HANDBOOK

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THE BRIGADE TARGETING OFFICER'S HANDBOOK

CENTER FOR ARMY LESSONS LEARNED (CALL)
U.S. ARMY TRAINING AND DOCTRINE COMMAND (TRADOC)
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FOREWORD

Targeting remains a critical element in providing fire support to the maneuver commander. In many ways, targeting is THE KEY COMPONENT in getting fires in the right place at the right time to achieve the desired results. Targeting encompasses all elements of fire support – artillery, air support, and organic indirect fires. Just as the maneuver commander seeks to coordinate, integrate, and synchronize all battlefield operating systems, the targeting officer seeks to do the same with fire support.

The Joint Readiness Training Center focuses on the light brigade combat team (BCT) and its subordinate maneuver and support units. The BCT is the first level of command where a commander has the opportunity and requirement to synchronize all battlefield operating systems. The BCT has the capacity to deliver a wide spectrum of fires throughout the battlefield. Creating a dedicated targeting officer at the brigade was the result of the need to deliver those fires on target and on time. Modeled on a battle book concept, this handbook is intended to provide the brigade targeting officer and others involved in the targeting process with a single reference of tactics, techniques, procedures, and other useful information.

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THE BRIGADE TARGETING OFFICER'S HANDBOOK

TACTICS, TECHNIQUES AND PROCEDURES

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CHAPTER 1

The Military Decision-Making Process

This chapter discusses the military decision-making process (MDMP) and input from the fire support element at brigade level. It shows the conduct of the process, the products produced from each phase of the MDMP, and how the targeting cycle is interwoven into its conduct. The brigade targeting officer must be interchangeable with the brigade fire support officer (FSO) so that when an item of responsibility is addressed to the FSO, the targeting warrant officer can be substituted.

"The military decision-making process (MDMP) is a single, established, and proven analytical process. The MDMP is an adaptation of the Army's analytical approach to problem solving. The MDMP is a tool that assists the commander and staff in developing estimates and a plan…… The MDMP helps the commander and his staff examine a battlefield situation and reach logical decisions. The process helps them apply thoroughness, clarity, sound judgment, logic, and professional knowledge to reach a decision……. The MDMP is the foundation on which planning in a time-constrained environment is based."

Excerpt from **FM 101-5, *Staff Organization and Operations,*** page 5-1

The MDMP has seven steps. Beginning with the receipt of a mission from division, the process flows through the remaining steps until an executable operations order (OPORD) has been produced by the brigade staff. The steps in the MDMP are:

1. Receipt of Mission
2. Mission Analysis
3. Course of Action Development
4. Course of Action Analysis (Wargame)
5. Course of Action Comparison
6. Course of Action Approval
7. Orders Production

Often these steps may be abbreviated. For example, a commander may decide, due to time constraints, that he may only want his staff to develop one course of action. In this situation, the commander must give detailed, specific guidance to his staff.

An abbreviated process does lend to a lack of detail within the OPORD. Remember, a staff tries to enforce the 1/3 - 2/3 rule of planning. This means that the parent unit uses only 1/3 of the total time before execution to allow their subordinate units to make use of the remaining 2/3 available time. The table on page 2 shows what products come from within each of the seven steps of the MDMP.

Military Decision-Making Process

INPUT	MDMP STEP	OUTPUT
• Mission received from higher HQ or deduced by the commander (Cdr)/staff	**Receipt of Mission**	• Cdr's initial guidance* • WARNO1
• Higher HQ order/plan/IPB • Staff estimates • Facts & assumptions	**Mission Analysis**	• Initial IPB products • Restated mission* • Cdr's intent* • Cdr's guidance* • WARNO 2 • Staff products • Battlefield framework • Preliminary movement
• Restated mission • Cdr's guidance • Cdr's intent • Staff estimates & products • Enemy COAs	**Courses of Action (COA) Development**	• COA statements & sketches
• Enemy COA • COA statements & sketches • Staff COA	**COA Analysis (War game)**	• Wargame results • Task organization • Mission to subordinate units • CCIR
• Wargame results • Establish criteria	**COA Comparison**	• Decision matrix
• Decision matrix	**COA Approval**	• Approved COA* • Refined Cdr's intent* • Specified type of order* • Specified type of rehearsal* • HPTL* • WARNO 3
• Approved COA	**Orders Production**	• OPLAN/OPORD*
* Responsibility of the maneuver commander		

Receipt of Mission

Upon notice of an impending mission, the brigade staff begins its analysis of the division's directions. The receipt of a mission can come in the form of a full OPORD issued from division, a warning order (WARNO) preparing the unit for deployment, or a fragmentary order (FRAGO) from an ongoing mission.

If a full OPORD is briefed, the secondary brigade staff will normally receive a hard copy, while the primary and key special staff attends the OPORD. If the fire support element (FSE) is manned enough to have one senior member stay with the FSE to begin OPORD review, then the targeting officer should make every attempt to attend the OPORD with the fire support officer (FSO).

While the OPORD is being briefed, the secondary staff analyzes the order. The FSE must review the division's Annex D, paying special attention to assets in direct support (DS) and general support (GS) that the brigade may have at its disposal. They must also review it for restrictions (i.e., no-fire areas [NFAs], restrictive fire areas [RFAs]), division-directed targeting objectives within the brigade's sector, adjacent units, and any other issues that will affect the completion of the brigade's mission.

There may be inconsistencies in what the brigade and division both see. To clear any ambiguities, the FSE should consolidate a list of requests for information (RFIs) and pass it to the brigade S3. The S3 consolidates the RFIs for the entire staff and passes them to the division G3 for clarification. If the FSE is unsure of a fire support-related area, such as ammunition allocation or a question easily answered, the brigade FSE should immediately contact division FSE via FM, telephonic or AFATDS (Advanced Field Artillery Tactical Data System). The faster these questions are answered, the faster a synchronized plan will be developed.

After receipt of the mission, WARNO #1 is issued to alert subordinate units of the impending mission.

Mission Analysis

Mission analysis is the beginning of combined brigade analysis. It is a crucial piece of the MDMP that lets the commander and his staff visualize their battlefield for the first time. The culmination of the mission analysis identifies tactical problems and proposes solutions. There are 17 steps within mission analysis. They can be found in FM 101-5, page 5-5, figure 5-4.

During mission analysis, the S2 begins his initial intelligence preparation of the battlefield (IPB). He analyzes the intelligence picture painted by division and displays the initial situational template (SITEMP), which arrays the enemy forces on the battlefield.

This is where the FSE and other battlefield operating systems (BOS) elements begin what is known as *reverse BOS*. The FSE analyzes the enemy's indirect fire capability. The FSE must assist the S2 in his endeavors. The targeting officer must be adept at analyzing enemy indirect systems. To do this he must be familiar with the enemy. This will also help the FSE with recommending Q-36/37 coverage, zone considerations, movement, and security to the commander.

Some of the steps the FSE must take during mission analysis are:

1. Analyze the higher HQ's mission.
2. Begin indirect IPB along with the brigade S2 to help develop high-value targets (HVTs) and begin analysis of HVT to high-payoff target (HPT) translation.
3. Review all available brigade assets as well as those given a DS/GS role by division.
4. Review ammunition availability, DS and GS, number of minutes of DS/GS smoke available, family of scatterable mines (FASCAM)/ special munitions availability and duration, CAS sorties/day allocation.
5. Consider constraints/limitations – Fire support coordination measures (FSCM), such as NFAs and RFAs on critical friendly terrain/units and cultural protected areas, effects of terrain and weather on fire support assets (smoke, CAS, naval gunfire [NGF]).
6. Initial cut of essential fire support tasks (EFSTs).
7. Recommend fire support-related commander's critical information requirements (CCIR).

8. Develop initial reconnaissance plan with the S2, COLT insertion/overwatch, UAV coverage recommendation, Q-36/37 coverage.
9. Review specified and implied tasks from division.

The staff will then conduct a mission analysis briefing to the commander. The FSE must brief all of the above related information. The mission analysis brief allows the commander to visualize the battlefield and begin to generate a scheme of maneuver.

Following the mission analysis brief, the commander will issue *commander's guidance*. Commander's guidance will give specific guidance for course of action (COA) development and will approve or refine the EFSTs for the FSE. After the commander's guidance is received, WARNO #2 is issued to subordinate units.

Course of Action (COA) Development

COA development occurs after the staff receives the commander's guidance. During mission analysis, the staff should have developed a planning timeline covering the MDMP, OPORD production, and rehearsals. This will aid the staff during their planning cycle to ensure a quality product is produced with sufficient time for subordinate battalions to plan.

The COA spells out how the brigade will execute the developed mission. Often several COAs will be developed to give the commander flexibility in his decision-making. His staff develops these COAs based on the mission analysis and the commander's guidance for each COA. Each COA must accomplish the developed EFSTs.

