 7.62-mm coax machine gun, and other dismounted assets, suppress enemy gunners within the objective building(s) and adjacent structures. (Figure E-3).

(b) Breach walls en route to and within the objective buildings.

(c) Use the 25-mm gun, the 7.62-mm coax machine gun to destroy enemy positions within a building.

(d) Provide replacements for the assault element.

(e) Provide a mobile reserve for the company team.

(f) Resupply ammunition and explosives.

(g) Evacuate casualties, prisoners, and noncombatants.

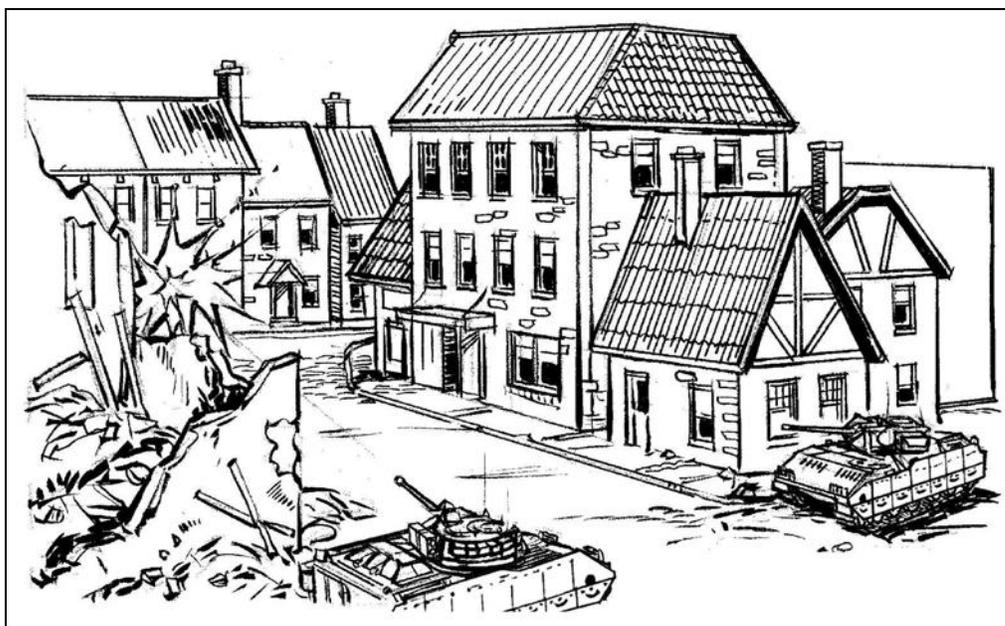


Figure E-3. Suppressive fires of 25-mm gun.

f. **Direct-Fire Support.** Ideally, BFVs provide direct-fire support to Infantry. The BFVs move behind the Infantry, when required, and engage targets located by the rifle squads (Figure E-4). The BFV's dash speed (acceleration) enables it to rapidly cross streets, open areas, or alleys.

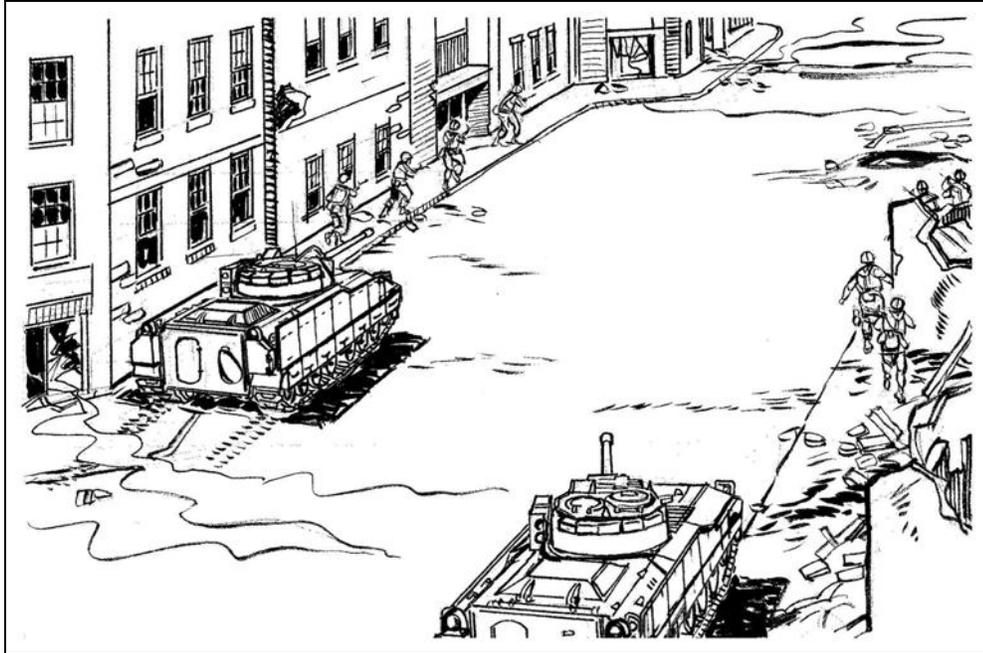


Figure E-4. Movement with dismounted element.

(1) *Weapons.* The BFV's mounted element provides fire (with its 25-mm gun and 7.62-mm coax machine gun) for the dismounted element on the opposite side of the street. The 25-mm gun is the most effective weapon on the BFV for UO (Figure E-5).

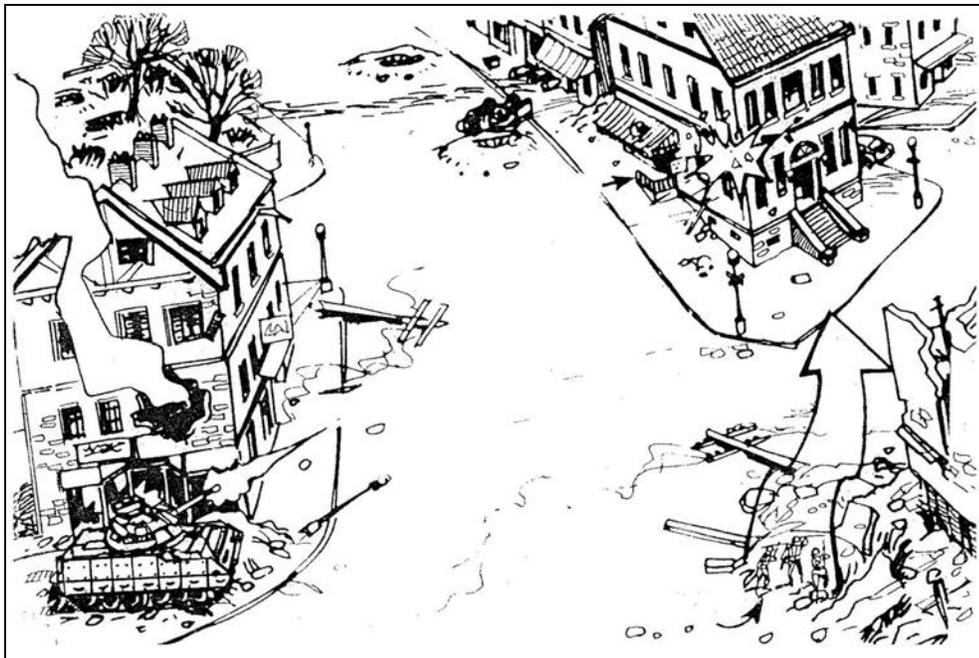


Figure E-5. Support by the 25-mm gun for the dismounted element.

(2) *Safety.* Using the 25-mm gun to support Infantry naturally requires BFV personnel to observe certain safety considerations.

(a) High-explosive 25-mm rounds arm 10 meters from the gun and explode on contact.

(b) Because the APDS-T round discards plastic sabots to the front of the gun, the 25-mm has a 60-degree safety fan. This fan extends 30 degrees to each side of the gun-target line and out 100 meters to the front of the gun (Figure E-6). Thus, when the gunner or BC fires armor-piercing rounds, exposed soldiers must remain to the rear of the 25-mm's muzzle (outside the 60-degree arc) or at least 100 meters from the muzzle blast.

(c) To prevent fratricide, BFV-equipped units must develop SOPs to help Bradley crews identify friendly dismounted soldiers. They can mark LBE, helmets, or uniforms with reverse-polarity tape, thermal or chemical lights, and so on. However, use of such measures must be weighed against enemy's thermal capabilities. For example, the M2A3's IBAS allows the viewer to see helmet bands and LBEs marked with reverse polarity tape.

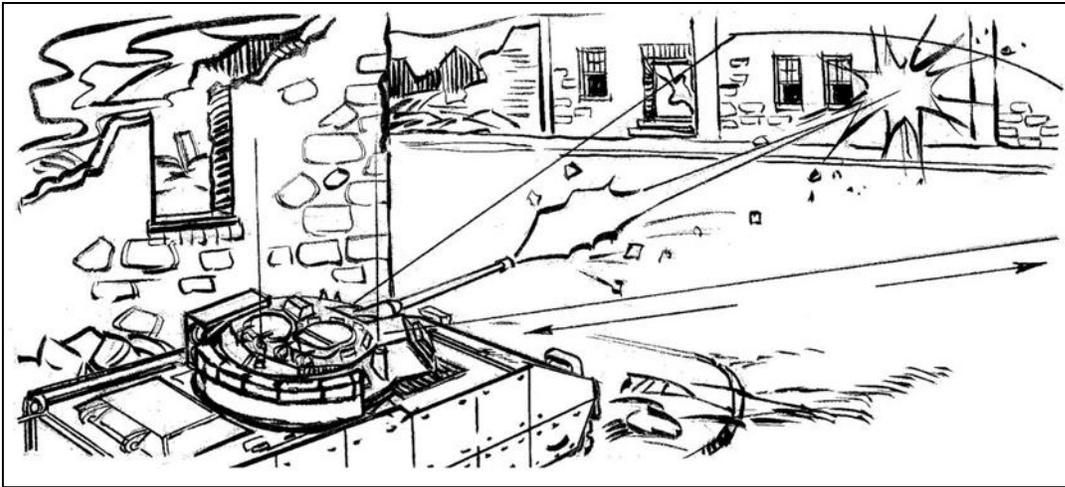


Figure E-6. Safety fan for 25-mm gun.

g. Isolation of a Building. To isolate a building, the BFVs take an overwatch position (Figure E-7). They fire the 25-mm gun and 7.62-mm coax machine gun. They adjust indirect fire to suppress enemy troops in the building and in nearby buildings who can fire at the assault element.

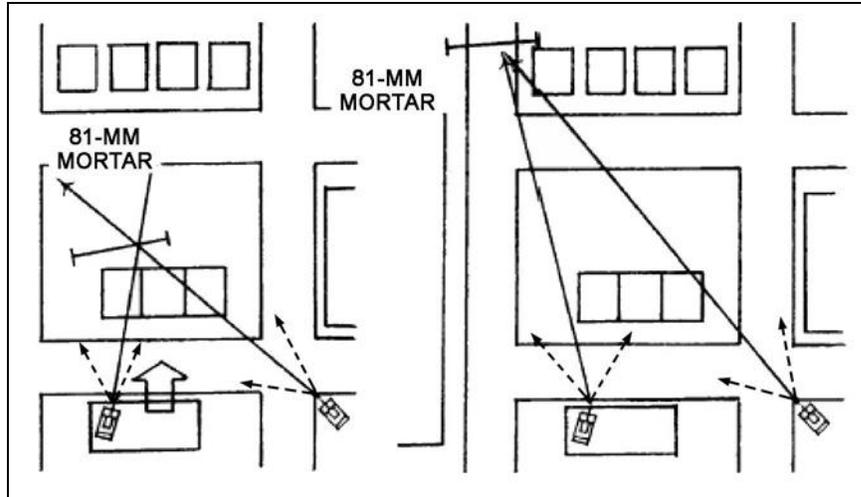


Figure E-7. Isolation of a building and shifting of fires.

E-8. DEFENSIVE TASKS

In the defense, Infantry soldiers in the BFV platoon will defend just like a light infantry platoon. The following are typical defensive tasks given to a BFV crew or section in the defense:

- a. Provide fire support for dismounted elements and mutual support to other BFVs.
- b. Destroy enemy armored vehicles and direct fire artillery pieces.
- c. Destroy or make enemy footholds untenable by fire using the 25-mm gun.
- d. Provide rapid, protected transport for organic rifle teams or other Infantry elements.
- e. Reinforce threatened areas by movement through covered and concealed routes to new firing positions.
- f. Provide mutual support to other antiarmor fires.
- g. Provide a mobile reserve and counterattack force.
- h. Provide resupply of ammunition and other supplies to the Infantry.
- i. Evacuate casualties, prisoners, and noncombatants.

NOTE: Weigh the overall value of the BFV to the defense against the need to resupply or to evacuate casualties.

E-9. DEFENSIVE PLAN

The BFVs are integrated into the company team defensive fire plan. The 25-mm gun and 7.62-mm coax machine gun fields of fire cover streets and open areas; TOWs are used to cover armor avenues of approach. Once placed in position, BFVs should not be moved for logistical or administrative functions. Other vehicles should accomplish these functions, when possible.

a. **Positioning of BFVs and Weapons.** Once the company team commander gives the BFV platoon leader his mission, the platoon leader will position his BFVs and dismounted element. Dismounted machine guns should be positioned to have grazing fire. For the coax machine gun to have grazing fire, the BFV must be in a hull-down position. BFVs are assigned primary, alternate, and supplementary positions. ATGMs

should be positioned on upper stories for longer range and to permit firing at the tops of armored vehicles. These positions should permit continuous coverage of the primary sectors and all-round defense.

b. **Engagement Ranges.** Due to the close engagement ranges on urban terrain, the 25-mm gun and 7.62-mm coaxial machine gun are used more than ATGMs. Short ranges degrade the BFV's own antiarmor capability, so they must rely instead on Dragons, Javelins, and AT4s (Figure E-8). ATGM and AT positions should be placed where they can support the BFV but must not attract enemy attention to the BFV location. Dragons, Javelins, and AT4s are much more effective against the flanks, rear, and tops of enemy armored vehicles and should be positioned to attack those areas. TOWs are also employed against enemy armored vehicles, however, minimum arming distances and back blast areas should always be taken into consideration during employment.



Figure E-8. Position of AT4 supporting BFV.

NOTE: TOWs cannot be dismounted. Company team commanders must determine which weapon will work most effectively against the threat he is anticipating. Ideally, the BFV should be positioned to take advantage of all the weapons on the vehicle.

c. **Integration of Fires.** All of the BFV's crew-served weapons are integrated with the rest of the company team's weapons and assets. The positions are recorded on a company sector sketch and forwarded to battalion.

E-10. BRADLEY TABLE IIA, BRADLEY CREW URBAN EXERCISE

The BCUE introduces crews to stationary and moving BFV engagements in an urban environment. This table develops the driving skills of the driver in built up areas while

the crew engages targets typically found in UO operations. Crews engage stationary and moving LTID-equipped panel targets (when available) from a moving and stationary MILES or PGS-equipped BFV. Frontal stationary targets may be used if moving targets are not available or the UO site is not equipped with moving targets. The BCUC consists of 5-day engagements and 5-night engagements (see table below). Scaled targets may be used however full-scale targets are recommended. OPFOR may be used when UO facilities are not equipped with full-scale targets. Figure E-9, page E-12, shows day and night engagements for BT IIA.

a. **Task.** Engage and destroy stationary and moving targets from a stationary and moving BFV during the day and night.

b. **Conditions.** Given a MILES or PGS equipped BFV, suitable UO environment with LTID equipped targets, during the day and night.

c. **Standards.** The crew must achieve a minimum of a "P" rating on 7 of the 10 engagements, with 2 of the 7 being night engagements. They must not engage any friendly or noncombatant targets.

d. **TDRS Cards.** If OPFOR is used with BFVs that have PGS, then TDRS cards must be programmed for "Force on Force."

BRADLEY TABLE IIA, DAY ENGAGEMENTS		
BFV	CONDITIONS	TARGET TYPE AND POSTURE
Stationary	Gunner, ISU or IBAS (Hunter-Killer)	HE Moving, Coax Point (RPG Rooftop), Coax Point (Sniper Window)
Moving	Gunner, ISU or IBAS (Hunter-Killer)	AP Moving, Coax Point (RPG Rooftop)
Moving	Commander, CSE or RBD	No Fire (friendly or noncombatant), Coax Point (Sniper Window)
Stationary	Gunner, Auxiliary Sight	AP Stationary, Coax Point (Sniper Window)
Stationary	Gunner, ISU or IBAS	HE Stationary (Bunker), Coax Area (Rooftop)
BRADLEY TABLE IIA, NIGHT ENGAGEMENTS		
BFV	CONDITIONS	TARGET TYPE AND POSTURE
Moving	Gunner, ISU or IBAS (Hunter-Killer)	AP Stationary, Coax Point (RPG Rooftop)
Stationary	Gunner, NBC (Hunter-Killer)	HE Moving, Coax Area (rooftop), Coax Point (RPG Rooftop)
Moving	Commander, CSE or RBD	HE Stationary (bunker), Coax Point (Sniper Window)
Stationary	Gunner, ISU or IBAS	No Fire (friendly or noncombatant), Coax Point (RPG Rooftop)
Stationary	Gunner, ISU or IBAS	AP Moving, Coax Point (Sniper Window)

Figure E-9. BT IIA, day and night engagements.