COA development follows six guidelines:

1. **Analyze relative combat power.** The FSE looks at the enemy's indirect capability vs. the brigade's capability. Staffs will often develop force ratios. These assist the staff in comparing combat power, but a COA should not be developed solely on mathematics. The targeting officer should look at the HVTs developed by the S2 that will translate into HPTs. He should then compare available assets and ammunition to decide whether or not the brigade has the assets available to engage these targets or if additional assets must be requested from division.
2. **Generate options.** Based on the commander's guidance, the staff lists options for attack. Each one should defeat each enemy COA in order of probability. The FSE should consider all asset capabilities and positioning for each COA. This leads into the next step.
3. **Array initial forces.** The FSE must consider direct support artillery position areas (PAs) for each COA, radar coverage, and terrain limitations for firing units. The FSE must decide if the FA can support each COA. If not, then that COA is not feasible. Array initial TA assets, such as COLTs and radars, into the reconnaissance and surveillance (R&S) plan.
4. **Develop the scheme of maneuver.** The FSE must consider how arrayed forces will accomplish the commander's intent. How will we support the main effort? Who will receive priority of fires (POF)? What actions will be taken in each phase of the operation? What assets will be positioned in the main battle area (MBA), the rear, and deep? How will reconnaissance assets be supported? The FSE will develop a scheme of fires for each proposed COA and develop initial triggers for fires based on key maneuver events. These will be later refined during COA analysis.
5. **Assign headquarters.** The FSE must consider C^2 of forward deployed recon assets, such as COLTs, and C^2 of aviation assets for air assault operations, as well as deep air attacks. Communication linkages must be developed for these assets.
6. **Prepare COA statements and concept sketches.** Each developed COA will have a corresponding concept sketch to visually depict the friendly scheme of maneuver with the associated enemy COA and SITTEMP. The FSE should display friendly firing units in initial PAs. This will show how each COA will be supported and

whether or not the COA can be supported with fires based on terrain and location in reference to developed brigade and battalion boundaries. These COA statements and sketches will aid the commander in his COA approval.

After the COAs have been developed, the staff *may* conduct a COA brief to the commander. Each COA will be briefed, along with facts and assumptions based on relative combat power, selected control measures, and reasons why or why not one particular COA is feasible. The commander will then choose one or more COA, and the staff will begin COA analysis (war game) to refine the selected COAs.

Course of Action (COA) Analysis (War Game)

The war game identifies which COA will accomplish the mission with minimum friendly casualties while positioning the force to keep the initiative for follow-on operations.

The war-gaming process must be a deliberate event that involves the entire battle staff and all of the BOS representatives. Visualizing the flow of the battle while meeting the commander's intent should be the overall desired end state. Each phase of the operation must be addressed in sequence, coinciding with the desired flow of the battle. Adequate time must be set aside by the XO for the war game. He must set a timeline and ensure it is followed to allow subordinate units time to react and plan. Keeping this in mind, enough time must be given to the process to produce an executable plan for the battalions. The war game should determine the strengths and weaknesses of each course of action and highlight any unforeseen problems. This may delete or add a new course of action not previously addressed.

Each participant must remain objective, not allowing himself to be swayed towards one particular COA. The session must have a recorder who lists the advantages and disadvantages of each COA. The COA must pass the common sense/feasibility test. Do not compare COAs while war gaming; use the comparison phase to deter premature conclusions.

War-Gaming Responsibilities

XO: Overall responsibility for the coordinating actions of the staff during the war game.

S1: Analyzes COAs to project potential personnel losses and determines how CSS provides personnel support during operations.

S2: Role-plays the enemy commander. Develops critical enemy decision points in relation to the friendly COA, projects enemy reactions to friendly actions, and projects enemy losses. Captures the results of each enemy action and counteraction and corresponding friendly/enemy strengths and vulnerabilities. By trying to win the war game for the enemy, he ensures that the staff fully addresses friendly responses for each enemy COA. For the friendly force he:

1. Identifies information requirements and refines the event template to include named areas of interest (NAIs) that support decision points (DPs) and refines the event matrix with corresponding DPs, target areas of interest (TAIs), and high-value targets (HVTs).
2. Refines the situation templates.
3. Participates in the targeting meeting, and identifies HVTs as determined in IPB.

S3: Normally selects the techniques and methods that the staff will use for the war game. Ensures the war game of the COA covers every optional aspect of the mission, records each event's strengths and weaknesses, and annotates the rationale. This is used later to compare COAs.

S4: Analyzes each COA to assess its sustainment feasibility. Determines critical requirements for each sustainment function by analyzing each COA to identify potential problems and deficiencies. Assesses the status of all sustainment functions required to support the COA and compares this to available assets. Identifies potential shortfalls and recommends actions to eliminate or reduce their effect on the COA. While improvisation can

contribute to responsiveness, only accurate prediction can ensure the continuous sustainment of the force. In addition, ensures that the available movement times and assets will support the COA.

FSO/Targeting Officer: The FSO must be aware of all the assets he has to bring to the table. This must include not only the lethal elements, but non-lethal as well. The capabilities and limitations of each asset must be known to give a proper assessment and predict the feasibility of supporting the particular COA in question. Ammunition available and CSR for the operation will be necessary to predict the supportability of a COA. Non-lethal fires, such as smoke, must be addressed and the total time for screening based on terrain, weather, and available ammunition. Divisional assets, such as CAS, GS fires, and NGF, will be addressed to allow the staff alternatives for engagement. The FSE must address, by phase, which HPTs will be attacked, the trigger tied to that event, and the asset to engage. This is where the essence of the initial targeting process takes place. From this analysis the targeting officer can develop his initial target synchronization matrix (TSM).

The targeting officer can begin orders production during this phase. It will save time during OPORD production. Having a computer or checklist present will aid the targeting officer during the war game in developing an initial Annex D.

BOS: Each representative must bring their expertise and determine the requirements needed to support the COA.

War-Gaming Steps

STEP 1: Gather the tools. The XO directs the staff to gather the necessary tools, materials, and data for the war game. Units need to war-game on maps, sand tables, or other tools that accurately reflect the nature of the terrain. The staff then posts the COA on a map displaying the operations area. Tools required include, but are not limited to:

- Current coordinating staff estimates.
- Event template.
- Recording method.
- Completed COAs, to include maneuver and R&S graphics.
- Means to post enemy and friendly unit symbols.
- Map of the AO.

STEP 2: List all friendly forces. The commander and staff consider all available combat, CS, and CSS units that can be committed to the battle, paying special attention to support relationships and constraints. The friendly force list remains constant for all COAs the staff analyzes.

STEP 3: List assumptions. The commander and staff review previous assumptions for continued validity and necessity.

STEP 4: List known critical events and decision points. Critical events are those that directly influence mission accomplishment. They include events that trigger significant actions or decisions (commitment of enemy reserve), complicated actions requiring detailed study (a passage of lines), and essential tasks identified during mission analysis. The list of critical events includes major events from the unit's current position to the accomplishment of the mission. Decision points are events or locations on the battlefield where tactical decisions are required during mission execution. Decision points do not dictate what the decision is, only that one must be made and when and where it should be made to have a maximum impact on friendly or enemy COAs. Therefore, critical events and decision points must be listed for each enemy COA war-gamed against. Decision points relate to identified critical events and are linked to NAIs and TAIs.

STEP 5: Determine evaluation criteria. Evaluation criteria are those factors the staff uses to measure the relative effectiveness of one COA over another. It must look at what can cause success or failure. The criteria may change from mission to mission. It may include anything the commander desires. Some examples are:

- The principles of war/ROE.
- Doctrinal fundamentals for the kind of operations being conducted.
- The commander's guidance and intent.
- The level of residual risk for accident hazards in the COA.

STEP 6: Select the war-game method. There are three war-game techniques: the belt technique, the avenue in depth, and the box. A brief description of each follows:

- **Belt Technique:** The belt technique divides the battlefield into belts laterally across the width of the area of operations (AO). The belt technique is effective when the terrain is divided into well-defined cross-compartments, the enemy is formed into belts or echelons, or when conducting operations such as river crossings.
- **Avenue-in-Depth Technique:** This technique focuses on one avenue of approach at a time, beginning with the main effort. This is useful for offensive COAs or in the defense when canalizing terrain inhibits mutual support.
- **Box Technique:** This is a detailed analysis of a critical area, such as an engagement area, a landing zone (LZ), or a river-crossing site. This is most useful during a hasty attack when time is limited. The staff isolates a particular area and focuses on the critical events within it.

For a more detailed description of the war-game method, see FM 101-5, pages 5-18 and 5-19.

STEP 7: Select a method to record and display results. Recording the war game's results gives the staff a record from which to build task organizations, synchronize activity, develop decision support templates (DSTs), confirm and refine event templates, prepare plans and orders, and analyze COAs based on identified strengths and weaknesses. Two methods to record results are the synchronization matrix (FM 101-5, pages 5-20 and 5-21) and the sketch note (shown below).

CRITICAL EVENT:

SEQUENCE NUMBER	ACTION	REACTION	COUNTER-REACTION	ASSETS	TIME	DECISION POINT	CCIR	CONTROL MEASURES	REMARKS

STEP 8: War-game the battle and assess the results. During war gaming the commander and staff try to foresee the dynamics of the battle's action, reaction, and counteraction. The staff analyzes the tasks the force must accomplish one echelon down using assets two echelons down. Identifying the COA's strengths and weaknesses allows the staff to make adjustments as necessary.

The war game follows an action-reaction-counteraction cycle. *Actions* are those events initiated by the side with the initiative (normally the force on the offensive). *Reactions* are the other side's actions in response. *Counteractions* are the first side's response to reactions. This sequence is used until the critical event is completed or the commander determines that he must use another COA. The end of the war game should result in the commander and staff:

1. Refining or modifying the COA, to include branches and sequels that become on-order or be-prepared-to missions.
2. Refining location and timing of the decisive point.

3. Identifying key or decisive terrain and determining how to use it.
4. Refining the event template and matrix.
5. Refining task organization to include GS assets.
6. Identifying tasks the unit must retain and tasks assigned to subordinate units.
7. Allocating combat, CS, and CSS assets to subordinate commanders to accomplish their missions.
8. Developing a synchronization matrix and decision support template (DST).
9. Identifying the enemy's most dangerous COA.
10. Projecting the percentage of total enemy forces defeated in each critical event and overall.
11. Identifying likely times and areas for enemy use of weapons of mass destruction (WMD) and friendly nuclear, biological, and chemical (NBC) requirements.
12. Identifying the location and commitment of the reserve.
13. Determining the requirements for smoke and deception.
14. Refining C^2 requirements, to include control measures and updated operational graphics.
15. Finalizing the commander's critical information requirements (CCIR) and information requirements (IR) with the last time information is of value.
16. Finalizing the R&S plan and graphics for the basis for the collection plan.
17. Refining CCIR and incorporating them into the R&S plan and graphics.
18. Developing fire support, engineer, air defense, information operations, and CSS plans and graphics.
19. Identifying or confirming the locations of DPs, NAIs, TAIs, and the information needed to support the DPs.
20. Determining the timing of force concentration and initiation of the attack or counterattack.
21. Developing the intelligence collection plan and dissemination plan.
22. Determining movement times and tables.
23. Identifying, analyzing, and evaluating the strengths and weaknesses of the COA.
24. Integrating the targeting process, to include identifying or confirming high-payoff targets, and determining attack guidance.
25. Synchronizing smoke operations.

By the end of the war game, the staff will conduct a COA decision brief to the commander. The staff will recommend one course of action which is the most preferable. The commander will then decide which COA he prefers, and the staff will enter OPORD production.

Fire Support Planning Process

MDMP STEP	INPUT	ACTIONS	OUTPUT
Receipt of Mission and Mission Analysis	• Higher HQ WARNO or OPORD. • Facts from higher, lower, and adjacent FSEs. • IPB products. • Enemy COA from S2. • HVTs by phase or critical event. • Facts from FS assets.	• Understand higher maneuver and FSP. • Conduct FS staff estimate – organize and analyze facts. • Identify specified/implied tasks. • Translate status of FS assets into capabilities/limitations. • Analyze effects of IPB on FS. • Develop draft EFSTs. • Identify FS-related CCIR. • Identify FS constraints/restrictions. • Obtain cdr's initial targeting guidance.	• Initial WARNO upon mission receipt. • FSCOORD portion of mission analysis brief. • Recommend EFSTs and FS/ROE guidance. • FS CCIR input. • Initial FS rehearsal guidance. • Cdr: Approve initial EFSTs or modify. Give other FS guidance. • WARNO after mission analysis brief.
COA Development	• See output from previous step.	• Determine where to find and attack EFST formations. • Identify HPTs in those formations. • Quantify the effects for EFSTs. • Plan methods for EFSTs. • Develop FSCMs. • Allocate assets to acquire. • Allocate assets to attack. • Integrate triggers with maneuver COA. • Analyze relative FS combat power. • Use battle calculus. • Assist S2 in R&S development to support FS. • Prepare FS portion of COA/sketch.	• For each COA developed: - Concept of fires - Initial FSCMs - Draft FSEM - Draft TGT list/overlay - Draft TSM or modified TSM - R&S plan
COA Analysis and COA Comparison	• See output from previous step.	• Targeting decisions: finalize HPTL. • War-game the brigade COA & integrated FSPs vs. enemy COAs. • Modify/refine input as required. • Refine and test FSP.	Final Drafts: • Fires Paragraph. • FS Annex: FSEM TGT List - TGT overlay - TSM or modified TSM (HPTL, AGM, TSS)
COA Approval and Orders Production **Staff Supervision**	• See output from previous step.	• Approval briefing. • FSP briefed as part of each COA. • FSCOORD presents analysis as part of staff.	• Cdr: Selects, modifies or approves COA. • FSCOORD: Issue WARNO as required. • Finalize FS products. • Issue FSP with OPORD. • FS backbrief. • Manage refinement. • Rehearsal.

Orders Production (Fires, Annex D)

After the commander approves the staff's COA, he will release more refined guidance. The COA sketch will become the basis for the brigade's operational graphics. The OPORD contains the necessary information for subordinate elements to begin their own MDMP planning to meet the commander's guidance/intent for the operation.

The OPORD format and accompanying annexes will be based on the brigade's planning standing operating procedures (PSOP). The standard format is the five-paragraph operations order. This may be written out or in a

matrix format. It may even be a combination of the two. Whichever method the brigade uses, the order must contain enough information for subordinate elements to plan. Below are a few examples of Annex D formats.

Written Five Paragraph Format

1. **SITUATION.**

a. Enemy Forces. See Intsum 2

b. Friendly Forces. AC-130U Gunship provides close air support and armed reconnaissance in support of 2nd BCT phase 3 of this operation.

c. Attachments. Four OH-58Ds from D 3-44 CAV are OPCON to 2nd BCT during phase 3 of this operation.

2. **MISSION.** 8-15 FA(-) provides close support and counter-mortar fires in support of the 2nd BTF attack to destroy the 3rd Krahn security company in AO Grant IOT set the conditions for AFL and ECOMOG to continue PKO.

3. **EXECUTION.**

a. Concept of Fire. For phase 3 of the operations, there are six essential fire support tasks.

(1) Task: Limit squad size or larger attacks against the Roberts International Airport.
Purpose: Allow 6-31 IN to retain control of the airhead line.
Method: 8-15 FA occupy PA1 and 2 while B Btry maintains 360 degree coverage. 6-31 is allocated 3 targets for planning. POF 6-31 o/o 5-14 upon occupation of assault position.
Endstate: Patrols neutralized with no penetration of the AHL.

(2) Task: Destroy enemy 60mm mortars.
Purpose: Preventing indirect fires against 2 BCT. Method: Counter-mortar fires using 8-15 FA and Q-36 radar, C Btry, located in PA3, is counter-fire battery.
Endstate: No enemy mortars remaining.

(3) Task: Destroy enemy COPs located along the infiltration routes.
Purpose: Allowing 5-14 INF to move without detection to assault positions.
Method: Under 2nd BCT's control, AC-130 gunships work in order of priority the infiltration routes, Obj Cow and counter attack routes S-SE of objective. Two windows of 281900 - 282300 and 282300- 290300 are scheduled for the operation. An informal ACA limit indirect fires to a maximum altitude of 5000ft (sea level) . NFAs will be established around all forward deployed scouts.
Endstate: At a minimum, 2 of 3 COPs destroyed, the objective clearly defined, and local counterattack neutralized.

(4) Task: Along the infiltration route, fires suppress or obscure enemy COPs.
Purpose: Allowing 5-14 to break contact.
Method: 8-15FA provides responsive immediate smoke/suppression from PAs 1 and 2. 5-14 is allocated 20 minutes of HC smoke (600m screen) for this operation. 5-14 IN is allocated two priority targets as well as 5 targets for planning.
Endstate: COPs suppressed or screened not allowing their movement to be impeded.

(5) Task: Disrupt enemy Plts on Obj COW.
Purpose: Preventing direct fires against 5-14 IN. Method: 4 OH-58Ds are allocated to 5-14 IN from 282100-290200 Jul 98. Group K1D fired on-call by 8-15 FA(-). FA POF remains with 5-14 o/o 6-31.
Endstate: Security company vicinity Obj Cow is suppressed during assault of the objective.

(6) Task: Disrupt local counterattacks.
Purpose: Allowing 5-14 IN to complete its reconsolidating on the objective.

Method: 5-14IN is allocated 1 battery FPF. AC-130 will be used to isolate the objective and is under Bde control.

Endstate: All counterattacks neutralized.

b. Air Support. General. AC-130 will remain under Bde control. The intent will be focused on infiltration routes, OBJ Cow, and the detection and destruction of enemy counterattack forces. The two windows for AC-130 support are 281900 - 282300 and 282300 - 290300. Airspace deconfliction between indirect fires and AC-130 will be altitude separation. All fires will have a max ordinate no greater than 5,000 meters. If security force is identified as moving from the base camp location, the AC-130 focus will be the destruction of forces immediately around the base camp. OH-58D revert to Bde control for potential targets identified by scouts away from Obj area.

c. Field Artillery Support.

(1) General. 8-15 FA, to include its organic Q-36 radar, will locate in position areas 1, 2 and 3 to provide close fires in support of 2nd BCT's operations during phase 3. A Btry is currently located in PA1 with a primary azimuth of fire of 3400. B Btry is located in PA2 with an azimuth of fire of 3600. The Q-36 is co-located with A Btry in PA1 with a primary search azimuth of 3650. C Btry is located in PA3 AOF 3600. A Btry is responsible for providing 5-14 two priority targets during the infiltration and a final protective fire during the counterattack. B Btry provides 360 degree coverage for 6-31's coverage of Roberts International Airport. A and B are both responsible for one target each in group K1D.

(2) Artillery Organization for Combat.

8-15 FA
A/8-15
B/8-15
C/8-15
Q-36 Radar

(3) Allocation of Ammunition. (Battery Basic Load)

HE 252
Illum 24
WP 42
APICM 234
HC 48
APERS 12
HE RAP 114

d. Smoke Operations. Use of WP will be coordinated with Bde to limit collateral damage for all other missions other than immediate smoke IOT disengage.

e. Target Acquisition. See Target Acquisition Appendix.

f. Coordinating Instructions.