NOTE: The target types shown in parentheses are included to help units develop scenarios. They may use any type of target, as long as it falls into the target category shown. Also, resources permitting, they may substitute moving targets for stationary targets.

E-11. TIMING MATRIXES

The matrixes in Figure E-10 show target threat times.

LIGHTLY ARMORED AND UNARMORED VEHICLES				
Range (Meters)	Normal (Seconds)	One Condition (Seconds)	Two Conditions (Seconds)	Three Conditions (Seconds)
< 50	7	8	12	13
50	8	9	13	14
100	9	10	14	15
200	10	11	15	16
300	10	11	15	16
DISMOUNTED TROOPS				
< 50	4	6	9	NA
50	5	7	10	NA
100	6	8	9	NA
200	7	9	12	NA

Figure E-10. Timing matrixes for various targets.

E-12. SCRIPT AND SCENARIO

The script should support an overall scenario. An example scenario to help crews understand the importance of situational awareness might have a BFV platoon attached to a light infantry company. The BFVs support the light infantry company from the South using their dismounted element as local security for their vehicles. The light infantry company maneuvers from the Northwest to seize a foothold on the city. Before conducting this table, the leader should give the crew an OPORD and a map of the urban environment with the buildings numbered.

a. **Engagement 1.** Assault elements are maneuvering towards Building C1. Orient your fires on Buildings A6, C2, D1, and D2. Report when set.

b. **Engagement 2.** Assault elements have secured C1 and are maneuvering towards C2. Orient your fires on the rooftop of C2 and on Buildings A6, D1, and D2.

E-13. EXAMPLE MAP HANDOUT

On this handout, buildings are numbered, and main roads are marked with road dividers, but alleys and small roads are unnumbered and otherwise unmarked (Figure E-11, page E-14).

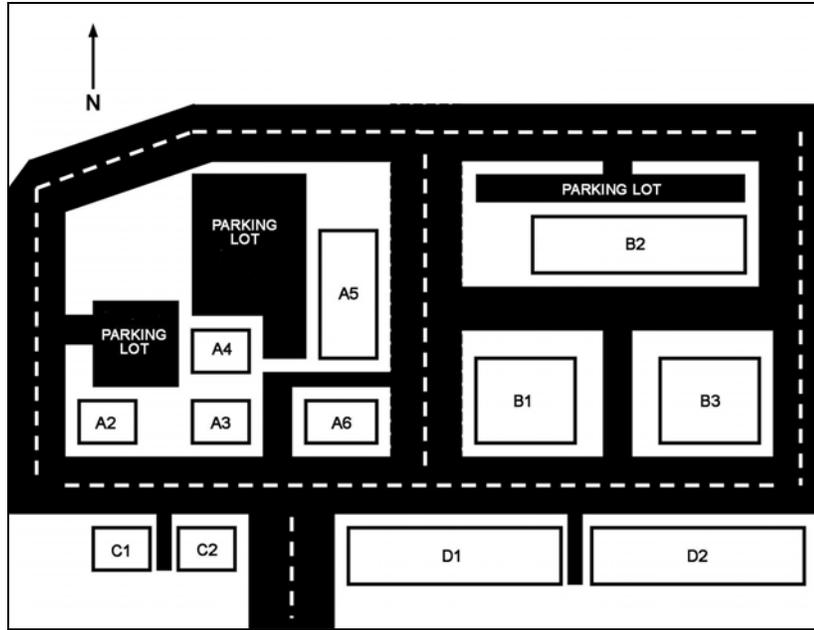


Figure E-11. Diagram of urban area.

E-14. BRADLEY TABLE IIIA, BRADLEY INFANTRY SQUAD OR SECTION URBAN EXERCISE

As the name implies, the Bradley Infantry squad or section urban exercise (BISSUE) integrates the performance of squad or section collective tasks by the dismounted element with the mounted element in an urban environment. Urban operation drills develop in mounted and dismounted personnel and crews the basic task-integration skills needed in BISSUE. Leaders develop the BISSUE scenario to support their training for UO. All squad and section members participate in a realistic exercise scenario. In this scenario, they must conduct battle-focused squad or section collective tasks, which integrate the following at a minimum. For this table, units may use OPFOR equipped with MILES (recommended), or targets equipped with LTIDS (Figure E-12):

a. Crew Drills.

- (1) Dismount the vehicle.
- (2) Mount the vehicle.
- (3) (Fire team member) load the 25-mm ammunition ready box (HE or AP).
- (4) (Fire team member) reload a TOW launcher.

b. Battle Drills.

- (1) Enter building.
- (2) Knock out bunkers.
- (3) Conduct initial breach of a mined wire obstacle.
- (4) Clear a room.

c. **Tasks.**

- (1) (BFV) perform overwatch/support by fire.
- (2) Clear restricted terrain.

BRADLEY TABLE IIIA, DAY ENGAGEMENTS		
BFV	CONDITIONS	TARGET TYPE AND POSTURE
Moving	Gunner, ISU or IBAS (Hunter-Killer)	AP stationary, coax point (RPG rooftop)
Stationary	Gunner, NBC (Hunter-Killer)	HE moving, coax area (rooftop), coax point (RPG rooftop)
Moving	Commander, CSE or RBD	HE stationary (bunker), coax point (sniper window)
Stationary	Gunner, ISU or IBAS	No fire (friendly or noncombatant), coax point (RPG rooftop)
Stationary	Gunner, ISU or IBAS	AP moving, coax point (sniper window)

Figure E-12. BT IIIA, day engagements.

NOTE: The target types shown in parentheses are included to help units develop scenarios. They may use any type of target, as long as it falls into the target category shown. Also, resources permitting, they may substitute moving targets for stationary targets.

E-15. EXAMPLE FIRE COMMANDS

Leaders must have the flexibility and capability to place direct fire from BFVs on key targets throughout combat operations.

a. Figure E-13, page E-16, provides the command for the dismounted leader to call for BFV direct fire.

b. Figure E-14, page E-16, provides the command for the BC to identify the enemy and clear fire with the dismounted leader.

Squad or Team Leader's Alert	"C23, HE"
Direction	"On my tracer-laser" <i>or</i> "Building 23, I-J, A3"
Description of target	"Enemy sniper"
Range	"200 meters"
Method of Fire (manipulation and rate of fire)	"Single shot"
BC confirmation	"Identified"
SL's command to commence firing	FIRE

Figure E-13. Leader's calls for direct fire.

BC's Alert	"Identified sniper"
Direction	"On my laser" <i>or</i> "Building 23, I-J, A3"
Range	"200 meters"
Method of fire (manipulation and rate of fire)	"Permission to engage with single-shot high explosive"
SL's confirmation	"Friendlies clear, engage"
BC's command to commence firing	ON THE WAY

Figure E-14. Bradley commander's identification of an enemy target.

APPENDIX F

Rifle Infantry Training

This appendix provides information for developing rifle infantry training programs. ARTEP 7-7J-Drill provides the tasks, conditions, and standards. Training must be battle-focused and challenging and must emphasize rifle infantry skills. Rifle infantry training must start with the individual soldier and progress through fire team, squad, and platoon.

F-1. CONSIDERATIONS

Tough standards help build rifle infantrymen who can win on the battlefield. Leaders and trainers should review their training responsibilities for planning and execution in FM 3-90.1. When conducting rifle infantry training, they must consider--

- a. **Fundamentals.** Shoot, move, communicate, sustain, and secure.
- b. **Simplicity.** Ensure proficiency in basics before moving to more complex tasks.
- c. **Prerequisites.** Certify crew and battle drills before executing collective live-fire tasks.
- d. **Realism.** Expose leaders and soldiers to unexpected and challenging situations--good and bad ones.
- e. **Conditions.** Replicate battlefield conditions for live-fire training.
- f. **Risk.** Assess risk before training.
- g. **Evaluations.** Conduct AARs as part of training.

F-2. WEAPONS AND EQUIPMENT

Weapons and equipment training consists of preliminary weapon training and qualification. All squad members must establish their proficiency with their assigned weapons and equipment before moving on to collective task training.

F-3. PRELIMINARY WEAPONS TRAINING

During preliminary weapons training, squad members learn and demonstrate their proficiency in disassembly, assembly, PMCS, and operation of their weapons along with all other squad equipment. Preliminary weapons training covers the following weapons and equipment:

- M16A2 rifles.
- M203 grenade launchers.
- M249 light machine guns.
- M240B machine gun.
- M47 Dragon or Javelins.
- Night vision devices.
- Mines and demolitions.
- Squad communication equipment.

F-4. WEAPONS QUALIFICATION

Leaders evaluate squad members' individual proficiency in using their assigned weapons every six months, during weapon qualifications. (For detailed training strategies, see the applicable weapon FMs and DA Pam 350-38.)

F-5. MOVEMENT TRAINING

During movement training, rifle infantrymen train and rehearse individual, buddy-team, fire-team, squad, and platoon movement formations and techniques. Movement training begins with individual and buddy-team movement techniques. Once individuals and buddy teams demonstrate their movement proficiency, leaders establish fire team and squad formations. Squad members train in movement techniques after all of the squad members have gained confidence in their individual abilities to move in fire team and squad formations. All squad members must know arm-and-hand signals. Platoons engage in movement training after squads achieve movement proficiency.

F-6. INDIVIDUAL AND BUDDY TEAM MOVEMENT

Squad and team leaders control and lead by example. They direct rifle infantrymen to move by the best method for the situation. In an assault, this movement may be by crawling or by short rushes from cover to cover. A high or low crawl is slow but may be necessary when cover and concealment are limited. Soldiers use short three- to five-second rushes when cover and concealment are available and the volume of enemy fire is low enough to allow brief exposure. Soldiers must look for the next covered position before moving away from their firing positions. When they move, they use the best covered routes available.

a. Individual movement training should include high and low crawl techniques, the difference between cover and concealment, and short rush techniques (Figure F-1). FM 21-75 explains the proper movement techniques. Squad leaders can designate a lane through various types of terrain and have soldiers move from one end to the other. Squad leaders should evaluate the soldiers' performance based on the use of cover and concealment, length of exposure to enemy fire, and speed of movement. As soldiers master these basic skills, leaders can add challenges with natural or manmade obstacles or add the use of MILES with a single enemy soldier at the far end of the lane. The squad member must negotiate the lane without taking enemy fire.

b. Buddy-team movement training builds on individual movement skills by having two-man teams negotiate the lane together. One soldier provides covering fire while his buddy moves to the next covered position. The team must maintain visual or audible communication with each other at all times during the movement. This exercise forms the foundation for trust and confidence between fire team and squad members. They should conduct this exercise before they execute battle-drill training. Figure F-2 shows an example individual or buddy team movement exercise lane, with the numbers representing the order of movement. The following text exemplifies an individual or buddy-team movement exercise:

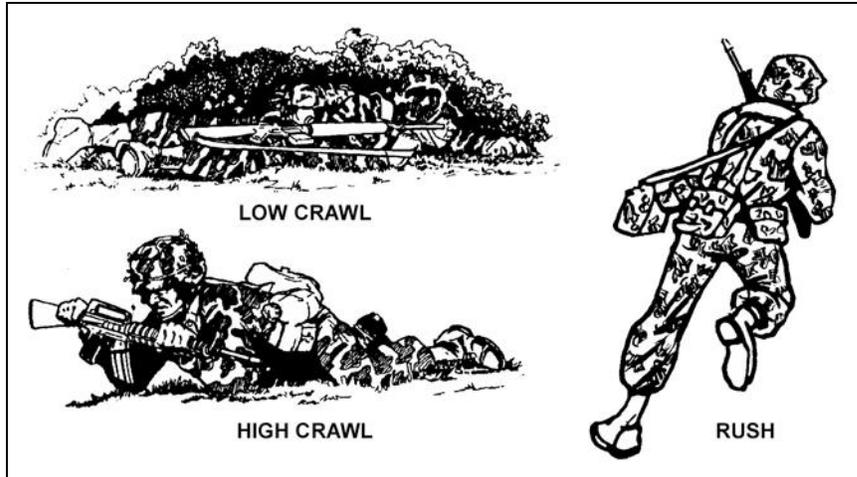


Figure F-1. High and low crawl (L) and rush (R).

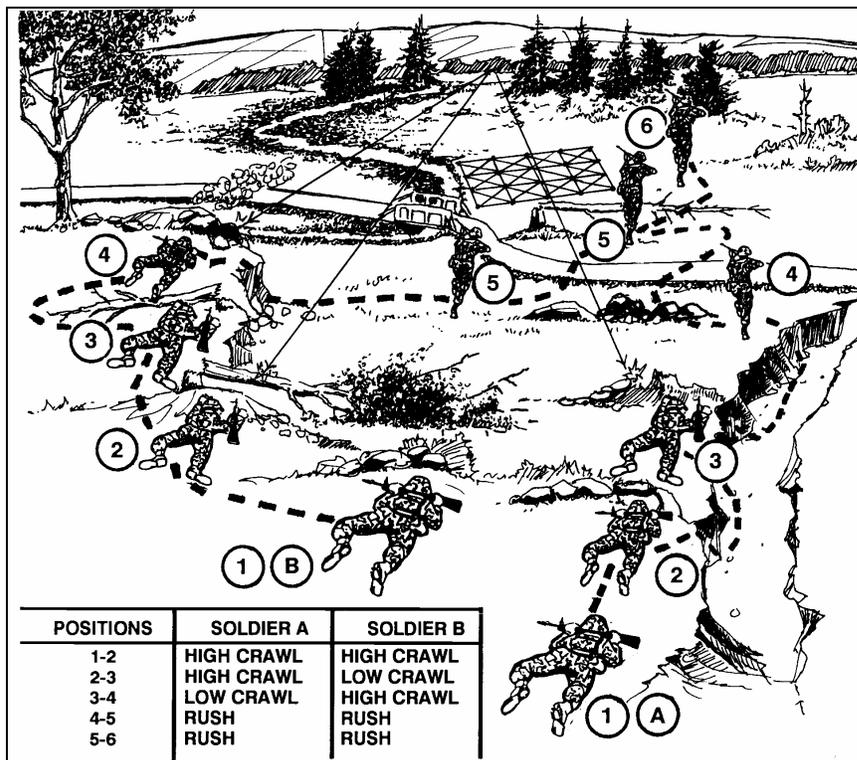


Figure F-2. Example individual or buddy team movement lane.

(1) Squad leaders should select a course area with various types of cover and concealment to allow the soldier to choose the best positions and routes. The soldier's or team's movement and coordination are evaluated by the performance measures in STP 21-1-SMCT, Task 071-326-0502.

(2) The squad leader or team leader conducts precombat checks to ensure that each soldier has the correct equipment and ammunition before starting the course. The soldier or team occupies prone positions at the start of the course, and the team leader tells them to move.

(3) Soldiers search the terrain to the front for enemy activity, select their next position, and choose a route that has the most cover and concealment.

(4) The soldier quickly moves along the route with the least exposure to enemy fire. He masks his fire and does not cross in front of his buddy. The soldier uses the appropriate individual movement technique (Figure F-3).

RUSH	HIGH CRAWL	LOW CRAWL
<ul style="list-style-type: none"> • Crossing open areas. • Low volume of enemy fire allows brief exposure. • Time is critical. 	<ul style="list-style-type: none"> • The route provides good cover and concealment. • Poor visibility reduces enemy observation. • Enemy fire prohibits rushing but speed is required. 	<ul style="list-style-type: none"> • The route provides cover and concealment less than one-foot high. • The enemy has good observation and can effectively fire at the position. • Speed is not required.

Figure F-3. Movement techniques.

(5) This process continues until the soldier closes with and kills the enemy soldier. If the enemy kills the soldier, the process starts again. Commanders can add situations to this course to make the soldier execute other individual tasks such as some from STP 21-1-SMCT. For example--

(a) The soldier can move over, through, or around a wire or log obstacle (Task 071-326-0503) while negotiating the course.

(b) Squad or team leaders can throw artillery simulators during daylight exercises or flares during night operations and evaluate the soldier's ability to react to indirect fire (Task 071-326-0510) or flares (Task 071-326-0511).

(c) Once the soldier closes with the enemy, he can use hand grenades (Task 071-325-4407) to knock out the enemy position. Once the enemy is killed or withdraws, the soldier should prepare and report enemy information (Task 301-348-1050) in the SALUTE report format.

(d) At the end of the mission, the soldier moves back to the start point (which can simulate friendly lines) and is challenged by the next soldier. Leaders grade both soldiers on use of a challenge and password (Task 071-331-0801).

F-7. FIRE TEAM, SQUAD, AND PLATOON MOVEMENT

Fire team, squad, and platoon movement training consists of movement formations and techniques. Formations are the arrangement of squad members in relation to each other. Movement techniques are the ways in which squads and platoons traverse terrain.

a. **Movement Formations.** Formations provide control, flexibility, and security. Leaders choose formations based on METT-TC. Leaders position themselves in the best position to control movement. Team leaders' positions are in front of their teams. All members must maintain positions that allow them to see their leader and to receive signals. Leaders change formations as needed, depending on terrain and visibility. They assign each team member a different sector of responsibility to guard while moving. This provides the formation with all-round security.