(1) High-payoff targets

PRI	CATEGORY	DESC	HOW	WHEN
1	C2	Base Camp	N	I
2	MNVR	Tech Veh	N	A
2	MNVR	COPs	S/N	I
3	FS	60mm mort	N	A

(2) Fire Support Coordination Measures.
(a) Airspace Coordination Area (ACA) - Informal altitude separation. No indirect fires above 5,000 feet.
(b) No-Fire Area (NFA) - NFAs will be placed around all scout locations and Rembass teams.
(3) Target Allocation. 5-14 has 2 FA priority targets for infiltration and attack and one FPF for reconsolidating. 5-14 is authorized five targets for additional planning.

4. **SERVICE SUPPORT.** Not Provided.

5. **COMMAND AND SIGNAL.** Succession of FA command - 2nd BCT FSO, 6-31 FSO, 5-14 FSO. BDE FSC Net: 390, Dig Net: 395

ACKNOWLEDGE:

XXXXXXXXXX
COL
BDE FSO

APPENDICES: 1. FSEM
2. TGT LIST
3. TSM

Five Paragraph (Matrix /Written Combined)

1. **SITUATION:** (See base order)

2. **MISSION:** (See base order)

3. **EXECUTION.**

   a. Commander's fire support guidance: (See fires paragraph)

   b. Essential fire support tasks.

   Fire support task for this operation:

EFST 1
Task: Disrupt CLF air defense artillery systems' ability to engage friendly aircraft.
Purpose: Protect friendly aircraft, allowing freedom of maneuver in zone during airlands, air assault, logistic resupply, and repositioning of assets.
Method: Initial SEAD for air assault operation will be supported by NSFS (2x5''54 guns) located in FSA IV (FSS 401). Subsequent SEAD for all air operations will be on call and fired by DS artillery assets. Targets are planned for fires during ingress of TF 6-27 AASLT into GERONIMO LZ. FA and NSFS fires will be observed by 2-25 Avn. Targets AF 0001, AF 0005, AF 0010, and AF 0045 are planned on templated DSHK/SA-18s and will be fired using HE/VT and WP to suppress ADA and obscure visibility of SA 18 operations. C/2-11 FA will airland 6 howitzers and prime movers and 2 C2 vehicles, in conjunction with Q-36, Engineer, ADA, MI elements, and 2 companies from TF 1-14 on D-1 (NET 151300R May 01) to GERONIMO LZ. C/2-14 FA will occupy PAA1 vic WQ 025433. B/2-14 will Air Assault on D-1 (152130R May 01, H hour) vic KEITH LZ and occupy PAA2 vic VQ 987434. POF during phase I (battle handover/complete lodgment) is to TF 1-18, TF 6-27, 2-28 AVN. Restrictions: The authority to engage hostile forces in or near buildings dedicated to religious, historic and cultural sites, or hospitals is withheld to ground force tactical commanders, battalion commander or above, unless the action is required for immediate self-defense. The authority to engage hostile forces in or near public works facilities, such as power stations, dams, and water treatment plants, is withheld to ground force tactical commanders, brigade commander or above, unless the action is required for immediate self-defense. Every reasonable effort will be made to provide visual observation of indirect fires regardless of target location. Authority to employ indirect fires in populated areas is delegated to brigade commander. Unobserved indirect fires will be employed only when absolutely necessary for mission accomplishment and last resort to prevent destruction of friendly units in contact. Unobserved indirect fires will not be employed against targets in populated areas unless it is a last resort, to prevent the destruction of a friendly unit in contact, or is ordered or approved by Cdr, 21st ID(L). Unobserved indirect fires may be directed against clearly identified targets in uninhabited or sparsely inhabited areas if deemed essential by the tactical commander directing the fires.
Effects: SA-18s suppressed prior to aircraft entering the engagement envelope, aircraft arrive and depart safely, and friendly forces occupy FLS and LZs.

EFST 2
Task: Disrupt CLF fire support systems in AO BEAR.
Purpose: To protect friendly forces and allow freedom of maneuver in zone.
Method: Q-36 radar will airland with C/2-14 FA on D-1 (NET 151300R May 01) to GERONIMO LZ, occupy PAA1 vic WQ 025433, AOS 2200, and provide continuous coverage in AO BEAR. C/2-14 FA will occupy vic PAA1, and B/2-14 FA will occupy vic PAA2 to provide fires to neutralize enemy mortars. Targets AF 00015, AF 0020, AF 0025 and AF 0030 are planned on templated enemy mortar locations. B/126th MI will coordinate and provide non-lethal fires to disrupt CLF fire support system nets. EH-60 provides EW effort focused on jamming

enemy mortar fire direction nets and forward observers. POF during phase II (secure ground and air LOCs) is to TM Heavy during clearance of Route Zinc. No change to restrictions as stated in EFST 1.
Effects: Enemy indirect fire systems in AO BEAR neutralized, accurate fires limited, allowing freedom of maneuver in zone.

EFST 3
Task: Disrupt CLF maneuver forces in AO BEAR.
Purpose: Allow friendly forces freedom of movement, and facilitate the destruction of CLF forces on contact.
Method: Fires are planned along MSRs and dismount routes during friendly forces' movement to provide close supporting and suppressive fires. Obscuration and reducing fires (SOSR) will be planned during obstacle reduction and screen maneuver during route clearance. Targets AF 00035 and AF 0040 are planned on templated enemy possible ambush sites. Fires are also planned to cover maneuver forces while seizing key terrain in AO BEAR. A/2-14 FA will GAC to PAA3 vicinity WQ 007437, establish FB GATOR to support operations in AO BEAR. Smoke platoon operations will be incorporated when available. TF 1-18 and TF 6-27 are each allocated 3 targets and 1 x 105mm priority target for planning. TF 2-28 AVN allocated 2 targets for planning. 228 FSB allocated 2 targets for planning. POF during phase III and IV(MTC and sustainment ops) is to TF 6-27 IN, TF 1-18, and TM HEAVY. No change to restrictions as stated in EFST 1.
Effects: CLF dismount forces in contact are suppressed and ultimately destroyed.

Fire Support Information

ALLOCATION						
Allocation	**BDE**	**TF 1-18**	**TF 6-27**	**228 FSB**	**TF 2-28 AVN**	**TEAM HEAVY**
COLT		1	1			
CAS	4	0	0			
Minutes Smoke, 200 minutes						57
Tgt / BN Volleys auth.		3 dismt tgts	3 dismt tgts	2	2	
Priority Targets	0	1	1			1 (along ZINC)

ORGANIZATION FOR COMBAT

DS Units: Location and AOF

2-14 FA, 105mm (3 x 6, T)
A/2-14 FA 105mm (T) location: WQ 007437 AOF 2500
B/2-14 FA 105mm (T) location: VQ 987434 AOF 2300
C/2-14 FA 105mm (T) location: WQ 025433 AOF 2200

GS, GSR, R Units: Locations and AOF

2 BCT allocated 5 GS artillery volleys per day
A/2-49 FA 155mm (1 x 6, T), GS location VQ 910510 AOF: 1800 Arrives: 17 MAY 01
1 -637 FA (18 x 155mm SP) GS location VQ 771412 AOF: 1600 Arrives: 23 MAY 01
1-651 FA (18 x 155mm T) GS location VQ 960270 AOF: 1000 Arrives: 20 MAY 01
10 CTAD (2x AN/TPQ-37) GS location VQ 960270 AOS: 1000; location VQ 771412
AOS: 1600 Arr: 4 MAY 01.....

CAS/ATK AVIATION

4 CAS sorties for planning per day. TF submit CAS requests NLT 0500 daily for an Air Tasking Cycle starting at 0001- 1159R. ATO publish 1200R daily.

NSFS

2 BCT allocated 150 salvos per day. Request on FH 817
Ship - HE/PD: 450, HE/VT: 50, HEMT/PD: 100, HE/CVT: 450, ILL: 50, WP: 100
USS Spruance (DD-963) 2 x 5" 54 cal gun LOC: FSA IV (FSS 401)
USS John Hancock (DD-981) 2 x 5in/54 cal gun

TARGET ACQUISITION AND AZIMUTH OF SEARCH

Q36: location: WQ 035425 AOS 2300
Zones:
CFZ: BDE TOC, BSA, AVN Assembly Area
CFFZ: VQ 981464, WQ 072415, WQ 056434, WQ 010423
CZ: 1-14, 1-27 81mm Mortar

LASER PRF CODES	**PRIORITY OF SURVEY**				
COLT 1: Pri 411-418 , COLT 2: Pri 421-428 A/1-7 MECH: Pri 431-438	1. 105mm	2. Q36	3. Mortars		

TARGETING BLOCK ASSIGNMENTS

2d BCT AF 0001-1999	TF 1-14 AF 2000-2999	TF 1-27 AF 3000-3999	TF 2-25 AF 4000-4999	TF 225 FSB AF 5000-5999	2-11 FDC AF 7000-7999	Counterfire AF 8000-8999

c. Coordinating instructions.
(1) FS rehearsal time: 141415 MAY 01
(2) Technical rehearsal time: 142100 MAY 01
(3) Target modification cut-off time: 141100 MAY 01

4. **SERVICE SUPPORT.**

Ammunition

CSR PER TUBE PER DAY												
	RAP	HE/ HER	WP	HC	ILL	ICM	APERS	ZONE 8	HEP-T	RAAMS	DPICM	CPHD
105 MM	5	20	5	3	0	5	1	5	1			
MINUTES AND BN VOLLEYS AVAILABLE BASED ON ABL												
WPN	RAP	HE/ HER	WP	HC	ILL	AP ICM	APERS	HEP-T	ADAM	DPICM	ER DPICM	CPHD
105 MM	21	21	21 min	36 min	0	50	5	Btry 5				

5. **COMMAND and SIGNAL.**

a. Command.
(1) FSCOORD located with BDE TAC vic WQ 035415.
(2) 2-14 TOC co-located with BDE TOC WQ 026424.

b. Signal. Current SOI in effect.