(1) **Fire Team Formations.**

(a) *Wedge.* The *wedge formation* (Figure F-4) is the basic formation for fire teams. The interval between soldiers in a wedge expands or contracts depending on terrain or visibility.

(b) *File.* The fire team uses the *file formation* (Figure F-5) when terrain precludes use of the wedge.

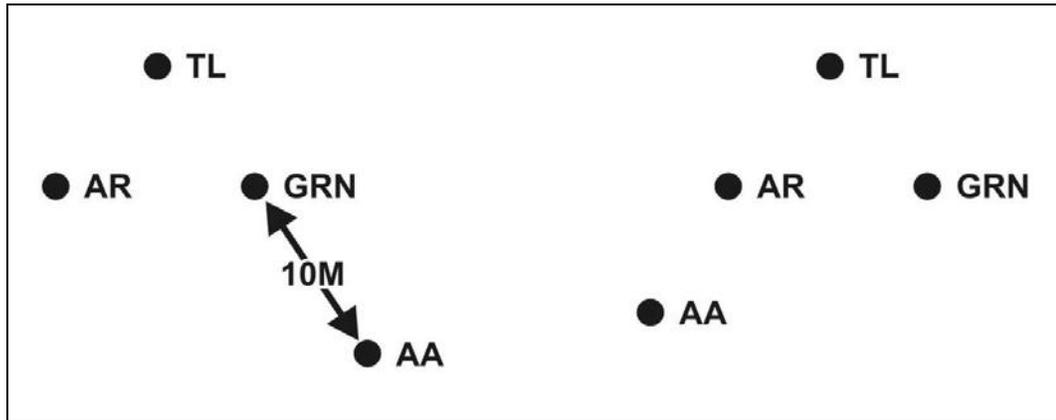


Figure F-4. Fire team wedge formation.

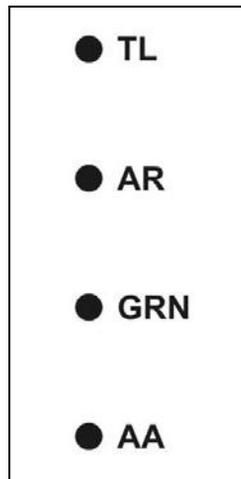


Figure F-5. Fire team file formation.

(2) **Squad Formations.**

(a) *Column.* The squad's basic formation is the column (Figure F-6, page F-6). It provides good dispersion laterally and in depth without sacrificing control, and it facilitates maneuver.

(b) *Line.* The squad line provides maximum firepower to the front (Figure F-7, page F-6).

(c) *File.* The squad uses the squad-file formation in restrictive terrain (Figure F-8, page F-7). To better control the formation, the squad leader can place himself in the first or second position. From there, he can make key decisions quickly. Moving a team leader to the rear can provide additional control of the rear of the formation.

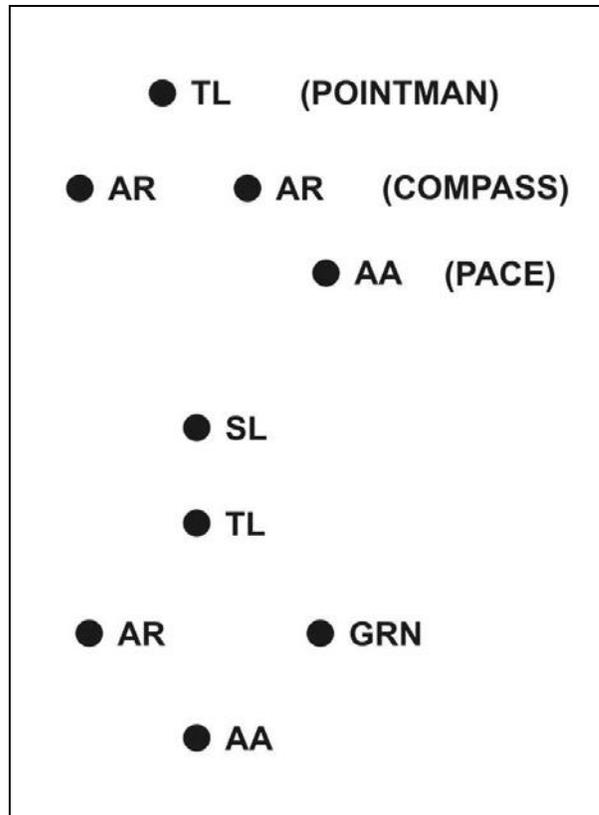


Figure F-6. Squad column formation.



Figure F-7. Squad line formation.

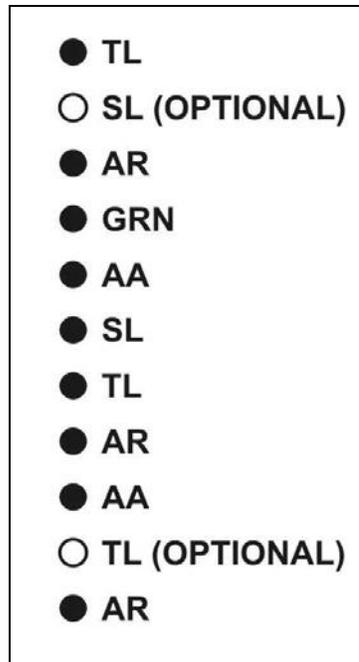


Figure F-8. Squad file formation.

(3) ***Platoon Formations.***

(a) ***Column.*** The platoon uses the column as its primary formation (Figure F-9, page F-8). This formation can deliver a limited volume of fire to the front and a high volume to the flanks.

(b) ***Line.*** The line formation allows the platoon to deliver the greatest amount of fire to its front (Figure F-10, page F-8).

b. **Movement Techniques.** Squads and platoons use three basic movement techniques: *traveling*, *traveling overwatch*, and *bounding overwatch*. They select a movement technique based on the likelihood of enemy contact and on the need for speed. In deciding, they consider such factors as control, dispersion, speed, and security.

(1) ***Traveling.*** The squad or platoon uses *traveling* (Figure F-11, page F-9) when contact with the enemy is not likely and they need speed.

(2) ***Traveling Overwatch.*** The squad or platoon uses *traveling overwatch* (Figure F-12, page F-9) when contact with the enemy is possible. Traveling overwatch resembles the traveling technique, except with greater distance between the lead fire team or squad and the remainder of the element.

(3) ***Bounding Overwatch.*** The squad or platoon uses *bounding overwatch* (Figure F-13, page F-9) when they expect contact with the enemy. This is the slowest movement technique, but it provides the most security.

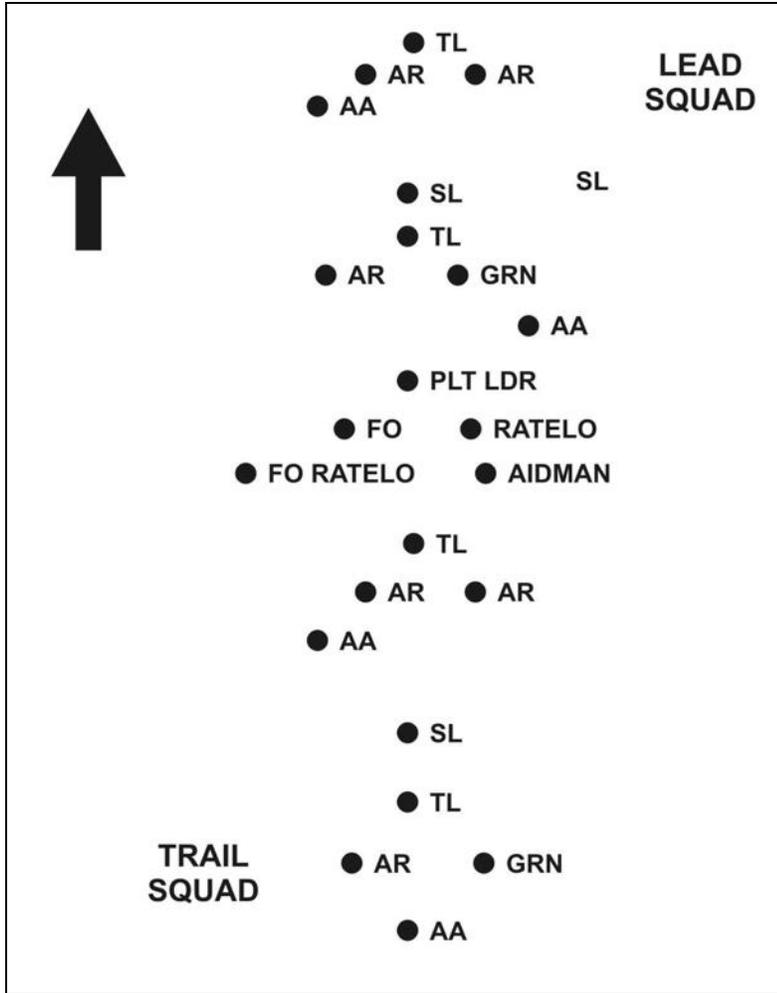


Figure F-9. Platoon column formation.

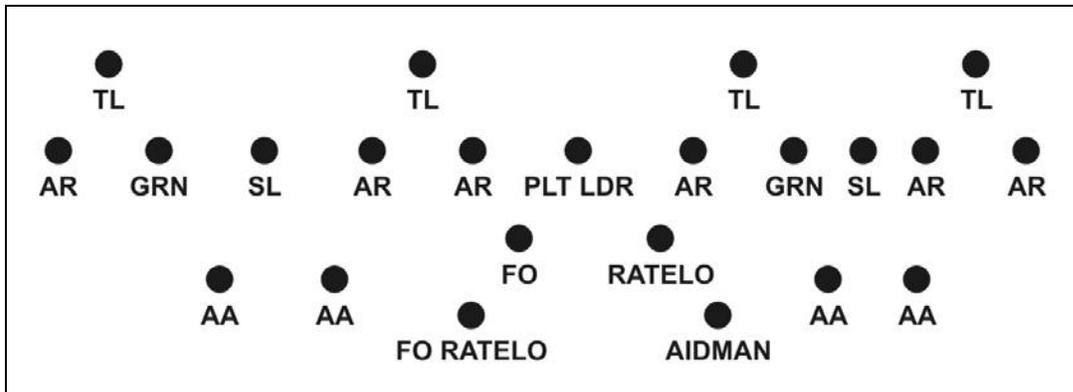


Figure F-10. Platoon line formation.

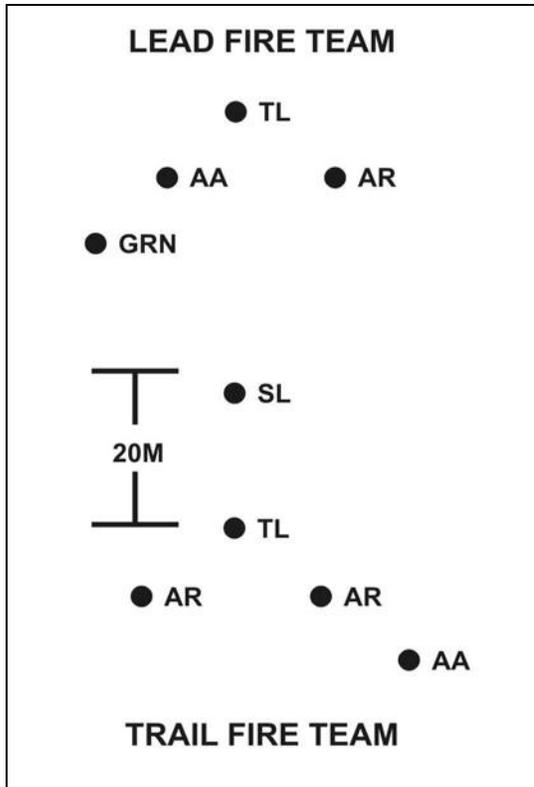


Figure F-11. Traveling movement technique.

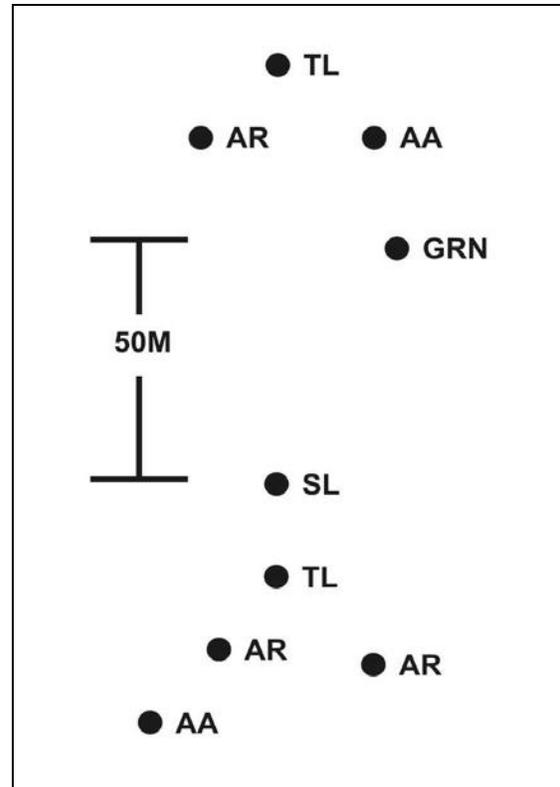


Figure F-12. Traveling overwatch movement technique.

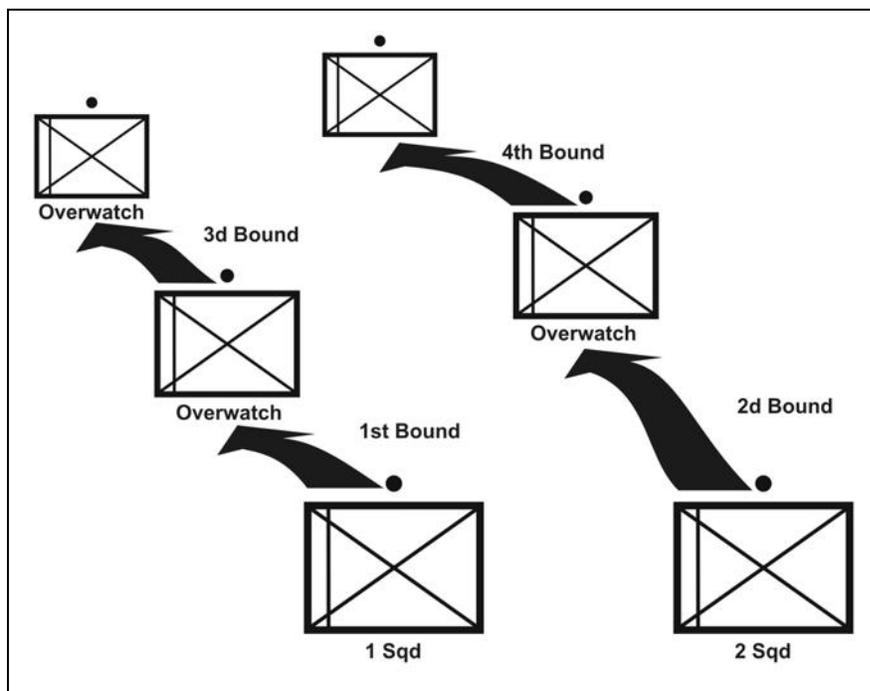


Figure F-13. Bounding overwatch movement technique.

F-8. SQUAD OR PLATOON SITUATIONAL TRAINING EXERCISE

STXs are short, scenario-driven tactical exercises that train a single collective task or a group of related battle drills and collective tasks. Chapter 4 of ARTEP 7-8-MTP explains how to develop, resource, train, and evaluate an STX.

a. Commanders must develop a graphical scenario of task performance to fit the exercise. In the scenario, the commander must place all rifle infantry critical collective tasks that support his METL and need improvement in a logical sequence. Figure F-14 shows an example task-performance scenario.

b. After drawing the graphical scenario, leaders must list each event in sequence and indicate the time required for each event. The leader adds all event times to determine the overall time required to complete the STX. Trainers use this overall time as a guide for planning purposes only, not as a training standard. Figure F-15, page F-12, provides an example sequence of events and times for the STX.

c. Trainers match the events on the list with the corresponding T&EOs in ARTEP 7-8-MTP. They do this to identify support requirements, prepare evaluation packets, and develop an OPORD or scenario that leads the squad or platoon through each of these collective tasks.

(1) Trainers review each T&EO to determine the support requirements for each event within the STX. These requirements include personnel, vehicles, ammunition, training aids, and training devices for friendly and OPFOR units. Trainers determine the consolidated support requirements for the STX by totaling these requirements for each event. Training managers must coordinate for and request these items early to ensure that they are available.

(2) Leaders prepare evaluation packets by copying and sequencing the T&EOs. The T&EOs form the framework of a collective task. The commander expands each T&EO by adding performance measures and details that tailor it to his unit and specific mission. This helps the evaluator record key training points during the STX execution. The evaluation packet should also contain the exercise scenario, the OPORD, any administrative instructions, and critical safety information.

(3) Commanders prepare orders that match the scenario. This procedure requires some imagination to present a realistic situation to the squad or platoon conducting the STX. A basic OPORD should provide the necessary information to start the exercise. Commanders can assess the squad's or platoon's flexibility by issuing FRAGOs during the exercise.