ACKNOWLEDGE:

XXXXXXX
Commanding

OFFICIAL:

ENCLOSURES:
Appendix I - Fire Support Execution Matrix
Appendix II - Target List Worksheet/Target Selection Standards
Appendix III - Targeting Synchronization Matrix/Attack Guidance Matrix
Appendix IV - Fire Support Coordination Measures
Appendix V - Scheduling Worksheet (TBP)

Integration of the Targeting Process into the MDMP

The military decision-making process (MDMP) is meant to produce a synchronized operations order for units to execute a directed mission. The FSE uses this to integrate fire support into the overall commander's plan for execution. The process is deliberate and consists of:

1. Receipt of Mission
2. Mission Analysis/Mission Analysis Brief
3. Issue of Commander's Guidance
4. Course of Action (COA) Development
5. Course of Action Decision Brief
6. Course of Action Analysis/War game
7. Operations Order Production/Brief

The initial targeting effort should be integrated into the unit's tactical decision-making process. As the staff is developing its plan for future operations, they should use the *decide, detect, deliver,* and *assess* methodology to ensure the synchronization of the plan.

The brigade targeting officer should attend this process and begin to collect targeting data based on the staff's endeavors. The targeting process at brigade level is different from that at division or corps level in that it must synchronize a fluid maneuver battle rather than a point-and-shoot deep fight.

Mission Analysis

During mission analysis the S2 determines the high-value targets (HVTs) that resulted from his analysis of the enemy COAs. This HVT list should detail the capabilities and limitations of each target. Additionally, each staff member should review the assets available to acquire (detect), attack (deliver), or assess targets. At this point the staff can initially begin to translate HVT to HPT. Helping the S2 with reverse BOS for enemy indirect fire systems can alleviate initial IPB efforts.

Commander's Guidance

Once the commander approves the restated mission, he issues guidance to his staff. This guidance provides the staff an initial planning focus. The commander identifies the enemy COA, along with its associated HVTs, that he considers most probable or most dangerous. He should also identify an initial focus on targets he deems critical to mission success. While issuing guidance on the scheme of maneuver, the commander should issue his initial attack guidance by indicating the desired effect on targets he deems critical to the mission. The commander will give specific guidance for fire support that should support the overall maneuver tasks. The FSE must take this guidance and decide which assets will best suit the tasks during COA development.

Course of Action Development

During the development of each course of action, the staff should determine the targets which, if successfully attacked, would contribute to the success of the mission. Forces are arrayed to acquire and then attack these tentative HPTs to meet the commander's guidance. Initial observation plans, along with fire support platform execution, must be developed for each COA. The feasibility of each must be determined to successfully synchronize each COA.

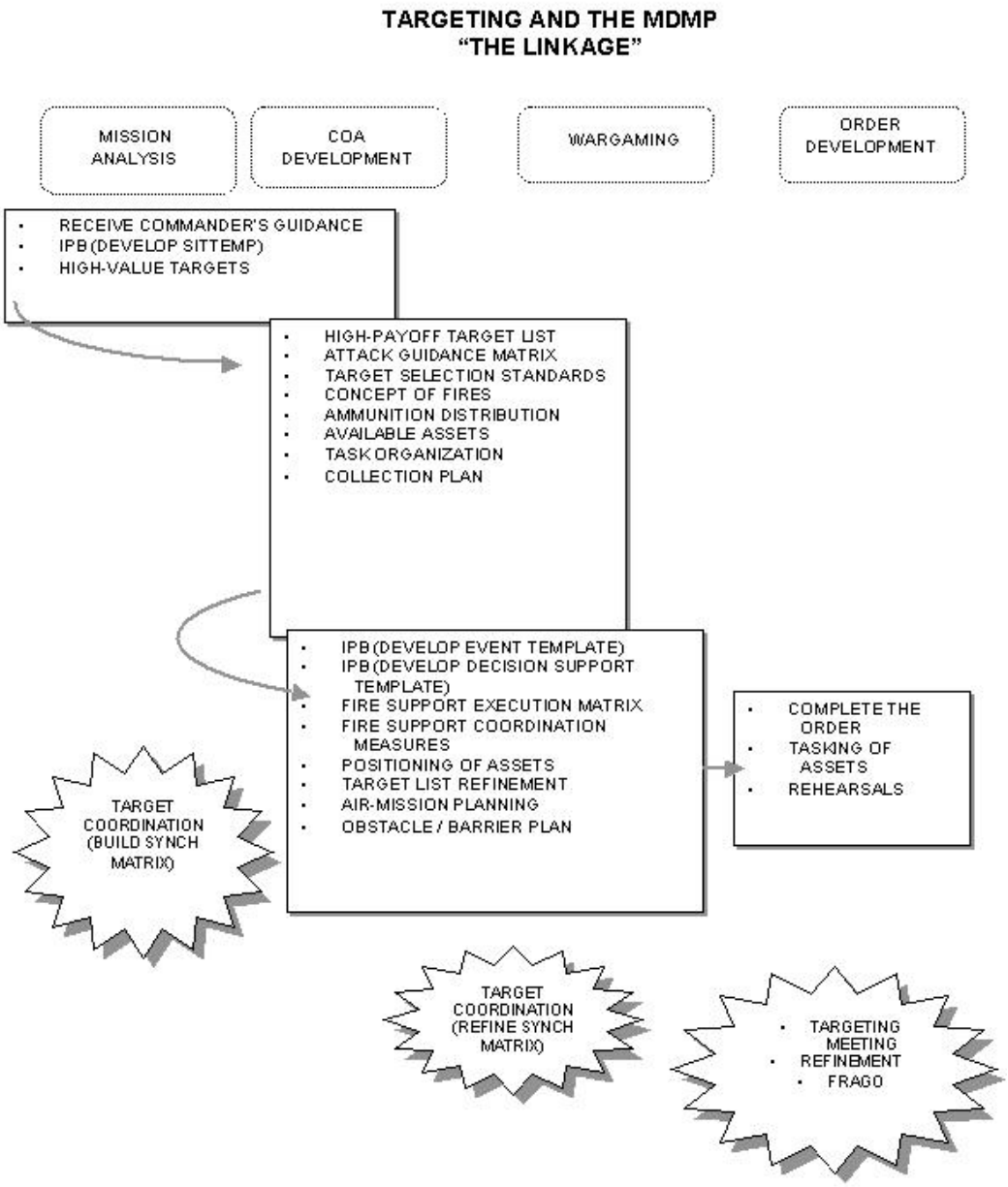
At the culmination of this phase, the staff should have the confirmed HPTL developed and the detect portion of the D3A (decide, detect, deliver, and assess) completed, minus any refinements from the war game.

Course of Action Analysis and Comparison

The staff analyzes the courses of action by war-gaming, risk assessment, and a comparison of the war-gaming results. During war gaming, the staff prioritizes the HPTs, determines which assets are available to acquire the targets (this becomes the basis for the S2's R&S plan), and which attack mechanisms are available to achieve the maximum desired effects on the target. Target selection standards are determined to identify the time and accuracy requirements necessary to launch attacks on HPTs. Additionally, war gaming should identify the requirements to assess the results of an attack to determine BDA or re-attack to meet the attack criteria. The process must be deliberate, and the staff must consider the friendly action, the enemy's reaction, and the friendly counteraction to effectively refine each COA. The results of the war gaming are reflected in the development of the initial targeting synchronization matrix, which indicates:

- The prioritized HPTs.
- The HPT's known, suspected, or templated locations.
- The asset tasked to acquire or detect it.
- The asset or delivery means tasked to attack it.
- The desired effects.
- Any requirement for assessment and the asset tasked to conduct BDA.

During the comparison of courses of action, the staff can use the COA's ability to achieve the commander's attack guidance as a criteria for comparison.