(4) Trainers must conduct an AAR so they can give the unit performance-oriented training feedback. The evaluator or controller uses the AAR to tell a story about what they had planned for the exercise. The soldiers and leaders discover for themselves what actually happened, why it happened, and what they could have done better. They usually conduct informal AARs at the crew, squad, and platoon levels.

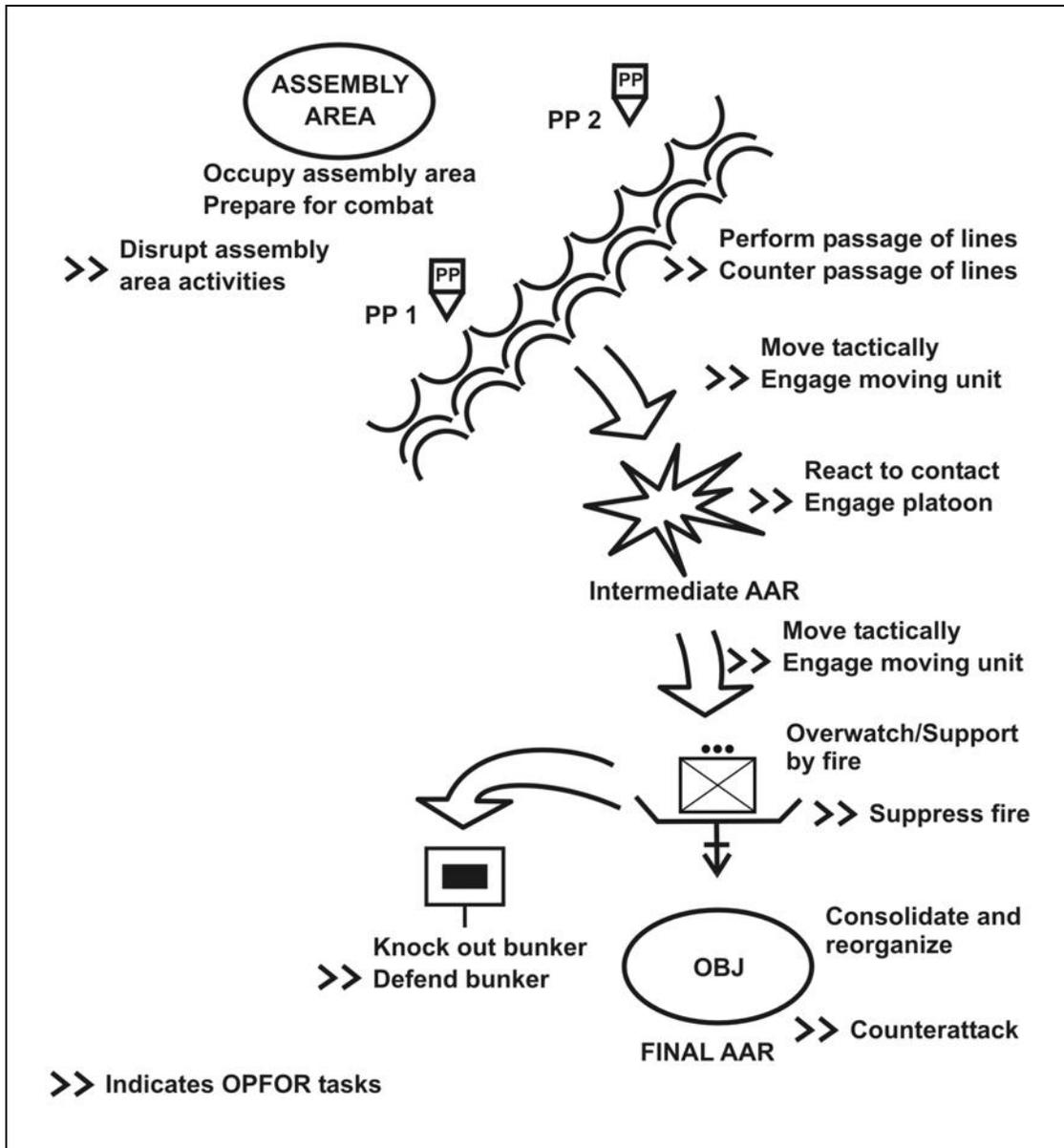


Figure F-14. Graphic scenario of task performance.

EVENT	ACTION	ESTIMATED
1	Occupy Assembly Area	1 Hr
2	Prepare for Combat	2 Hr
3	Perform Passage of Lines	30 Min
4	Move Tactically	1 Hr
5	React to Contact	5 Min
6	Intermediate AAR	20 Min
7	Move Tactically	1 Hr
8	Overwatch/Support by Fire	2 Hr
9	Knock Out Bunker	2 Hr
10	Consolidate and Reorganize	1 Hr
11	Final AAR	45 Min
*	Maintain Operational Security	
** Total Time: 11 hours		
* These tasks are integrated and evaluated throughout the exercise.		
** Additional time is required if great portions of the exercise are conducted at night or during other limited visibility.		

Figure F-15. Sequence of events and times for STX.

F-9. SQUAD OR PLATOON LIVE-FIRE EXERCISES

Live fire must replicate battlefield conditions. Squad and platoon LFXs develop confidence and esprit while reinforcing soldier, leader, and unit discipline. Rifle squad and platoon LFXs are the culmination of separate rifle infantry STX training. Live-fire exercises are critical for preparing soldiers and units for the danger, confusion, and speed of combat operations. External evaluators should critique the LFX and give the commander a critical assessment of the squad or platoon's performance of the critical combat tasks that support the company METL.

a. **Exercise Development.** The principal focus of LFXs is weapons integration in a tactical operation. Squads and platoons must learn the procedures to command, control, and distribute well-aimed, effective fires, including small arms, indirect fire support assets, and other weapons, demolitions, and pyrotechnics.

(1) The commander and S3 determine which ARTEP 7-8-MTP rifle infantry operations will be evaluated based on METL and command guidance (movement to contact, attack, raid, ambush, reconnaissance and security, defend, retrograde, or various combinations of these). The S3 selects subtasks within these operations for the platoon or squad to execute.

(2) The S3 and S2 select enemy target arrays that the infantry squad or platoon can expect to see in combat. These rifle infantry target arrays are developed based on threat analysis and command emphasis. Enemy scenarios must include M16A2, M249, M203, AT4, and Dragon or Javelin targets.

(3) The S3 develops an exercise scenario in which the squad or platoon conducts tactical tasks in a maneuver area and live-fire tasks mixed with tactical tasks on the range.

Higher prepares an operation order, which provides all the tactical information and supports the execution of the exercise, and gives it to the unit.

(4) Commanders must include night and NBC conditions into scenarios. Soldiers should wear the man-worn MILES laser detector harnesses equipment (not weapons transmitters), which allows the controller to cause a near miss or to kill personnel for tactical errors or to induce stress. Combat service support (casualty evacuation and resupply) can be added to the scenario.

b. **Prerequisites.** The crew must meet the following prerequisites before the LFX:

(1) Each soldier must have qualified with his individual weapon (M16A2, M203, M240B, and M249) within the previous 6 months.

(2) Dragon gunners must have certified with the Dragon within the past 3 months.

(3) Squads must have completed a squad LFX within the past 6 months before a platoon LFX.

c. **Standards.** Each MTP operation and subtask has established maneuver and live-fire standards. These standards are in ARTEP 7-8-MTP. Trainers use the T&EOs and the rifle infantry penalty matrix from ARTEP 7-7J-MTP to evaluate the squad or platoon. Units are given a rating of trained, needs practice, or untrained. Squads and platoons must achieve a trained or needs practice rating to receive a GO on the LFX.

d. **Example Squad LFX Scenario.** The tasks cited in this paragraph are all from ARTEP 7-8-MTP. Figure F-16, page F-14, shows an example squad LFX task list.

(1) The squad occupies a tactical assembly area (Task 7-3/4-1022) and prepares for combat operations (Task 7-3/4-1046). The platoon leader gives an operation order in which the squad moves as part of the platoon (simulated) along a specified route in a rifle infantry movement to contact.

(2) The squad moves tactically (Task 7-3/4-1025), performs a passage of lines (Task 7-3/4-1040), and receives fire from a three-man enemy ATGM position. The squad executes the React to Contact battle drill (Battle Drill 2 from ARTEP 7-7J-Drill), then assaults (Task 7-3/4-1001) to destroy the enemy (Figure F-15, Event 1).

(3) The squad provides the platoon leader a SITREP and continues to move. The squad makes contact with an enemy combat reconnaissance outpost consisting of several troops and a reconnaissance BTR. The squad leader reports contact and the platoon leader orders the squad to engage (Figure F-15, Event 2).

(4) The platoon leader orders the squad to continue to move. The squad receives fire from a bunker. The lead fire team provides suppressive fire while the trail fire team maneuvers to assault the enemy position from the flank. The squad knocks out the bunker (Task 7-3/4-1012) and engages the enemy vehicle and troop targets in the enemy main defensive belt (Figure F-15, Event 3).

(5) The squad leader continues to clear the objective and the enemy withdraws. The squad consolidates and reorganizes on the position (Task 7-3/4-1047). The squad prepares a hasty defensive position (Task 7-3/4-1021) to prepare for a counterattack.

(6) The squad defends against an enemy platoon's counterattack. The squad can call for and adjust indirect fire (Figure F-15, Event 4).

(7) The squad repels the counterattack and is ordered to disengage (Task 7-3/4-1008). The mission is complete.

F-10. SAMPLE RIFLE INFANTRY TRAINING PROGRAM

Units must develop training programs that train and evaluate infantry squads and platoons. Successful training programs use the individual tasks that serve as building blocks to support identified collective tasks. Collective tasks build upon each other: beginning with fire team, then squad, and finishing with platoon collective tasks. The rifle infantry squad-training program must parallel the mounted element's training. This gets them both prepared to take part in integrated training at the prescribed times. These building blocks also provide an organized method to plan, resource, and manage the program. Leaders will find tasks, conditions, and standards in the following manuals--

- STP 21-1-SMCT.
- STP 7-11BC24-SM-TG.
- ARTEP 7-8-MTP.
- ARTEP 7-7J-Drill.

F-11. PRELIMINARY TRAINING

Preliminary training consists of movement training, weapons training, equipment training, and qualification. Weapons and equipment training and qualification are the rifle infantry element's equivalent to the mounted element's BGST.

TASK	TARGET ARRAY	RANGE	AMMUNITION	STANDARDS
1. Engage target with small-arms weapons.	Enemy ATGM team (3 IRETS)	200 to 400 M	30 5.56 (each M16A2) 5 (each M249)	Hit 1 target within 20 seconds.
2. Engage target with small-arms weapons (use AT-4).	Enemy squad (-) dug in as combat outpost (5 IRETS)	300 to 500 M	30 5.66 (each M16A2) 3 40-mm (each M203) 100 (each M249)	Hit 2 targets within 20 seconds.
	One BTR-60	600 M	2 9-MM or MILES	Kill target IAW applicable threat-based timing matrix.
3. Engage targets with small-arms weapons.	Enemy platoons (21 IRETS) in prepared positions	100 to 150 M	60 5.56-mm (each M16A2) 3 40-mm (each M203) 100 (each M249)	Hit bunker with effective weapon system.
Engage targets with AT-4.	Two BMPs	400 M	2 9-MM or MILES	Kill targets IAW applicable threat-based timing matrix.
4. Engage targets with small-arms weapons.	21 IRETS	600 to 800 M	90 5.56-mm (each M16A2)	Hit 4 targets within 20 seconds at each range band.
	11 to 14 IRETS	300 to 400 M	50 (each M249)	
	7 to 9 IRETS	100 M	5 40-mm (each M203)	
Engage targets with AT-4.	Two BMPs	One at 500 M One at 400 M	4 9-mm or MILES	Kill targets IAW applicable threat-based timing matrix.
Engage target with Dragon or Javelin.	One flank BMP	800 to 1,000 M	1 Dragon or Javelin (MILES).	Kill target IAW applicable threat-based timing matrix.

Figure F-16. Example squad LFX (day).

F-12. MOVEMENT TRAINING (TABLES 1 -- IV)

Rifle Infantry Tables I through IV train soldiers in infantry movement.

a. **Rifle Infantry Table I, Individual or Buddy-Team Movement Exercise.** DT I trains and evaluates individual and buddy-team movement techniques. Tasks evaluated include--

- (1) *Individual.* Move Under Direct Fire (071-326-0502).
 - (a) High crawl.
 - (b) Low crawl.
 - (c) Rush.
- (d) Select Temporary Fighting Positions (071-326-0513).

(2) *Buddy Team.*

- (a) Move Over, Through, or Around Obstacles (Except Minefields) (071-326-0503).
- (b) React to Indirect Fire while Dismounted (071-326-0510).

b. **Rifle Infantry Table II, Fire Team Movement Exercise.** DT II trains and evaluates a fire team's ability to move tactically. Tasks evaluated include--

- (1) Move as a Member of a Fire Team (071-326-0510).
- (2) Control Movement of a Fire Team (071-326-5605).
- (3) Conduct the Maneuver of an M2 BFV Section/Squad (071-420-0007-A).

c. **Rifle Infantry Table III, Squad Movement Exercise.** DT III trains and evaluates a squad's ability to use movement techniques. Tasks evaluated include--

- (1) Conduct maneuver of a squad (071-326-5611).
- (2) Select an overwatch position (071-326-5606).

d. **Rifle Infantry Table IV, Platoon Movement Exercise.** DT IV trains and evaluates a platoon's ability to use movement techniques. Tasks evaluated include--

(1) Conduct Movement Techniques by an M2 BFV Dismount Platoon (071-326-5910-A).

- (2) Conduct the maneuver of a platoon (071-420-0005).

F-13. DEVICE TRAINING (TABLES VI -- VIII)

These firing tables train infantry squads and platoons to use devices. Device training (DT) consists of infantry squad and platoon STXs. These STXs in turn consist of infantry squad battle drills and collective tasks. STXs either use MILES equipment in a force-on-force mode, or they use MILES LTID targetry. Although these are rifle infantry exercises, while operating in assembly areas, the unit should provide the squad or platoon with Bradleys. This ensures realistic training in assembly area procedures.

a. **Table VI--Squad Practice.** DT VI allows squads to practice troop-leading procedures, reactions to contact, and an antiarmor ambush. Although this is a day exercise, the squad may conduct it again at night (Figure F-17).

b. **Table VII--Squad Certification.** DT VII evaluates the rifle infantry squad's conduct of tactical tasks, day and night (Figure F-18, page F-18).

c. **Table VIII--Platoon Certification.** DT VIII evaluates the rifle infantry platoon's conduct of tactical tasks, day and night (Figure F-19, page F-19).

F-14. LIVE-FIRE TRAINING (TABLES XI -- XII)

Live-fire training consists of infantry squad and platoon LFXs. The LFXs combine battle drills and collective tasks conducted on live-fire ranges. Live-fire training includes two rifle infantry qualification firing tables, XI (squad) and XII (platoon).

a. **Rifle Infantry Table XI, Squad Qualification.** DT XI evaluates the infantry squad's ability to conduct live fire, tactical tasks during day and night (Figure F-20, page F-20).

b. **Rifle Infantry Table XII, Platoon Qualification.** DT XII evaluates rifle infantry platoon's ability to conduct live fire, tactical tasks during day and night (Figure F-21, page F-21).

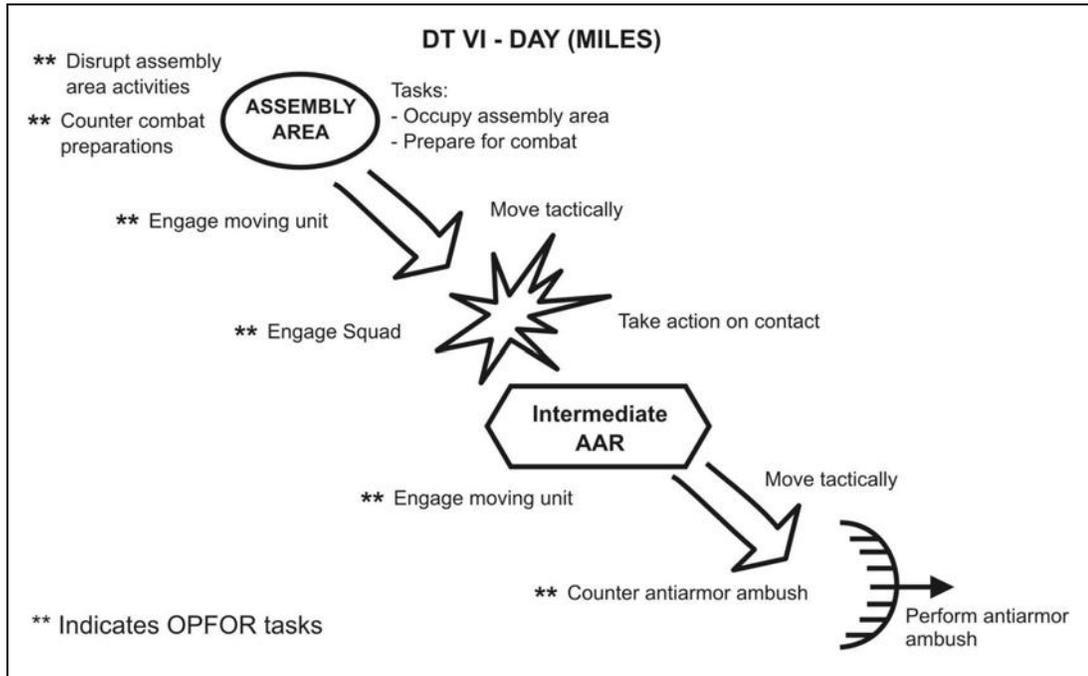


Figure F-17. Squad practice (Table VI).

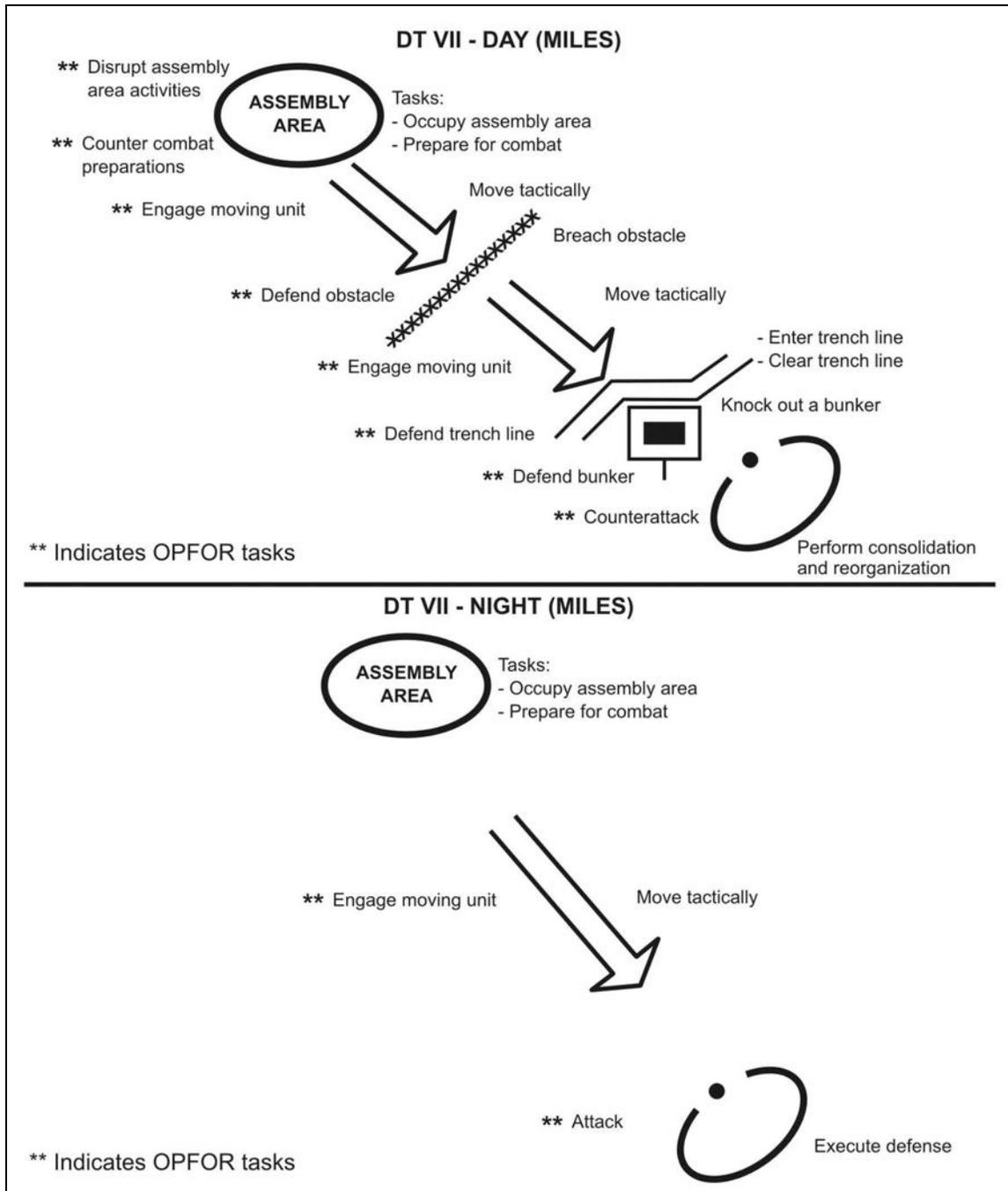


Figure F-18. Squad certification (Table VII).

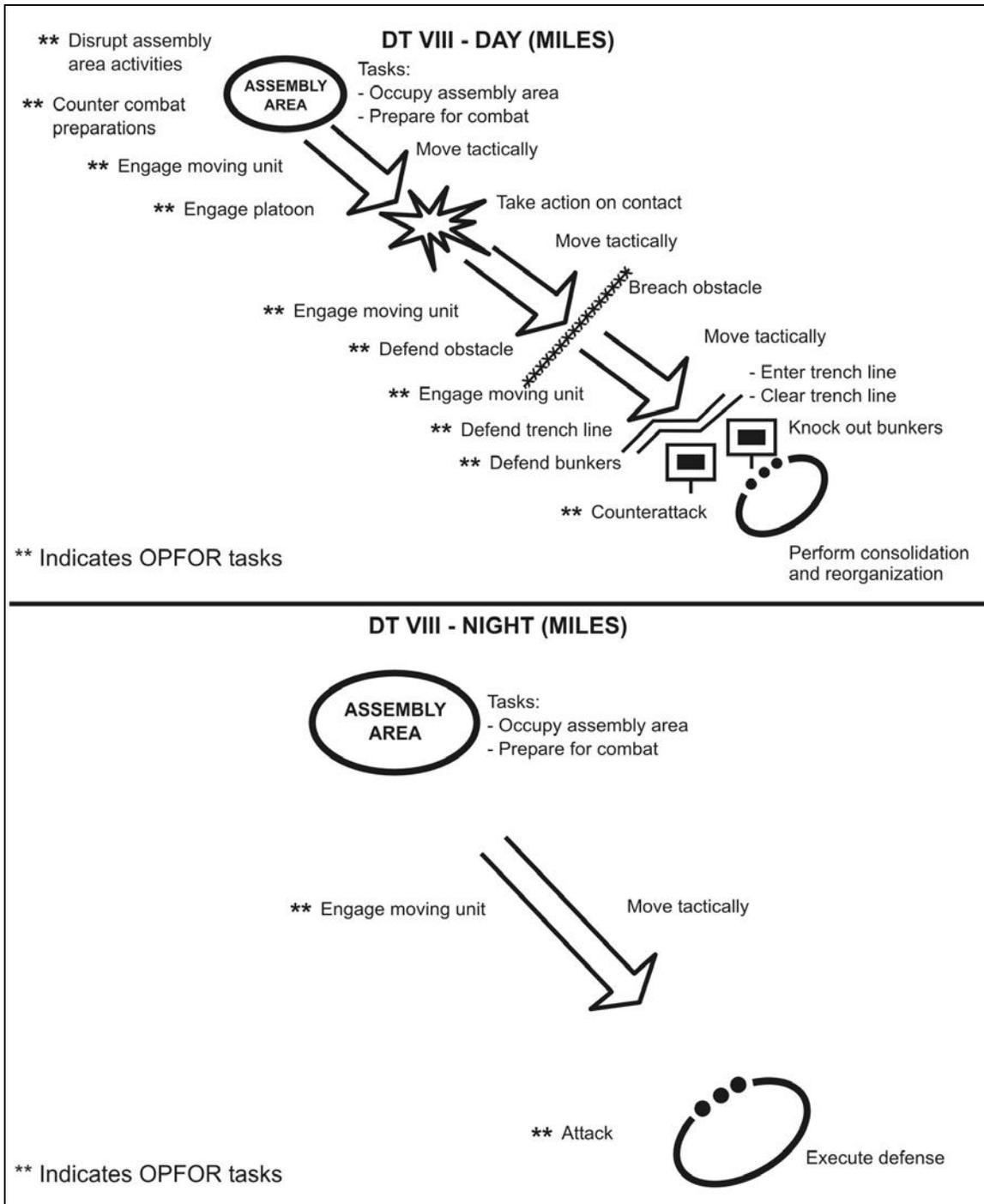


Figure F-19. Platoon certification (Table VIII).

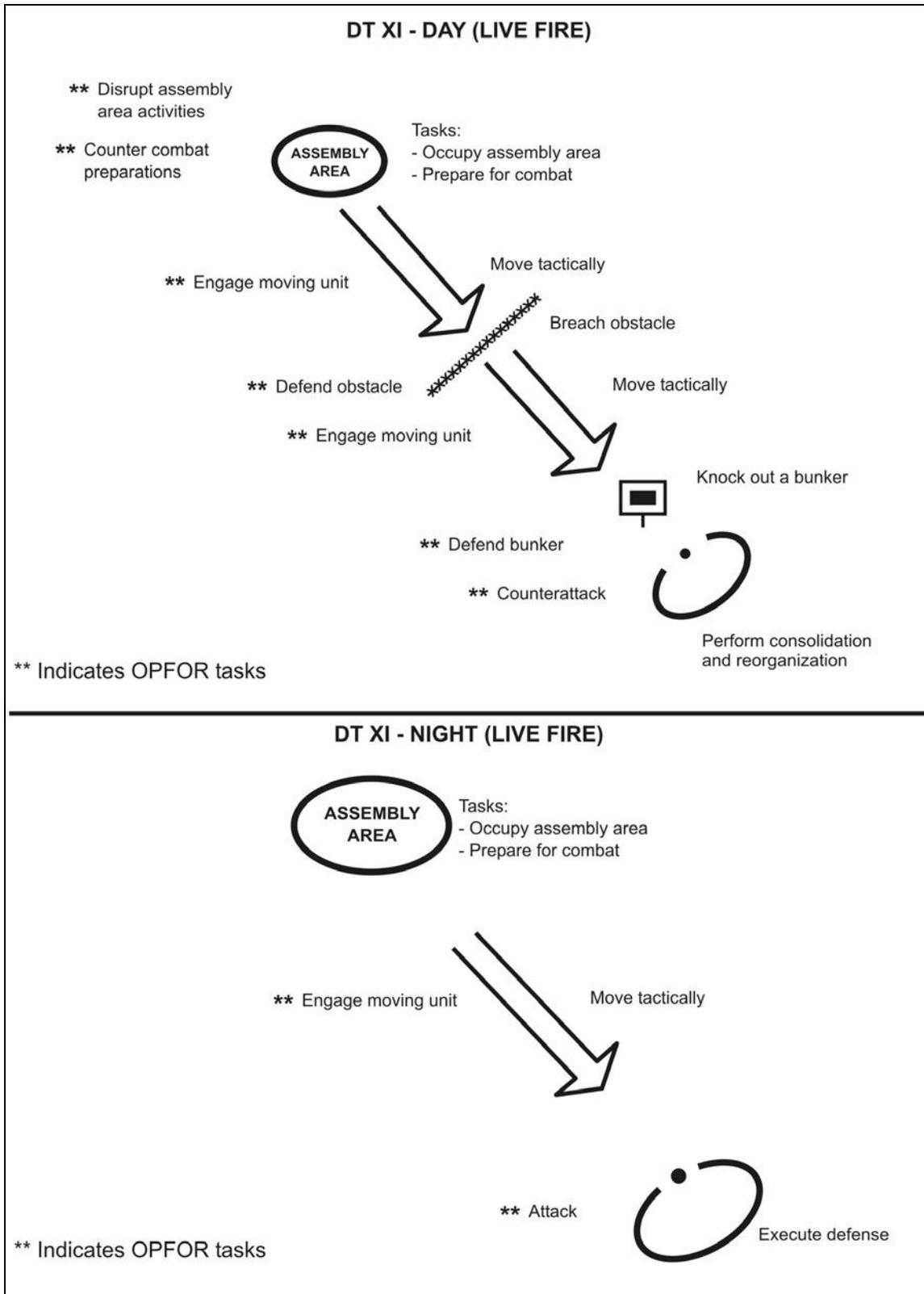


Figure F-20. Squad qualification (Table XI).

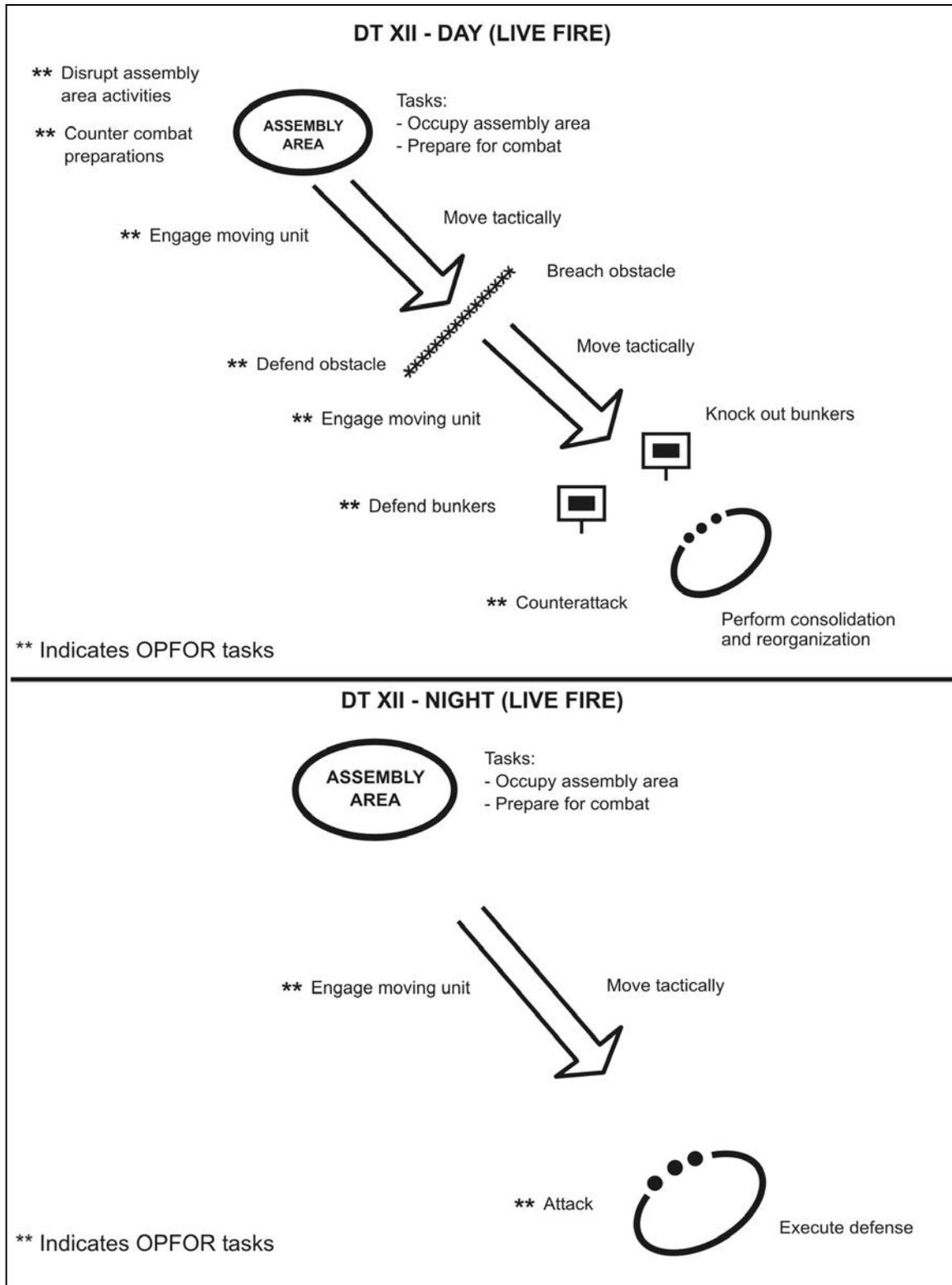


Figure F-21. Platoon qualification (Table XII).