TARGETING AND THE MDMP
"THE LINKAGE"
MISSION ANALYSIS
COA DEVELOPMENT
WARGAMING
ORDER DEVELOPMENT
• RECEIVE COMMANDER'S GUIDANCE
• IPB (DEVELOP SITTEMP)
• HIGH-VALUE TARGETS
• HIGH-PAYOFF TARGET LIST
• ATTACK GUIDANCE MATRIX
• TARGET SELECTION STANDARDS
• CONCEPT OF FIRES
• AMMUNITION DISTRIBUTION
• AVAILABLE ASSETS
• TASK ORGANIZATION
• COLLECTION PLAN
• IPB (DEVELOP EVENT TEMPLATE)
• IPB (DEVELOP DECISION SUPPORT TEMPLATE)
• FIRE SUPPORT EXECUTION MATRIX
• FIRE SUPPORT COORDINATION MEASURES
• POSITIONING OF ASSETS
• TARGET LIST REFINEMENT
• AIR-MISSION PLANNING
• OBSTACLE / BARRIER PLAN
• COMPLETE THE ORDER
• TASKING OF ASSETS
• REHEARSALS
TARGET COORDINATION (BUILD SYNCH MATRIX)
TARGET COORDINATION (REFINE SYNCH MATRIX)
• TARGETING MEETING
• REFINEMENT
• FRAGO

CHAPTER 2

The Targeting Cycle

Preparation for the Targeting Meeting

The targeting meeting is the critical event to facilitate and integrate the targeting process. The purpose of a targeting meeting is to walk through the *decide, detect, deliver, assess* methodology to focus and synchronize the unit's combat power and resources toward finding, attacking, and assessing current high-payoff targets. The meeting verifies and updates the high-payoff target list; verifies, updates, and retasks available collection assets for each HPT; allocates delivery systems to engage each target; and confirms the assets tasked to verify the effects on the target after it has been attacked. A successful targeting meeting requires focus, participation by all battlefield operating system (BOS) representatives, preparation by all participants, and the rapid development and dissemination of required products.

The following personnel should attend the targeting meeting: the commander or executive officer, S3, S2, FSO and FSCOORD, targeting officer and direct support field artillery battalion S2, air liaison officer (ALO), air defense artillery liaison officer (ADA LNO), engineer LNO, S5, S3 Air, aviation liaison officer (AVN LNO), military intelligence company commander, psychological operations (PSYOPS), civil affairs, chemical officer, and the Staff Judge Advocate. Key to the successful conduct of the targeting meeting is that each representative comes to the meeting prepared to discuss available assets and the capabilities and limitations of their particular BOS.

The executive officer or S3 chairs the meeting. At brigade level, the meeting should be tailored for operations 24-36 hours out and at battalion level 12-24 hours out, or it can be tailored for a specific event (i.e., the division recon, regimental recon, and main body). Participants must conduct detailed prior coordination, come prepared, and bring several products to the meeting.

The S3 brings any changes to the commander's intent or task organization, requirements from higher headquarters (to include recent FRAGOs and taskings), current combat power, the current situation of subordinate units, planned operations, and maneuver assets available.

The S2 prepares an overview of the current enemy situation, to include enemy battle damage assessment (BDA), current situational and event templates, current high-value targets with locations, the commander's priority intelligence requirements (PIR), named areas of interest (NAI), and an overview of the reconnaissance and surveillance (R&S) plan. Most importantly, he prepares a predictive analysis of future enemy courses of action based on continuous intelligence preparation of the battlefield (IPB). The S2's products must be tailored to the designated time period to be discussed at the meeting.

The fire support officer (or targeting officer) provides the *current* high-payoff target list and prepares the *proposed* high-payoff target list for the designated period, with grid coordinates previously coordinated with the S2. The grid coordinates must be the most current and as accurate as possible. This will require detailed and extensive analysis, consultation, and coordination with the S2 and other staff members. The FSO (or targeting officer) brings the current target synchronization matrix and must be fully prepared to review what has and has not been accomplished. He also brings the current attack guidance matrix and target selection standards. He prepares to brief available fire support assets, to include status of the Q-36, close air support station time and sorties available, AC130 status (if applicable), status of naval gunfire, and ammunition availability and projection (normally expressed in number of volleys by type, or minutes of continuous smoke or illumination).

Based on the situation, additional staff members will need to provide the assets available and the capabilities and limitations of their assets. They must be prepared to discuss the integration of their assets into the targeting process. Additionally, they must be able to discuss in detail the capabilities and limitations of enemy assets within their BOS. If it is impossible for a particular staff officer to attend the meeting, he must provide his products and information to the primary staff officer that has supervisory responsibility for his particular area.

The following tools should be available to facilitate the conduct of the targeting meeting:

- Target synchronization matrix (TSM)
- List of potential detection assets
- List of potential delivery assets

The TSM visually illustrates the high-payoff targets and is designed to list specific targets with locations in each category. The matrix then provides entries to ensure each target is covered by an NAI and specific *detect, deliver,* and *assess* assets for each target as well as attack guidance for each target. Once completed, the TSM serves as a basis for updating the R&S plan and for issuing a FRAGO at the conclusion of the meeting. In addition, it facilitates the distribution of the results of the targeting meeting. The results of the meeting must be captured, and any new taskings or deletions of taskings must be spelled out in *tasks to subordinate units* within the FRAGO.

A list of all potential assets may help attendees visualize what assets may be available for detection and delivery purposes. It is essential that staff members be prepared to discuss the potential contribution for the particular assets within their BOS.

Conduct of the Targeting Meeting

The executive officer should open the targeting meeting by conducting a roll call, detailing the purpose of the meeting, discussing the agenda, and specifying the time period or event being discussed.

The S2 provides an intelligence update. First, he briefs the current enemy situation. Next, he reviews the current collection and R&S plans. Then he provides a battle damage assessment of targets previously engaged since the last targeting meeting and the impact on the enemy course of action. Next, he provides an analysis of the enemy's most probable courses of action and locations for the next 24-36 hours using the event template and a list of high-value targets. Finally, the S2 briefs changes to the PIR for review by the battle staff.

The second briefer is the S3. First, he briefs any particular guidance from the commander and changes to the commander's intent. Next, he briefs any requirements from higher headquarters since the last targeting meeting and a review of current operations. Finally, he informs the battle staff of the status of assets available for the targeting process.

The third briefer is the FSCOORD or FSO. He reviews the current TSM, providing a summary of results of actions taken. Next, he provides the new TSM with the proposed list of HPTs and locations for the battle staff's concurrence and refinement. Once any changes to the HPT have been made and any locations updated or refined, the XO or S3 facilitates a crosswalk to complete the remainder of the matrix by identifying a detector, determining an attack means, and assigning an asset to assess each HPT.

The first step is to determine and prioritize collection assets responsible for detecting, confirming, or denying the location of each suspected target. This information should then be entered into the "Detect" portion of the TSM. Be specific – state what unit or asset must detect, or confirm or deny the location of each specific target. Clear and concise taskings must be given to the acquisition assets. Mobile HPTs must be detected and tracked to maintain current target location. Assets should be placed in the best position according to estimates of when and where enemy targets will be located. Consider assigning an NAI to the target and enter the number on the TSM.

The second step is to determine which delivery means will be used to attack each target once detected or confirmed by using the list of delivery assets available. Enter this information into the "Deliver" portion of the TSM. Consider redundant means to attack each target. When determining an attack asset for each target, the attack guidance is also determined and entered. Determine for each delivery means when to attack the target (immediately, as acquired, or planned) and the effects to be achieved on the target. Effects of fire can be to destroy, neutralize, suppress, or harass the target.

- **Destroy** – physically renders the target permanently combat ineffective or so damaged that it cannot function unless restored, reconstituted, or rebuilt.
- **Neutralize** – renders the target ineffective or unusable for a temporary period.
- **Suppress** – degrades a weapon system's performance below the level needed to fulfill its mission. Lasts only as long as fires continue.
- **Harass** – designed to disturb the rest period of enemy troops, curtail movement, and lower enemy morale.

The final step is to determine and prioritize which assets will assess whether desired effects were achieved on targets after they are attacked. Enter this information into the "Assess" portion of the TSM.

During this portion of the meeting, it is essential that each member of the battle staff and each BOS representative provide their expertise and knowledge of friendly and enemy systems' capabilities and limitations. Consideration should be given to providing redundant means to detect, deliver, and assess targets. At the conclusion of the crosswalk, the TSM should be complete. The XO should keep the focus of the discussion to within the possibilities of friendly unit operations and on who should be the final arbitrator when filling out the TSM.

Targeting/Synchronization Meeting Agenda

I. Focus: 12 to 24 hours out, tailored for a specific event (i.e., counter-recon, division recon, brigade recon, main body).

II. Staff Preparation: Sets the conditions for a succinct targeting meeting.

A. S3
- FRAGOs from higher (HPTL).
- Forces available (task org/changes).
- Current combat power/unit status.
- Status of current operations.
- Changes to commander's intent.

B. S2
- Current enemy situation (SITTEMP/incident overlay).
- Current HVTs.
- Current PIR, highlighting any unanswered PIR.
- BDA of attacked targets last 12-24 hrs, highlighting changes in enemy capabilities.
- Status of R&S plan (NAIs tasked, gaps in coverage, and significant reports).
- Status of collection assets (C^2 relationship, location, and capabilities now and for targeting period).
- Enemy COAs for targeting period (SITTEMP, event temp, and HVTs).
- Proposed PIR.

C. FSO
- Current TSM.
- Proposed HPTs and locations (coordinated with S2 and S3).
- Status of fire support assets. Q-36 acquisitions last 12-24 hrs (given to S2).

D. ENG
- Enemy mines/obstacles.
- Friendly mines/obstacles.

E. ADAO
- Enemy air corridors.
- Location of ADA assets.

F. CA
- Population centers/protected areas/other civilian information.

G. MICO
- Asset status/location/composition.
- Capabilities cheat sheet (movement rates/battery usage/combat loads).

III. Targeting/Synchronization Meeting Tools (Visual Aids)

A. SITTEMP and event temp (next 12-24 hrs).

B. Assets available matrix (MI, task org forces, FS, Army air, CAS).
- Enemy BDA rollup.
- Proposed HPTL.
- TSM.
- Wargaming Synchronization Matrix.