Glossary

AAR	after-action review
ABFIST	advanced Bradley full-crew interactive-simulation trainer
AC	active component
ACE	armored combat earthmover
admin	administrative (graphics only)
AD	air defense
ADA	air defense artillery
ADR	air-defense reticle
ammo	ammunition (graphics only)
amp	ampere (graphics only)
annunciator	one that annunciates; specifically, a usually electrically controlled signal board or indicator
AP	armor piercing
APC	armored personnel carrier
APDS-T	armor-piercing discarding sabot with tracer
APFSDS-T	armor-piercing, fin-stabilized discarding sabot with tracer
APFT	Army Physical Fitness Test
AR	automatic rifleman
ARTEP	Army Training and Evaluation Program
ATGM	antitank guided missile
ATT	aided target-tracker
autogyro	a freely rotating rotor for lift
aux	auxiliary (graphics only)
AVLB	armored vehicle-launched bridge
az	azimuth (graphics only)
BATS	Bradley advanced training system
BC	Bradley commander
BCE	Bradley crew evaluator
BCPC	Bradley Crew Proficiency Course
BD	biocular display
BFV	Bradley fighting vehicle
BFIST	Bradley fire support team
BGM	basic guided missile
BGST	Bradley Gunnery Skills Test
BISSUE	Bradley Infantry squad or section urban exercise
BIT	built-in test
BMP	a light armored vehicle made by the former Soviet Union
BOT	burst on target
BPI	bolt position indicator
BPPC	Bradley Platoon Proficiency Course
BRDM	a scout car made by the former Soviet Union
BSFV	Bradley Stinger fighting vehicle

BSS	ballistic solution software
BSSE	Bradley squad or section exercise
BT	Bradley table
BTR	a light armored vehicle made by the former Soviet Union
C3I	command, control, communications, and intelligence
CALFEX	combined arms live-fire exercise
C2	command and control
C3	command, control, and communications
CBLS	combat lifesaver
CCTT	close-combat tactical trainer
cdr	commander
CDT	control display terminal
CEV	combat engineer vehicle
CFT	captive flight trainer
CFV	cavalry fighting vehicle
CGE	command-guidance electronics
CGF	computer-generated force
CGUN	control gun
CHS	commander's handstation
CIP	combat identification panel
CIV	commander's independent viewer
CM	cruise missile
CMTC	Combat Maneuver Training Center
co	company (graphics only)
coax	coaxial
COFT	conduct of fire trainer
commo	communication
COMSEC	communications security
contingent	dependent on or conditioned by something else
contingency	something liable to happen as an adjunct to or result of something else
CP	control panel
CPU	computer processing unit
CS	combat support
CSCP	commander's sight control panel
CSE	commander's sight extension
CSIC	crew station-interface computer
CSS	combat service support
CTC	Combat Training Center
CTD	commander's tactical display
CTT	common task test
CVC	combat vehicle crewman (helmet)
DA	Department of the Army
DCGE	digital command guidance electronics

DCS	digital compass system
def	defense (graphics only)
DEROS	date eligible for return from overseas
DH/DR	the amount of change occurring in height for each 100 meters of change in range
DIFCUE	direct or indirect-fire cue [simulator]
DIVARTY	division artillery
DMPRC	digital multipurpose range complex
DoD	Department of Defense
DODAC	Department of Defense ammunition code
DR/DSE	the amount that range changes for each 1 mil of change in superelevation
DT	device training
DTG	date-time group
DTV	day television
DU	depleted uranium
DVE	driver's vision enhancer
DVO	direct-view optics
EBFV	engineer Bradley fighting vehicle
EIB	expert infantryman badge
el	elevation (graphics only)
ELRF	eye-safe laser range finder
EOD	explosive ordnance disposal
EPLRS	Enhanced Position-Location Reporting System
F	Fahrenheit
FAAD	forward area air defense
FAASV	field artillery armored support vehicle
FBCB2	Force (XXI) battle command brigade and below
FCS	fire-control system
FCSW	fire-control software
FFE	fire for effect
FFCS	full-function crew station
FH/M	frequency hopping/master
FL	forward looking
FLIR	forward-looking infrared radar
flt	fault
FM	fire mission
FO	forward observer
forwarder	(25-mm machine gun) an internal piece of the feeder (top half of the weapon) that pushes the rounds into position.
FOV	field of view
FPS	feet per second
FPW	firing port weapon
FR	fire request

FSSO	fire-support station operator
FT	firing table
FTX	field training exercise
fuse	a wick-type detonating device that, when lit by a match or other means, sets off the bursting charge of a projectile, bomb, or torpedo
fuze	a mechanical or electrical detonating device that sets off the bursting charge of a projectile, bomb, or torpedo
GHS	gunner's handstation
gnr	gunner (graphics only)
GPS	global positioning system
gren	grenadier (graphics only)
gripstock	the interface between gunner and missile
GSCP	gunner's sight control panel
GSR	ground surveillance radar
GTA	graphic training aid
gunnery	the use of guns; the science of the flight of projectiles and of the effective use of guns.
G/VLLD	ground/vehicle laser locator designator
HB	handbook
HE	high explosive
HEI	high-explosive incendiary
HEI-T	high-explosive incendiary with tracer
HEMTT	heavy expanded-mobility tactical truck
HET	heavy equipment transporter
Hind	a helicopter made by the former Soviet Union
HMMWV	high-mobility, multipurpose, wheeled vehicle
hotbox	a box containing rounds of linked ammunition
hp	horsepower (graphics only)
hr	hour (graphics only)
HSG	home station gunnery
HTU	handheld terminal unit
Hz	hertz
IAW	in accordance with
IBAS	improved Bradley acquisition system
IC3	integrated communications, command, and control
IFF	identify friend or foe
IFV	Infantry fighting vehicle
impact	to strike forcefully
in	inch (graphics only)
intravehicular	within a vehicle
intervehicular	between vehicles
INU	inertial navigation unit

I/O	instructor/operator
IOS	instructor/operator station
IPB	intelligence preparation of the battlefield
ICPC	Infantry Crew Proficiency Course
IPPC	Infantry Platoon Proficiency Course
IR	infrared
IRETS	Infantry remoted-target system
ISU	integrated sight unit
ITOW	improved TOW
IUH	instructor utilization handbook
km	kilometer
KPH	kilometer per hour
lase	to emit coherent light; to use a device or weapon that employs a laser light
LAV	light armored vehicle
lb	pound (graphics only)
LCD	liquid crystal display
LCPC	Linebacker Crew Proficiency Course
ldr	leader (graphics only)
LFX	live-fire exercise
LOGPAC	logistics package
LOS	line of sight
LRA	local reproduction authorized
LRF	laser range finder
Lt	lieutenant
LT	Linebacker table
LTID	laser-target interface device
LTTT	Linebacker Tabletop Trainer
LWRS	laser warning receiver system
m	meter (graphics only)
MANPADS	Man-Portable Air Defense System
maximum ordinate	the highest measurement the round will travel above the line of sight, often referred to as "max ord"
MBT	main battle tank
MCD	missile countermeasure device
MCOFT	mobile conduct of fire trainer
MCS	missile control subsystem
MDI	miss-distance indicator
MEL	maximum engagement line
MELIOS	miniature, eye-safe-laser, infrared observation set
MEP	mission-equipment package
METL	mission-essential task list
METT-TC	mission, enemy, terrain, troops and time available, civilians
mi	mile (graphics only)

MILES	Multiple Integrated Laser-Engagement System
mm	millimeter
MOPP	mission-oriented protective posture
MPH	miles per hour
MPRC	multipurpose range complex
MPS	meters per second
msl	missile (graphics only)
MSR	missile simulation round
MTI	moving target indicator
MT-LB	a vehicle made by the former Soviet Union
MTOE	modified table of organization and equipment
MTP	mission training plan
NA	not applicable
NBC	nuclear, biological, chemical
NCO	noncommissioned officer
NCOIC	noncommissioned officer in charge
NFOV	narrow field of view
NSN	national stock number
NTC	National Training Center
obturator	something that closes or blocks an opening
ODS	Operation Desert Storm
ODS-E	Operation Desert Storm with appliqué
O/G	observer grid
OIC	officer in charge
OP	observation post
OPFOR	opposing force
ORD	operational requirements document
OPORD	operation order
orig	original (graphics only)
OTPD	optical turret positioning device
PC	personnel carrier
PCS	permanent change of station
PD	proximity device
PDF	principal direction of fire
PEWS	platoon early warning system
PGS	precision gunnery system
PH	probability of hit
PK	probability of kill
PLGR	precision lightweight GPS receiver
plt	platoon (graphics only)
PMCS	preventive maintenance checks and service
PN	part number
P/O	positioned on

POS-NAV	position-navigation
prox	proximity
psi	pounds per square inch
QDR	quality deficiency report
RATELO	radiotelephone operator
RBD	remote biocular display
RC	reserve component
rds	rounds (graphics only)
REMS	remotely employed sensor
retroreflector	device that reflects radiation (as light) so that the paths of the rays parallel those of the incident rays
RIT	rifle infantry table
RMP	reprogrammable microprocessor
RMS	remote monitoring station
ROE	rules of engagement
RP	reference point
RPG	rocket-propelled grenade
RPVTS	Remotely Piloted Vehicle-Target System
RSO	range safety officer
RSOP	reconnaissance, selection, and occupation of position
rule of thumb	a method of procedure based on experience and common sense; a general principle regarded as roughly correct but not intended to be scientifically accurate
S&A	safety and arming
SALT	size, activity, location, and time
SALUTE	size, activity, location, unit, time, equipment
SCB	system control box
SDU	Stinger distribution unit
sec	second (graphics only)
setback	the distance that a projectile sits behind the nose cap, which allows room for the air to push out the sabots
SHORAD	short-range air defense
SIMNET	simulations network
SIO	senior instructor/operator
SINCGARS	single-channel ground and air radio subsystem
SITREP	situation report
slave	one mechanism directly responsive to, or to make a mechanism directly responsive to, another mechanism
SLD	squad leader's display
SMCT	soldier's manual of common tasks
SOP	standing operating procedures
SPC	special-purpose computer
SPOT	

SS	single shot
STC	slew-to-cue
STRAC	Standards in Training Commission
STX	situational training exercise
superelevate	to increase the vertical distance between two objects; to add elevation
SVM	Stinger vision module
SVML	Stinger vehicle-mounted launcher
T&EO	training and evaluation outline
TAS	target-acquisition system
TBOS	tracer burst obscuration simulator
TDA	table of distribution and allowances
TDIP	training device interface panel
TDRS	Training Data Retrieval System
TDS	turret drive system
THT	tracking heat trainer
TL	team leader
tm	team (graphics only)
TOT	tracer on target
TOW	tube-launched, optically-tracked, wire guided
TPDS-T	target practice discarding sabot with tracer
TP-T	target practice with tracer
TPU	trained, needs practice, or untrained
TRP	target reference point
TSCP	targeting-station control panel
TSV	through-sight video
TWGSS	Tank Weapons Gunnery Simulator System
UAV	unmanned aerial vehicle
UCOFT	unit conduct of fire trainer
ULT	unit laser transmitter
uncage	to free from a container or a restraint
US	United States
UV	ultraviolet
VMS	vehicle motion sensor
way point	an intermediate point on a route or line of travel
WCB	weapons control box
WFOV	wide field of view
WRP	weapon reference point
wt	weight (graphics only)
ZSU	a vehicle made by the former Soviet Union

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Index

- 1-1000 boresight telescope, B-3, B-4
(*illus*)
- 25-mm gun, 6-17
- access doors, 2-5
- acquisition report. *See* target acquisition.
- active component (AC), 3-4, 3-24
- adapter, boresight, B-2
- adapter template, 25-mm, B-18
- adjustment of fire, 2-19, 3-5, 3-13, 5-3, 6-11, 6-29
- aerial targets, 6-42
- direct fire, 6-32
- kinematic lead, 6-34
- advanced gunnery, 13-3
- aerial targets, 6-42, 6-49 (*illus*), 11-3
- after-action review (AAR), 4-1, 4-6, 5-6, 5-12 (*illus*), 7-2, 8-20, 9-16, 10-3, 10-10, 11-6, 13-4, F-1, F-10, F-12 (*illus*)
- aided target-tracker (ATT), 6-49, 6-50 (*illus*)
- air defense, 6-16
- air defense training, 11-1, 11-6, 11-7.
See also aerial targets.
- aircraft. *See* aerial targets.
- air-defense artillery (ADA), 3-1, 6-53, 7-1, 8-28 (*illus*), 8-38 (*illus*), 8-42 (*illus*), 8-46 (*illus*), 11-1, 11-2 (*illus*), A-56. *See also* firing tables.
- air-defense reticle (ADR), 6-49 (*illus*)
- alert terms, 6-52
- alibis, 8-17
- ammunition, 2-13
- aerial target, 6-45 (*illus*)
- allocations, 3-11
- commands, 6-52, 6-53 (*illus*)
- annunciator, 6-65, 7-14
- antipersonnel (AP), 2-1, 4-14, 6-15, 6-26, 6-51, 6-67, 7-32, 8-3, 8-23, 8-30 (*illus*), 8-35 (*illus*), 8-37 (*illus*), 9-18 (*illus*), 9-24 (*illus*), 9-25 (*illus*), 12-4, A-6, B-32, C-1, D-2, D-3 (*illus*)
- antitank guided missile (ATGM), E-5, E-9, F-13
- appended equipment, 4-1
- area targets, 6-37, 6-38 (*illus*)
- armament. *See* weapon (by model number).
- armored equipment, A-59
- armored personnel carrier (APC), 6-8, 6-15, A-56
- armored vehicle kill standards and indicators, 6-51
- Army Physical Fitness Program (APFT), 3-6
- Army Training and Evaluation Program (ARTEP), 3-6
- Army Universal Task List (AUTL), 11-5
- auxiliary sight, 6-15
- avoidance of fratricide. *See* safety.
- azimuth indicator, 7-21, 7-22 (*illus*)
- backblast, 2-8, 2-9 (*illus*)
- ballistic
- battlecarry, 6-27, 6-28 (*illus*)
- firing table, 5-14
- solution software (BSS), 6-33
- battle focus, 3-4
- battlesight gunnery, 6-27, 6-56
- biocular display, 6-9
- boresighting, B-1
- Boresight Telescope Accuracy Test.
See forms.
- Bradley, A3. *See* M2A3 or M3A3.
- Bradley Advanced Training System (BATS), 3-6, 4-9 (*illus*), 7-16
- Bradley commander, 2-4, 3-1, 4-11, 5-6, 5-20, 6-2, 6-6 (*illus*), 6-10, 6-57, 6-58 (*illus*), 6-65, 6-74 (*illus*), 7-2, 7-22, 7-38, 8-12, 8-20, 9-5, 9-14, A-1, C-1, D-2 (*illus*), D-4, D-6 (*illus*), E-3, E-8, E-16
- Bradley crew evaluator (BCE), 1-6, 8-3, 8-9, 8-12, 8-20, 9-17

- Bradley Crew Proficiency Course (BCPC), 3-2, 3-6, 8-26, 8-30 (*illus*), 13-2
- Bradley Crew Scoresheet. *See* forms.
- Bradley Crew Urban Exercise (BCUE), BT IIA, E-10, E-12 (*illus*)
- Bradley fire-support team (BFIST), 1-7, 4-19, 13-1 (*illus*). *See also* M6. evaluation, 3-1, 3-4, 13-1, 13-3 (*illus*) firing table. *See* firing tables.
- Bradley firing tables, ix
- Bradley Gunnery Skills Test (BGST) Scoresheet. *See* forms.
- Bradley Infantry squad or section urban exercise (BISSUE), 3-14, 3-15 (*illus*)
- Bradley Platoon Proficiency Course (BPPC), 12-5
- Bradley squad or section exercise (BSSE). *See* firing tables.
- Bradley Stinger fighting vehicle (BSFV), 8-7, 11-1
- breach, E-1, E-2 (*illus*)
- built-in test (BIT), 1-4, 2-3
- burst on target (BOT), 6-32, 6-33 (*illus*)
- captive flight trainer (CFT), 4-2 (*illus*), 4-7 (*illus*)
- Cavalry. *See also* firing tables. fighting vehicle (CFV), 1-1 section gunnery, 10-1, 10-7 (*illus*), 10-13 (*illus*), 10-14 (*illus*)
- choke sight, 6-14
- choked hull, 6-18 (*illus*)
- circle value, 7-23, 7-26 (*illus*)
- classification of targets, 6-23
- clock method of target detection, 6-9
- close-combat tactical trainer (CCTT), 4-10, 4-11 (*illus*)
- coaxial machine gun. *See* M240C.
- collective training, 3-13
- combat
 - identification panel (CIP), 6-24
 - lifesaver (CBLS), 5-6
 - range. *See* range.
 - service support, 5-20, 9-17, 12-4
 - support, 12-4
 - vehicle crewman [helmet], D-6
- Combat Training Center (CTC), 3-9
- combined arms live-fire exercise (CALFEX), 9-3
- command and control (C2), 1-4, 2-12, 3-13, 6-25, 9-4, 11-5, 12-4, D-6
- command, control, communications, and intelligence (C3I), 1-5, 2-12, 11-2
- commander's
 - assessment, 3-4
 - handstation (CHS), C-2, C-4
 - independent viewer (CIV), 1-3, 6-4, 6-15
 - sight-control panel (CSCP), D-4
 - sight extension (CSE), 6-5, 7-9, 7-12 (*illus*), 8-25, E-12
 - tactical display (CTD), 1-4, 6-16
- command-guidance electronics (CGE), 2-5
- common task test (CTT), 3-6
- communications, A3, 1-4
- communications security (COMSEC), A-61
- computer-generated force (CGF), 4-10
- conduct-of-fire trainer (COFT), 3-2, 4-8 (*illus*), 7-16
- contingency
 - area(s) of operations, 8-1, 9-10, 12-1
 - missions, 8-31, 11-1, 13-1
 - plans, 3-4, 9-5, 13-9
- control display terminal (CDT), 1-5, 7-17
- crew duties
 - defense, 6-64 (*illus*)
 - offense, 6-71, 6-74 (*illus*)
- crew gunnery, 8-1, 8-33, 8-35 (*illus*), 8-48 (*illus*)
 - drills, 3-6
 - levels, 3-13
 - preliminary, 3-1
 - stability, 3-9
 - tables, ix
 - training plans, 3-10
- cruise missile, 2-12
- DA Forms. *See* forms.
- Daily Staff Journal or Duty Officer's Log. *See* forms.
- danger close, E-5

- data set, 5-20
- date eligible for return from overseas (DEROS), 3-10
- Day TV, 6-4, 6-16, 6-50
- dead space, 7-22, 7-29 (*illus*)
- decision process, 6-25
- defense, 6-13, 10-4, 13-6 (*illus*).
See also Man-Portable Air Defense System.
 air, 1-5, 2-12, 11-1
 crew, 3-13
 prepared, 6-61
 range cards, 7-21
 self-, 1-7, 13-5
 task organization, 9-4
 threat, F-13
 TOW, E-9
 urban operations, E-9
- defensive
 driving, 3-2
 engagement, 6-64, 8-10, 10-6
 exercise, 3-6, 7-8, 13-2
 plan, E-9
 position, 5-8, 6-2, F-13
 techniques, 8-15
- defilade positions, 8-12
- degraded mode, 1-4
- Department of Defense ammunition code (DODAC), B-27
- depleted uranium (DU), 2-18
- detailed search, 6-3
- detection devices. *See* target detection.
- device gunnery, 3-2, 3-13, 4-1, 9-3, 13-2
- digital
 base station, 5-20
 command guidance electronics (DCGE), 2-5
 compass system (DCS), 1-1
 early-warning data, 1-5
 map, 1-4
 range card overlay, 7-35
- direct fire. *See* fire.
- direction and deflection, 6-53, 7-33
- direct-view optics (DVO), 1-3
- discarding sabots, 2-14
- discrimination. *See* target discrimination.
- divided sector search, 6-6 (*illus*)
- division artillery (DIVARTY), 13-1
- driver's vision enhancer (DVE), 1-3
- duds, 2-10
- dummy rounds, 4-13, 4-14 (*illus*)
- elevation, 7-34 (*illus*)
- engagement, 6-1 (*illus*). *See also* target acquisition.
 commands, 6-52
 crew duties in, 6-64
 decision process for, 6-25
 defensive, 6-64
 execution of, 6-27, 6-51 (*illus*)
 Linebacker, 8-10
 of paratroopers, 6-48 (*illus*)
 offensive, 6-71
 parameters, 4-9
 techniques, 6-28
- Engineer section and platoon training, 12-1, 12-5
- Enhanced Position-Location Reporting System (EPLRS), 1-5
- estimation of range. *See* range estimation.
- explosive ordnance disposal (EOD), 2-10, 7-20
- exposure matrix, 8-3, 8-5, 8-9 (*illus*)
- extended battlecarry, 6-28
- eye-safe laser range finder (ELRF), 1-1, 5-16, 6-28, 6-34, 6-49, 6-52, 7-23, 8-14, 8-24, 13-11, A-48, D-5
- far lead, 6-31 (*illus*)
- field of fire, E-2
- field-expedient, early-warning devices, E-3
- fire commands, 6-60, 6-61 (*illus*), E-15, E-16 (*illus*)
 ammunition, 6-52
 battlesight, 6-56, 6-57 (*illus*)
 elements, 6-62, 6-64 (*illus*)
 infantry platoon and scout section, 6-61
 multiple targets, 6-60, 6-63 (*illus*)
 precision, 6-57, 6-58 (*illus*), 6-59 (*illus*)
 reduced, 6-59
 standardized, 6-62
 subsequent, 6-58

- fire commands (*continued*)
 weapon, 6-60
- fire
 adjustment of, tracer on target, 2-19
 control, A3, 1-4
 delay, 2-6
 direct, adjustment of, 6-32, 7-8, 7-12
 (*illus*)
 for effect (FFE), 13-6
 live, 3-4, 3-13, 3-15 (*illus*), 4-1, 5-3,
 5-12, 7-16, 8-23, 9-3, 9-22, 10-6,
 10-9 (*illus*), 11-1, 13-3, 13-10
 over wires, 2-8
 support team (FIST), 1-7
 suppression system, 1-7
 through concealment, 6-39
 tracer on target, 2-19
- fire-control system (FCS), 6-33
- fire-mission task (FMT), 3-1
- fire-support station operator (FSSO),
 13-11
- firing positions, range card, 7-37
- firing tables, ix
 ballistic, 5-14, 5-15 (*illus*)
- flash-to-bang method. *See* range
 estimation.
- football-field technique, 6-47 (*illus*)
- Force XXI Battle, Command, Brigade,
 and Below (FBCB2), 1-3, 5-20, 6-10,
 6-27, 7-1, 8-20, 8-24, 8-31, 9-23, A-2,
 A-16, A-21, A-27, A-32, A-42, A-61,
 D-4, D-8, E-4
- forms
 DA Form 1594,
*Daily Staff Journal or Duty Officer's
 Log*, 5-3
 DA Form 2408-4,
Weapon Record Data, 3-8, 5-2, 5-5
 DA Form 5517-R,
Standard Range Card, 7-33 (*illus*)
 DA Form 7354-R,
Bradley Crew Scoresheet, 8-17,
 8-18 (*illus*), 8-19 (*illus*)
 DA Form 7522-R,
*Bradley Gunnery Skills Test
 Scoresheet*, A-1, A-3 (*illus*)
- forms (*continued*)
 DA Form 7523-R,
Boresight Telescope Accuracy Test,
 B-11 (*illus*)
 Standard Form 368,
Quality Deficiency Report (QDR),
 B-26, B-29 (*illus*)
- forward area air defense (FAAD), 1-5
- forwarder, A-8, A-19, A-22, A-24, A-26,
 A-27, A-54
- forward-looking infrared radar (FLIR),
 1-3, 6-3
- fratricide avoidance. *See* safety.
- frequency hopping/master (FH/M), 5-20
- full-function crew station (FFCS), D-4
- gap lead, 6-31 (*illus*)
- global positioning system (GPS), 1-1, 1-4
- grid method of target detection, 6-10
- gripstock, 2-23
- ground search techniques, 6-2, 6-4 (*illus*)
- ground surveillance radar (GSR), 13-7,
 E-3
- Guard FIST II Trainer, 13-2
- gunner, range detection by, 6-14, 6-23
 (*illus*)
- gunner's handstation (GHS), C-2, C-3,
 C-4, D-3, D-4
- gunner's sight-control panel (GSCP), C-2,
 C-3 (*illus*)
- gunnery
 battlesight, 6-27, 6-28 (*illus*)
 conditions, 3-14
 crew, 3-1
 densities, 3-13
 gun-lay exercises, 7-2
 levels, 3-13
 precision, 6-28
 preliminary, 7-1
 tables, ix
- handheld terminal unit, 1-6
- helicopters (aerial targets)
- hilly terrain scan, 6-4, 6-5 (*illus*)
- home-station gunnery, 3-13
- horizontal-ranging stadia, 6-16, 6-17
 (*illus*)
- icon management, 5-20

- immediate action, 3-2. *See* weapon by model number.
- integrated training, 3-6
- M172 dummy round (7.62 mm), 4-14
- M794 dummy round (25-mm), 4-14
- missile simulation round, 4-14
- preliminary gunnery, 3-2
- Improved Bradley Acquisition System (IBAS), 1-1, 2-20, 6-4, 6-13, 8-32
- incendiary fire, 6-39
- inertial navigation unit (INU), 1-4
- Infantry gunnery training, 9-2, 9-21
- Infantry Platoon Proficiency Course (IPPC), 9-21
- Infantry Remoted-Target System (IRETS), 8-10, 9-20, F-15
- instructor/operator, 4-9, 7-7, 7-16, 8-20
- integrated command, and control (IC3), 1-3, 7-35, 8-14
- integrated sight unit (ISU), 6-14
- intelligence preparation of the battlefield (IPB), 11-5
- interface electronics assembly, 1-6
- kill standards, 6-50
- kinematic lead, 6-34, 6-37, 6-49
- L8A-series red phosphorus smoke grenade, 2-24
- laser range finder, AN/GVS-5, 6-14
- laser-target interface device (LTID), 4-12 (*illus*), 12-3, E-11
- launcher. *See* TOW.
- leader
 - coordination, 3-3
 - key, 3-9
 - relationship with trainer, 3-8
 - skills, 3-3
- limits, sector, 7-23, 7-25 (*illus*)
- line of sight (LOS), 6-10, B-1
- Linebacker, 1-5
 - Crew Proficiency Course (LCPC), 8-28. *See* firing tables.
 - engagement, 8-10
 - tables. *See* firing tables.
 - Tabletop Trainer (LTTT), 4-12 (*illus*)
- live ammunition, 3-3, 3-6, 4-6, 5-3, 13-2, 13-10, A-6, D-1, F-12, F-17
- live fire, 3-4, 3-13, 3-15 (*illus*), 4-1, 5-3, 5-12, 7-16, 8-23, 9-3, 9-22, 10-6, 10-9 (*illus*), 11-1, 13-3, 13-10
 - device training, 9-3
 - exercise (LFX), F-12, F-15 (*illus*), F-16, F-20, F-21 (*illus*)
 - range, 5-14
- local air-defense warning, 8-10
- location of target. *See* target acquisition.
- logistics package (LOGPAC), 11-5
- M1 Abrams tank, trainer, 4-10 (*illus*)
- M6 (Linebacker, Air Defense BFV), 1-5
- M7 (BFIST), 1-7
- M22 blank firing device, 2-23
- M76 infrared screening grenade, 2-24, 2-25 (*illus*)
- M231 5.56-mm firing port weapon, 2-11 (*illus*), 2-23, 6-42
- M240C 7.62-mm coaxial machine gun, 2-4, 2-5 (*illus*), 2-19, 6-35, 6-36 (*illus*), 6-46, 6-47 (*illus*)
 - aerial targets, 6-46, 6-47 (*illus*)
 - immediate action, A-18
 - misfire, A-18, D-7
- M242 25-mm gun, 2-1, 6-33 (*illus*), 6-34, 6-36 (*illus*)
 - aerial targets, 6-44, 6-49
 - cycle of functioning, 2-2, 2-4 (*illus*)
 - gun reticle, 6-15, 6-17 (*illus*)
 - immediate action, 3-2, A-10
 - kinematic lead, 6-34, 6-38, 6-49
- M257 smoke grenade launcher, 2-11, 2-12 (*illus*), 2-24, 2-25 (*illus*)
 - immediate action, 2-11, 2-12 (*illus*), 2-24 (*illus*), 2-25 (*illus*), D-7
- M2A2 ODS, M3A2 ODS trainer, 5-16
- M2A3 or M3A3 Bradley, 1-3
 - aerial targets, 6-49
 - auxiliary sight, 3-14
 - BATS, 4-9
 - CIV, 6-4
 - CTD, 6-27
 - degraded mode, 3-14
 - digital engagement, 3-1
 - digital maps, 6-13
 - digital zoom, 6-3

- M2A3 or M3A3 (*continued*)
 driver-unit's dual bracket, 4-6
 ELRF. *See* eye-safe laser range finder.
 enhanced 25-mm gun, 2-3
 fire-control subsystem, 6-33
 FLIR. *See* forward-looking infrared radar mode.
 IBAS. *See* Improved Bradley Acquisition System.
 kinematic lead, 6-34
 lateral target dispersion, 5-9
 Precision Gunnery System (PGS), 4-6, 4-7 (*illus*)
 range estimation, 6-10
 reticles, 6-15, 6-23 (*illus*)
 search, 6-4
 tracer-burst obscuration simulator, 4-6
 main gun. *See* M242.
 malfunctions, D-6, D-8. *See also* misfire, safety.
 manipulation, 7-4, 7-7 (*illus*)
 Man-Portable Air-Defense System (MANPADS), 2-12
 map, 1-4, 5-5, 5-14, 6-10, 12-2
 master gunner, 3-4, 3-7, 3-9, 5-5, 8-19
 maximum engagement line, 7-21, 9-15, 9-16 (*illus*)
 maximum engagement range, 6-15, 6-23 (*illus*)
 maximum ordinate, 5-14, 5-15 (*illus*), 6-27
 mil-relation method of target location, 6-10, 6-13 (*illus*)
 miniature, eye-safe-laser, infrared observation set (MELIOS), 7-23
 misfire
 coax machine gun, A-18, D-7
 main gun, 2-3, A-10, D-7
 missile simulation round, 4-14
 range, 5-2, D-6
 smoke grenades, 2-25, D-7
 Stinger, 7-19
 TOW, 2-10, 7-12
 miss-distance indicator (MDI), 11-3
 missile control subsystem (MCS), 2-5
 missile countermeasure device (MCD), 1-3
 missile tracking concept, 6-41
 mission, enemy, terrain, troops, time available, and civilian [considerations] (METT-TC), 5-12, 6-5, 6-24, 6-51, 6-55, 7-21, 7-32, 9-5, 9-9, 9-12, 9-13, E-4
 mission-equipment package (MEP), 13-6
 mission-essential task list (METL), 3-4, 3-13, 4-9, 8-1, 8-33, 8-35 (*illus*), 8-48 (*illus*), 9-2, 9-21, 10-1, 10-7 (*illus*), 10-13 (*illus*), 10-14 (*illus*), 12-1, F-10
 mission-oriented protective posture (MOPP), 9-23
 mission training program, 3-4
 mobile conduct of fire trainer (MCOFT), 4-1, 4-8 (*illus*)
 modified table of organization and equipment (MTOE), 3-4
 moving target indicator (MTI), 13-7
 Multiple Integrated Laser-Engagement System (MILES), 3-2, 4-4, 4-5 (*illus*), multiple targets, 6-28
 multipurpose range complex (MPRC), 10-10
 near-to-far sector search, 6-6
 noncommissioned officer in charge (NCOIC), 5-5
 nuclear, biological, chemical (NBC), 1-4, 8-4, 8-17 (*illus*), 8-23, A-1
 obscuration, 2-24
 observation post (OP), 9-15, 13-9, E-4
 observation, 6-2
 obturator, 2-19
 offense, 6-13
 multiple targets, 6-28
 task organization, 9-4
 urban operations, E-5
 offensive engagement, 6-64, 6-71, 6-74 (*illus*)
 officer in charge (OIC), 5-1, 5-4, 5-13, 8-24, 8-33
 Operation Desert Storm (ODS), 1-1

- operation order (OPORD), 9-21, 10-10, 11-1, 12-3, 13-7, E-13, F-10, F-11 (*illus*)
- opposing force (OPFOR), 5-4, 5-12, 9-21, 10-13, E-11, F-10
- overlapped sector search, 6-6 (*illus*)
- paratrooper, engagement of, 6-48 (*illus*)
- penalty matrix, 9-19
- platoon gunnery levels, 3-13
- point targets, 6-33
- poisonous gas, 2-1, 2-5
- position-navigation (POS-NAV), A3, 1-4
- postfire checks, 3-3, D-8
- precise reference point method of target location, 6-10
- precision fire command, 6-57
- precision gunnery, 6-28
- Precision Gunnery System (PGS), 3-2, 4-2 (*illus*), 4-6, 4-7 (*illus*)
- precision lightweight GPS receiver (PLGR), 1-1
- prefire check, 2-1, D-1
- preliminary gunnery, 3-1, 7-1
- preventive maintenance checks and services (PMCS), 1-4, 6-65, D-1, F-1
- principal direction of fire (PDF), 9-6
Quality Deficiency Report (QDR).
See forms.
- quick reference-point method, 6-47, 6-53, 7-21, 7-28 (*illus*), 7-39 (*illus*), 7-41 (*illus*)
- quick target reference-point method, 6-10
- radiotelephone operator (RATELO), 5-6
- range cards, 7-22, 7-25 (*illus*), 7-26 (*illus*), 7-29 (*illus*), 7-33. *See also* map.
digital overlay, 7-35
maximum engagement, 6-15
targets, 6-13, 6-14 (*illus*), 6-20 (*illus*)
task, 7-38
TOW, 7-30 (*illus*)
- range estimation, 6-10. *See also* IBAS.
- range
combat and scaled, 7-3 (*illus*)
defilade positions, 8-12
determination, 6-11, 6-12, 6-14 (*illus*)
6-18 (*illus*), 7-7
- range (*continued*)
digital, 5-20
equipment checklist, 5-7
layout, 5-7, 5-12 (*illus*)
limited visibility, 6-13
live fire, 5-14
operation, 5-1
personnel, 5-5
reconnaissance, 5-4
safety officer (RSO), 5-5
- ranging stadia, 6-14
- rate of fire, 2-1
- reconnaissance, selection, and occupation of position (RSOP), 11-5
- remote biocular display (RBD), 1-3
- remote monitoring station (RMS), 4-9
- Remotely Piloted Vehicle-Target System (RPVTS), 4-7, 8-8, 11-3
- Reserve Component (RC), 3-4, 3-24
- response terms, 8-14
- reticles, 6-15, 6-19 (*illus*)
- retroreflector, 11-3
- rocket-propelled grenade (RPG), 6-8, 6-33, 8-33, E-12
- rollover procedures, 1-7
- rules of engagement (ROE), 9-6
- safety. *See also* immediate action, misfire, RSO, surface danger area diagram, target, *and* weapons.
access doors, 2-5
ammunition, 2-11, 2-18,
built-in test, A3, 1-4
damaged missile, 2-9, 2-10
danger close, E-5
digital early-warning data, 1-5
discarding sabots, 2-14
duds, 2-10
faults, 1-4
field-expedient early warning devices,
E-3
firing port weapon, 2-11
fratricide avoidance procedures, E-8
local air-defense warning, 8-10
main gun, E-7
malfunctions, D-7
nonoperational safety switch, 5-13