IV. Attendees: CDR, XO (Chairs), S3, S2, FSO, ENG, ADAO, CA, BALO, MICO, PSYOP, chaplain

V. Targeting Meeting Agenda:

A. XO
- Focus of targeting/synch process (next 12-24 hrs or a particular event).

B. S2
- Current PIR, highlighting any unanswered PIR.
- BDA of attacked targets last 12-24 hrs, highlighting changes in enemy capabilities.
- Status of R&S plan (NAIs tasked, gaps in coverage, significant reports).
- Current enemy situation (SITTEMP/incident overlay).
- Collection assets available for targeting period (C2 relationship, location, capabilities).
- Enemy COA for targeting period (SITTEMPs, event temps, and HVTs).
- Recommended PIR for targeting period.
- Recommended R&S for targeting period.

C. S3
- Summary of current ops/dispositions. Status of EEFI and FFIR.
- Requirements from higher (tasks, HPTL).
- Forces available (time available for tasking, in position, operational).
- Changes to commander's intent.

D. FSO
- Status of FS delivery assets available.
- Q-36 orientation.
- Proposed HPTs.

E. CDR/S3/XO
- Approve HPTL and PIR (Decide).

F. ALL
- XO leads BOS crosswalk through new TSM (Detect, Deliver, Assess).

G. Products: Updated SITTEMP, PIR, R&S plan, FS plan, target list, friendly COA.

VI. War-game/Synchronization Process:

A. XO
- Facilitates action/reaction/counter-action process.

B. S2
- Fights enemy COA (SITTEMP/event temp).
- Confirms/adjusts R&S plan.

C. S3
- Fights friendly COA, integrating all BOS.

D. BOS
- Plan, coordinate, integrate, and schedule support for COA.

E. Products: FRAGO, graphics, SITTEMP, event temp, R&S plan (overlay and matrix), FS plan, target overlay/list, CSS plan/overlay.

VII. Dissemination of Products: Determine method of dissemination (next FRAGO?) and incorporate into battle rhythm.

Targeting Products

The XO, S3, S2, and FSO brief the commander on the results of the targeting meeting. Once the results of the targeting meeting are approved, several products are updated, written, and reproduced for distribution. This must be accomplished quickly, allowing sufficient time for subordinate units to react, plan, rehearse, and execute.

The timing of the targeting meeting is critical. It must be effectively integrated into the brigade's battle rhythm to ensure that the results of the targeting process focuses, rather than disrupts, operations. A successful technique is to conduct the brigade targeting meeting immediately following the commander's morning update, with all products, to include the fragmentary order, issued to the battalion task forces by midday. This allows the battalion task forces to incorporate guidance and taskings from brigade into their targeting meeting that is conducted mid- to late afternoon. It enables them to issue orders to their companies, conduct rehearsals and pre-combat checks, and execute within the designated time period.

Products resulting from a targeting meeting are:

1. **The updated target synchronization matrix.** This matrix specifies which high-payoff targets the commander has decided to attack, how the target will be detected, what lethal or non-lethal system will deliver on the target, and how to assess the damage.
2. **Tasks to subordinate units and assets from the target synchronization matrix.** The S3 should prepare and issue a FRAGO to subordinate elements to execute the planned attack and assess targets developed in the targeting meeting. The S2 reorients his acquisition assets and updates and disseminates the collection or R&S plan. Each staff member should confirm that subordinate elements have received taskings as a result of the targeting meeting and then confirm that these tasks are executed.

Conclusion

The targeting process is one of the single most important events to integrate, synchronize, and focus combat power. It requires command emphasis and the full and effective integration of all battlefield operating systems. It must be effectively integrated into the unit's battle rhythm. It is not just a wartime function. This process must be exercised before battle if it is to be effective. The members of the targeting team must be familiar with their roles and the roles of other team members. This familiarity can only be acquired through staff training. With low-intensity conflicts prevailing among real world deployments, the targeting process has proven to be most useful during sustained movement-to-contact operations. From Panama to Kosovo, units are experiencing lengthy operations where new operations orders are not built as they are in the combat training centers. The targeting process has proven to be the best method of synchronizing a brigade's focus and ensure unity of effort.

CHAPTER 3

Fire Support Planning

Essential Fire Support Development

Paragraph 3a(2), Concept of Operations (Fires), as well as the execution paragraph within Annex D, describes the concept of fires that is tied to the brigade's scheme of maneuver to achieve the commander's intent and desired end state for the operation.

The overall content should mirror that of the maneuver's concept of operations and must be fluid to ensure each phase within the fires portion is married to a phase within the maneuver's plan.

The concept of fires is described through essential fire support tasks (EFSTs). The EFST is normally tied to a key maneuver task drawn from the commander's guidance after mission analysis is complete. A brigade commander who understands fires will often give precise guidance for fire support from which these EFSTs directly fall.

The brigade FSO recommends to the field artillery battalion commander/fire support coordinator (FSCOORD) those critical tasks he deems essential to the operation, or EFSTs. By doctrine, failure to achieve an EFST may require the commander to alter his tactical or operational plan. Therefore, EFST development is critical and paramount. If the FSO and the FSCOORD have a common understanding of the operation, the EFSTs will be approved and refined quickly as the MDMP continues.

The EFST is comprised of four categories: **Task, Purpose, Method,** and **Effects**. Each must be coherent enough to convey its purpose and together describe the who, what, where, when, and how fires are effectively executed in sync with maneuver. The four portions of the EFST are described below.

- **TASK:** The task describes the targeting objective desired to achieve against specific enemy formations, functions or objectives. *Disrupt, Delay, Limit,* and *Destroy* are the most commonly used.

  Disrupt: To stop the enemy from performing a specific function.
  Delay: To hinder the enemy's ability to accomplish a specific task at the time it needs to.
  Limit: Reduce the enemy's ability to execute a course of action where he needs to.
  Destroy: Self-explanatory, but must be quantified by commander and validated by the FSO as achievable.

- **PURPOSE:** This is the maneuver or operational reason for the *TASK*. This will describe what specific maneuver function will be accomplished.

- **METHOD:** This describes how the *TASK* and *PURPOSE* will be achieved. Essential field artillery tasks (EFATs) are most often derived from the data within this portion. This section provides the collection asset tied in with its delivery asset. It tells the who, what, where, when, and how the *TASK* will be executed. Develop this in terms of *Purpose, Allocation,* and *Restrictions*. This should include POF, observer, trigger, target allocation, priority targets, CAS allocation, final protective fires (FPFs), restrictions (such as FSCMs, ammunition, or anything that may hinder *TASK* accomplishment), and special munitions (FASCAM, CPHD).

- **EFFECTS:** This quantifies the success of the *TASK*. This shows when the task is complete and can give guidance for re-attack if necessary.

Below are a few samples of EFSTs. There are also examples found within the sample Annex D within this handbook.

Maneuver Concept: 2nd BCT attacks in zone 150600Z to destroy enemy forces and return control of AOR to local authorities. 1st Battalion conducts air assault operations into LZs Slash and Stab IOT seize Objective Bull. 2nd Battalion conducts ground movement into AOR along route Copper to seize objective Cow once 1st Battalion secures Objective Bull.

EFST #1:
Task: Suppress enemy air defense systems (SA-7, ZSU-23-4).
Purpose: Allow 1st Battalion to conduct AASLT operations into LZs Stab and Slash without loss of aircraft allowing freedom of movement.
Method: C Battery, 1-2 FA, located in PA 2, provides SEAD fires on enemy ADA locations; targets: AG1015 and AG 1028 Plt 3 rounds VT on each. Colt three (POF during insertion), located in NFA 12, will execute these targets on frequency 388 (BDE FSC) when flight lead calls in ACP 4.
Effects: 1st Battalion arrives in LZs with no loss of aircraft.

EFST #2:
Task: Disrupt enemy's ability to mass indirect fires.
Purpose: Allow 2nd Battalion freedom of movement into AOR along route Copper.
Method: Conduct counter-fire against enemy mortar systems. The brigade Q-36 radar system, located in PA 5 (AOS 2400), will locate enemy mortar fires attempting to mass on friendly convoys and pass acquisitions to B Battery located in PA 5 as well. B Battery will fire a Btry 4 rounds HE on located enemy systems. All acquisitions will be passed voice on frequency 388 (BDE FSC) for clearance of fires procedure IAW BN TACSOP.
Effects: Enemy mortar systems neutralized and route Copper unaffected by indirect fires.

EFST to EFAT Translation

EFATs are tasks that the field artillery must accomplish to achieve an EFST. EFAT production is not complex. On the contrary, it is a rather simple process. An EFAT is generated from an EFST when the field artillery battalion has any nested requirements in an EFST. Usually this can be determined quickly by reading the *Method* portion of the EFST. If artillery fires are mentioned in the *Method* portion of the EFST, usually an executor in the delivery of fires, that EFST forms the basis for an EFAT. Additionally, an EFAT helps accomplish an EFST. In other words, an EFAT is similar to a critical battle task, whereas the EFST is a METL task. Bottom line: To achieve the end state of the EFST, the EFAT must be successfully executed. What does this EFST-EFAT translation require? The EFAT must first be artillerized for the DS battalion assets. Below is an example of an EFST, followed by an example of an EFAT derived from that EFST:

EFST#1
Task: Destroy enemy indirect fire system's ability to place effective fires on the forward operating base (FOB).
Purpose: Allow unimpeded build-up of combat power.
Method: Priority: Field artillery priority of fires (POF) to 1st Battalion, 2nd Battalion, aviation. Primary detection mechanism is Q-36 radar, alternate is MICO assets and brigade reconnaissance, tertiary means is crater analysis. Allocation: Field artillery fires and division cavalry destroy identified mortars. One priority TGT, AF4000, will be allocated to 1st Battalion. Restrictions: No cratering munitions within 50 meters of FLS.
Effects: All identified mortars destroyed.