- safety (*continued*)
- obscuration, 2-24
 - poisonous gas, 2-1
 - postfire checks, 3-3, D-8
 - posture, 9-9
 - rollover procedures, 1-7
 - smoke grenades, 2-12, 2-25
 - tools for avoidance of fratricide, 9-5
 - training range, 2-1, 5-13
 - urban operations, E-7
 - warning flag, A-43
 - warning shots, 9-6
 - weapons safety posture, 9-9
- scale models, 4-13 (*illus*)
- scaled range. *See* range.
- scan, 6-4, 6-10
- search, 6-2, 6-6 (*illus*)
- section gunnery levels, 3-13
- sector limits, 7-23, 7-25 (*illus*)
- sector method of detection, 6-10
- sector search, 6-2, 6-5
- ground surveillance radar, 13-7
 - image-intensifiers, E-3
 - thermal sights, 6-8
- selection of weapon and ammunition, 6-25, 6-26 (*illus*)
- senior instructor/operator (SIO), 3-7, 4-9
- setback, 2-14
- SF 368. *See* forms.
- shoot-on-the-move, 1-5
- short-range air defense (SHORAD), 2-12, 11-5
- sight picture, 6-16
- signatures, 6-7
- simulations network (SIMNET), 4-9, 4-10 (*illus*)
- simulators, 3-1, 3-2, 4-1, 4-8, 4-7 to 4-11 (*illus*), 9-23, 10-6, 12-3
- single-channel ground and air radio subsystem (SINCGARS), A-61, D-4
- situational awareness, 1-4, 6-27
- situational training exercise (STX), 3-10, 3-13, 4-10, 9-2, F-10, F-12 (*illus*), F-17, F-19 (*illus*)
- situation report (SITREP), 8-31, F-13
- size, activity, location, and time (SALT), 5-20
- size, activity, location, unit, time, equipment (SALUTE), F-4
- slew-to-cue (STC), 1-5
- smoke grenade launcher. *See* M257.
- special-purpose computer (SPC), 4-9
- spot report (SPOTREP), 8-31
- squad leader's display (SLD), 1-4, 6-4, 6-27, E-5
- Standard Range Card. *See* forms.
- standard vehicle-mounted launcher (SVML), 1-5, 2-12, 7-16
- Standards in Training Commission (STRAC), 12-5, 13-10
- standing operating procedures (SOP)
- adjustment of fire, 6-33
 - certification of BCEs, 1-6, 8-3, 8-9, 8-12, 8-20, 9-17
 - direct fire, 9-5, 9-9, 9-10 (*illus*), 9-12, 9-13 (*illus*)
 - equipment stowage, 1-7
 - evaluation, 9-17, 9-24, 12-4, 13-3, A-1
 - fires, grass and forest, 5-3
 - fires, weapon, 9-4, 9-5, 9-9, 9-10 (*illus*)
 - fratricide avoidance. *See* safety.
 - immediate action, 2-3, 7-19
 - misfire, 2-3, 7-19
 - observation, E-4
 - performance checklists, 10-3
 - prefire checklist, D-4
 - range operation, 5-8, 5-12
 - range, 5-2, 10-10
 - reference points, 7-21
 - tactical scenario, 13-7
 - target location, 6-9
 - training area, 5-2
 - unit markings, 6-24
 - vehicle designation, 7-32
- superelevation, 1-5, 4-4, 5-14, 6-15, 6-20 (*illus*), 6-38, 7-21, C-1, D-2 (*illus*), D-5 (*illus*)
- suppressive fire, 2-19. *See also* tracer on target.

- surface danger area diagram, 5-5, 5-13, 5-16 (*illus*), 5-20 (*illus*)
- standing operating procedures (*continued*)
See also safety.
- synchronization
 engagement, 8-13
 fires, 9-4
 reengagement, 13-6
 sight picture, 4-4
 target, 5-20
 vehicle movement, 3-2, 3-7, 4-11
- system control box (SCB), 1-6
- table
 ballistic firing, 5-14, 5-15 (*illus*)
 distribution and allowances (TDA), 3-4
- tables, firing, numerical index of, ix
- tactical navigation system (TACNAV), 1-1
- Tank Weapons Gunnery Simulator System (TWGSS), 4-6
- target
 acquisition, 1-3, 6-1, 6-24, E-3
 detection, 2-21, 4-4, 4-15, 6-2, 6-7, E-3
 identification, 6-23
 location, 6-9
 aerial, 8-4
 armored, 8-3
 burst on, 6-32, 6-33 (*illus*)
 classification, 6-24
 confirmation, 6-26
 description, 6-24 (*illus*)
 designation (A3 only), 6-10
 detection, 6-7, 6-9. *See also* range and map.
 discrimination, 6-24, E-4
 identification, 6-23, 6-24 (*illus*)
 leading, 6-30, 6-32 (*illus*)
 observations, 6-29, 6-39 (*illus*)
 point type, 6-33
 reference point (TRP), 5-20, 6-10, 7-22, 7-28 (*illus*), 7-36 (*illus*), 7-38, 7-39 (*illus*), 7-41 (*illus*)
 reports, 6-24
 search tips, 6-5
 television, A-41, A-42
- target (*continued*)
 threat levels, 6-25, 6-48, 8-11, 8-14, 8-24, 9-4, 9-23, 12-3
 tracer on, 6-32
- Target Acquisition System (TAS), 1-4
- targeting-station control panel (TSCP), 13-5, A-48
- task index (BGST), A-2
- task list, 3-4, 10-2, 10-3 (*illus*). *See* METL and live-fire exercise.
- task penalty matrix, 9-17, 9-18 (*illus*), 9-19, F-13
- technical data, 1-2
- thermal sights, 3-14, 6-7, 6-24, A-38, B-1, B-30, D-2, E-3
- threat
 levels, target, 6-25
 template, 4-9, 9-9, 9-23, 12-3
- thru-sight video (TSV), 3-3, 4-1, 4-2 (*illus*), 4-4 (*illus*), 8-22
- timing matrixes, 8-3, 8-9 (*illus*), 8-11, 8-31, 11-4, 13-3, E-13 (*illus*)
- TOW drive system (TDS), 1-4
- TOW training, 7-12
 device, 4-4
 ranges, 2-1, 2-6 (*illus*), 2-19, 2-22 (*illus*), 6-16, 6-23 (*illus*), 6-43 (*illus*), E-5
 techniques, 6-29
- tracer on target (TOT), 2-19, 6-32
- trained, needs practice, or untrained (TPU), 8-2
- training
 collective, 3-13
 crew, 3-5
 cross, 3-6
 devices, 4-1
 evaluation, 3-5, 9-16
 individual, 3-4
 integrated, 3-6
 plans, 3-7, 3-10
 program, 3-4
 range, 5-1
 requirements, 3-14, 3-15 (*illus*), 9-4
 strategy, 3-5

training and evaluation outline (T&EO),
 9-16, 9-22, 12-3, F-10
 Training Data Retrieval System (TDRS),
 E-11
 training exercises
 force on force, 4-4, 9-21
 platoon, 9-2 (*illus*), 9-3, 9-16
 responsibilities, 5-5
 situational (STXs), 3-10, 3-13, 4-10,
 9-2, F-10, F-12 (*illus*), F-17, F-19
 (*illus*)
 troop targets, 6-46, 8-4, 8-9 (*illus*), 9-23,
 10-6, 12-3, F-13
 tube-launched, optically-tracked, wire
 guided (TOW), 1-2 (*illus*), 2-5, 2-7
 (*illus*), 2-19, 8-3, 12-5
 alignment, B-35, B-36 (*illus*)
 backblast, 2-8, 2-9 (*illus*)
 boresighting, B-1
 close-in panel, B-30 (*illus*), B-42
 configuration, E-10
 crew drills, 3-7
 defense, E-9
 device training, 4-4
 dummy round, 4-14
 ELRF, 6-16
 engagement, 4-12, 6-27, 7-4
 gunnery program, 3-14
 immediate action, 7-14
 kill standards, 8-3
 launcher, 7-13
 power mode, 7-12
 prefire checklist, D-2, D-3 (*illus*)
 preliminary gunnery, 3-5, 3-13, 7-1
 range card, 7-21
 reticles and sight pictures, 6-16, 6-23
 (*illus*), 6-40, 6-41 (*illus*) 7-4
 simulator, 3-2
 support, E-5
 suppressive fire, E-5
 targets, 6-26, 12-4
 task penalty matrix, 9-19
 tasks, 7-12, A-37, A-45, A-48, A-49,
 A-58
 tracking, 3-15, 7-16
 urban operations, E-5
 weapons safety posture, 9-9
 turret position indicator, 7-22
 ultraviolet (UV) detectors, 2-22
 unit conduct of fire trainer (UCOFT), 3-5
 unmanned aerial vehicle (UAV), 2-12,
 4-11, 6-54, 6-61
 urban area diagram, E-14
 urban operations, 6-8, E-1, E-14 (*illus*)
 vehicle motion sensor, 1-4
 way point, 1-1
 Weapon Record Data. *See forms.*
 weapon reference point (WRP), 7-23,
 7-31 (*illus*), 7-39 (*illus*), 7-41 (*illus*)
 weapons control box, 2-6, 7-17
 weapon, selection of, 6-25, 6-26 (*illus*)
 weapons safety posture, 9-9

BRADLEY CREW SCORESHEET
Instructions for completing

- 1 **Date.** Enter date of last day engagement of evaluation.
 - 2 **Range.** Enter name(s) of facility(ies) used.
 - 3 **Unit.** Enter battery, battalion, or squadron identification.
 - 4 **Bradley Table Number.** Enter table number.
 - 5 **Vehicle ID.** Enter bumper number(s) of vehicle(s) used.
- Enter rank and last name.
- 6 **Commander.**
 - 7 **Gunner.**
 - 8 **Driver.**

- Enter last name followed by first name. Initial after the AAR.
- 9 **BCE - Day Phase.**
 - 10 **BCE - Night Phase.**

- 11 **Engagement Task No.** Enter task numbers in order of engagement. If a gunnery event contains more than ten engagements, use an additional scoresheet. Be sure to complete Blocks 1 through 10 again, then complete form as before.

Except when otherwise noted, enter "G" (GO) or "N" (NO GO) for each column in Blocks 12 through 15. Chapter 8 explains these further.

- 12 **Task Standards.**
 - (a) **KILL.** Target kill standards.
 - (b) **TGT (EXP TIME).** Target type and BFV-exposure time to target. For defensive engagements, last BFV-exposure time to engage target, or time, if it exceeds target-threat time.
 - (c) **STD.** Bradley exposure standards.

13 **Critical Subtasks.**

- (a) **AUX.** Auxiliary sight.
- (b) **NBC.** NBC engagements.
- (c) **MAN.** Manual controls.
- (d) **CDR.** Commander's handstation.
- (e) **FRND.** Friendly targets.
- (f) **SSS.** Stinger subsystem.

14 **Leader Tasks.**

- (a) **FC.** Fire commands.
- (b) **MD/LD.** Most dangerous and least dangerous targets.
- (c) **AMMO.** Correct ammunition.
- (d) **DIST.** Distance of vehicle movement during a defensive engagement.
- (e) **WAIT.** Fire before command to fire.
- (f) **DIG.** Digital system.

15 **Noncritical Subtasks.**

- (a) **RESP.** Response terms.
- (b) **ENG.** Engagement techniques.
- (c) **DRV.** Driving techniques.
- (d) **DEF.** Defensive techniques.
- (e) **SUP.** Suppression of coax area targets.

16 **Engagement Assessment.** Enter T, P, or U.

- 17 **Remarks.** Note anything that the BCE should address in the AAR.

18 **Qualification Rating.** Check the appropriate rating.

D	Distinguished
Q	Qualified
S	Superior
UQ	Unqualified

BRADLEY GUNNERY SKILLS TEST SCORESHEET

For use of this form see, FM 3-22.1; the proponent agency is TRADOC.

NAME <i>(Last, First, MI)</i>	UNIT	BUMPER NO		
-------------------------------	------	-----------	--	--

TASK NO	TASK TITLE	GO	NO-GO	RETEST
1.	Clear, remove, disassemble, assemble, and install an M242 25-mm gun.			
2.	Load an M242 25-mm gun feeder.			
3.	Apply immediate action on an M242 25-mm gun.			
4.	Unload and clear an M242 25-mm gun feeder.			
5.	Install an M240C coax machine gun.			
5a.	Install an M240C coax machine gun <i>(ODS and A3 only)</i> .			
6.	Load, fire, and apply immediate action on an M240C coax machine gun.			
6a.	Load, fire, and apply immediate action on an M240C coax machine gun <i>(ODS and A3 only)</i> .			
7.	Clear an M240C coax machine gun and unload 7.62-mm ammunition.			
7a.	Clear an M240C coax machine gun and unload 7.62-mm ammunition <i>(ODS and A3 only)</i> .			
8.	Remove an M240C coax machine gun.			
8a.	Remove an M240C coax machine gun <i>(ODS and A3 only)</i> .			
9.	Disassemble <i>(field strip)</i> and assemble an M240C coax machine gun.			
10.	Boresight turret weapon systems.			
10a.	Boresight turret weapon systems <i>(A3 only)</i> .			
10b.	Boresight turret weapon systems <i>(BFIST)</i> .			
11.	Load and unload 25-mm HE ready box.			
12.	Load and unload 25-mm AP ready box.			
13.	Identify combat vehicles.			
14.	Set up radio (SINCGARS) for digital communications.			

CREWMEMBER'S OVERALL BGST SCORE

CREWMEMBER <i>(Print or type name)</i>	EVALUATOR <i>(Print or type name)</i>
CREWMEMBER <i>(Sign)</i>	EVALUATOR <i>(Sign)</i>

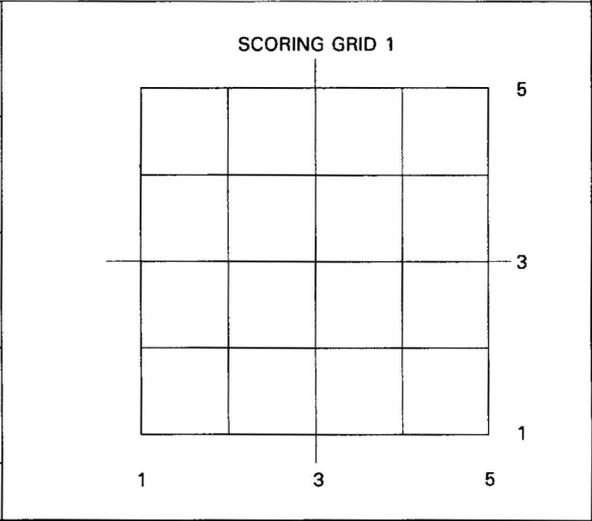
BORESIGHT TELESCOPE ACCURACY TEST

For use of this form, see FM 3-22.1; the proponent agency is TRADOC.

DATE (YYYYMMDD)	TIME	TEST TYPE <input type="checkbox"/> TELESCOPE <input type="checkbox"/> ADAPTER <input type="checkbox"/> KIT	
TESTER		TELESCOPE NO.	ADAPTER NO.
UNIT		<input type="checkbox"/> PASS <input type="checkbox"/> FAIL (Pass requires a GO on both tests)	

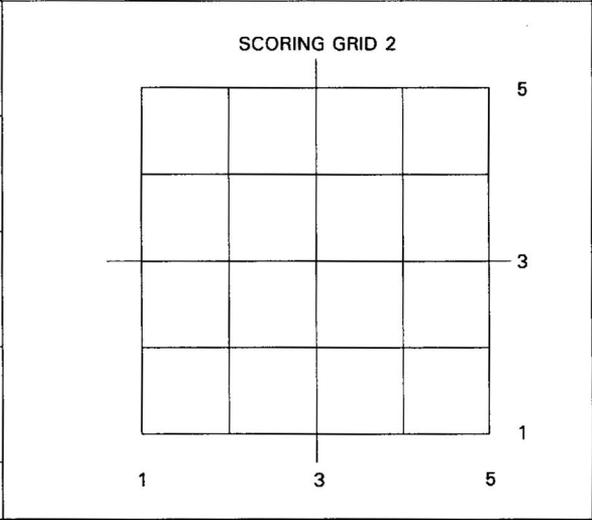
TEST 1

RIGHT AIM POINT COORDINATES	AZ	EL
LEFT AIM POINT COORDINATES	AZ	EL
DIST BETWEEN AIM POINTS (INCHES)		
DIST BETWEEN AIM POINTS (MILS)		
SCORE (GO is 1 mil or less)	GO	NO-GO



TEST 2

RIGHT AIM POINT COORDINATES	AZ	EL
LEFT AIM POINT COORDINATES	AZ	EL
DIST BETWEEN AIM POINTS (INCHES)		
DIST BETWEEN AIM POINTS (MILS)		
SCORE (GO is 1 mil or less)	GO	NO-GO



INCH-TO-MIL CONVERSION CHART

INCH(ES)	1/8	1/4	3/8	1/2	5/8	3/4	7/8	1
MIL(S)	1/4	1/2	3/4	1	1 1/4	1 1/2	1 3/4	2

FM 3-22.1 (FM 23-1)
28 NOVEMBER 2003

By Order of the Secretary of the Army:

PETER J. SCHOOMAKER
General, United States Army
Chief of Staff

Official:



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