EFAT#1
Task: Destroy enemy indirect fire system's ability to place effective fires on the forward operating base (FOB).
Purpose: Allow unimpeded build-up of combat power.
Method: Priority of 105mm fires is to 1st Battalion, 2nd Battalion, aviation. Priority of survey support to A Battery. Allocation: A Battery, the counter-fire battery, with Q-36, TLQ-17, and PADS. Team #1 conducts road movement from PA 5 to PA 13 at 212100, IPRT NLT 212330 vicinity grid WQ 318456 on AOF and AOS of 4800, alternate AOF 3600. TLQ-17 occupies and commences ECM against C2/FS nets. Survey section establishes declination station at PA5. Alternate PA is PA 12. B Battery with fabricated Q-36 (WOODY) and battalion retrans conducts road movement to PA 19 vic grid WQ158456 on AOF of 1600, alternate 3000. Secure retrans. Alternate PA is PA 18. Trigger to move is A Battery IPRTF. C Battery remains IPRTF vic grid WQ255555 on AOF 3200, alternate 2600. Alternate PA is PA 7. All three firing batteries IPRTF and Q-36 IPRTO prior to 1st Battalion's LD. Counterfire drill rehearsed. All counterfire missions fired within two minutes of acquisition. Fire Order: Battery 2 rounds HE/VT. Maneuver tied in with indirect fires as kill mechanisms, and enemy mortars destroyed using proactive and reactive counterfire. Assessment sensors include infantry, OH-58's and scouts. Sound predictive analysis using all acquisitions, crater analysis reports, and MICO intelligence feeds. BCT conducts aggressive crater analysis and sends SHELREPS via AFATDS to BDE FSE/FA BN TOC (Alt Voice FH 651) immediately. Quick fire net will be established between 1st Battalion and A Battery in support of combined arms mortar fight, and one priority TGT, AF4000, will be allocated to 1st Battalion. Clearance of fires drill rehearsed in the FA TOC. Restrictions: No cratering munitions within 50 meters of FLS.
Effects: 2 x 81mm mortars destroyed. Assessment sensors include infantry, OH-58's and scouts.

Following is a breakdown of the four elements of an EFAT.

- **Task** describes the objectives that fires must achieve against a specific enemy capability. Like an EFST, it has three parts: targeting objective, enemy formation, and function. *Destroy, delay, disrupt,* or *limit* are all examples of objectives. Formation is the size of the threat, and function is the capability of this threat to achieve its task and purpose. *Destroy* is the targeting objective, all *enemy indirect fire systems* is clearly the enemy formation, and the enemy's *ability to place effective fires on the FOB* is the function in EFAT#1 above.

- **Purpose** describes the operational purpose for the task – how it will contribute to the friendly force's mission and commander's intent. As with an EFST, it should identify the decisive point that will leverage the targeting effect. Very similar if not identical to the EFST, allowing *unimpeded build-up of combat power* is the purpose of EFAT#1.

- **Method** describes how the task and purpose will be achieved. Like the EFST, the method of the EFAT is very detailed and includes priorities, allocations, and restrictions. The EFAT's method may contain movement functions and priorities, critical tasks to subordinate firing units supporting the EFAT, and other critical mission essential tasks required to achieve the task and purpose of the EFAT. In EFAT#1, the FA BN TOC prescribed priority of fires, priority of survey support, concept of movement, and concept of fires to achieve the EFAT task and purpose. Additionally, EFAT#1 includes primary and alternate position areas and triggers for movements.

- **Effects** attempt to quantify the successful accomplishment of the task. They are assessment oriented and assist in the decision to re-attack or not. *Two 81mm mortars destroyed. Assessment sensors include infantry, OH-58's, and scouts*. Effects are more than destroying the enemy mortar – they are quantifiable and observable. Accurate assessment and confirmation that the system has been destroyed is the end result of the task.

Once the EFAT is developed, it should be disseminated in paragraph three of the OPORD/FASP. Using the matrix technique seems to work well, but the unit SOP will determine this.

Recommended tactics, techniques and procedures (TTP):

- **Provide a liaison to the brigade TOC.** Prior to publication of the fire support annex, it is critical that during the brigade MDMP process, the FA battalion TOC have a liaison or other representative (LNO) other than the FSCOORD or FSO assist in the MDMP process in the brigade TOC. The LNO must understand EFST development as it is covered in **FM 6-20-40, *Tactics, Techniques and Procedures for Fire Support for Brigade Operations (Heavy),*** and the Ft. Sill White Paper dated 16 September 1998. His task is to assist the FA BN TOC in parallel planning by providing working knowledge of EFST development. Additionally, he is the link between the two TOCs – the eyes and ears of the FA BN TOC S3 during the MDMP. Questions the LNO must ask are:

  1. *Which EFSTs identify field artillery assets that are required to provide fires in the EFFECTS portion of the EFST?*
  2. *How is the FA BN TOC tied into this?*
  3. *How would the METHOD portion of the EFST determine movement priorities?*
  4. *What ammunition or other special considerations are there?*
  5. *Is an air assault planned?*

The LNO invariably assists in giving the FA BN TOC a jump-start on EFAT development by addressing these types of questions early in the process. He also must provide the BDE FSO's battle calculus information required for the FA BN TOC mission analysis.

- **Establish a menu of EFATs with a checklist of considerations for each type of possible mission.** This menu is not a "cookie-cutter" technique for EFATs, but instead a memory jogger of the normal tasks associated with common missions. A matrix format works well. An example follows:

EFAT	CONSIDERATIONS
DESTROY MORTARS	AMMUNITION; OBSERVER PLAN, POSITIONING OF FA ASSETS AND Q-36, AZIMUTHS OF FIRE AND CUEING AZIMUTHS, PROACTIVE AND REACTIVE PREDICTIVE ANALYSIS, SENSOR-TO-SHOOTER ARCHITECTURE, QUICK FIRE NET(S), FIRE ORDER IAW MEMS IOT DESTROY MORTARS, COUNTERFIRE DRILL, CLEARANCE OF FIRES PROCEDURES, MANEUVER TIED INTO D3A METHODOLOGY
SUPPRESS ENEMY ADA SYSTEMS	AMMUNITION; OBSERVER PLAN, POSITIONING OF FA ASSETS AND Q-36, AZIMUTHS OF FIRE AND CUEING AZIMUTHS, SENSOR-TO-SHOOTER ARCHITECTURE, QUICK FIRE NET(S), FIRE ORDER IAW MEMS IOT DESTROY ADA SYSTEMS, SEAD COVERAGE/PLAN, CLEARANCE OF FIRES PROCEDURES, MANEUVER TIED INTO D3A METHODOLOGY, GS/R ASSETS TIED INTO BDE CONCEPT

- **Conduct continuous parallel planning.** FA BN TOC personnel must be forward-thinking in their approach to MDMP. With timely and accurate feeds from the FA BN TOC LNO, the FA BN TOC can rapidly and effectively produce sound and relevant EFATs through the use of the MDMP process, which can then be published in paragraph 3 of the FASP/OPORD. As the FA BN TOC establishes its MDMP-based battle rhythm, production of EFATs becomes rhythmic and more integrated with brigade functions.

In conclusion, EFAT production for the FA BN TOC is a key and essential task in itself. Using proactive, forward-thinking planning, sound and continuous liaison with the brigade TOC, and EFAT menus incorporated into unit SOPs, EFAT production becomes a normal TOC function that is easily incorporated in the unit's battle rhythm. EFATs translate the commander's guidance to the firing unit level. When done effectively, EFATs greatly assist FA BN TOC lash-up with subordinate units. More importantly, though, they assist in accomplishing non-routine tasks to standard. Through continued training, units can bridge the gap between brigade EFSTs and battery-level

execution, and EFAT production can be developed into a universally accepted TTP.

FIRE SUPPORT PLANNING

Long range planning. Upon receipt of a mission, the following actions will occur:		
ACTION	**CONSIDERATIONS**	**RESPONSIBILITY**
Obtain enemy order of battle and develop situation template.		Tgt Off, FA BN S2, BDE S2
Check FA attack matrix; update as necessary based on current enemy.		Tgt Off
Develop artillery and mortar force ratios to be used in war gaming and planning.		Tgt Off, FA BN S2
Planning for the immediate battle - Bde FSE		
ACTION	**CONSIDERATIONS**	**RESPONSIBILITY**
Receive higher HQ's OPORD.		BDE FSO
Conduct mission analysis (higher HQ's mission, intent, area of operations, tasks, assets available, limitations, risk, time).	FSO explains fire support combat power in terms the maneuver commander understands to include the number and type of missions available/possible? Btry/Bn/mortar volleys by type of ammunition and effects expected? Minimum safe distances? Minutes of smoke and allocation? Minutes of illumunation and allocation? Number of available RAAM/ADAM minefields by type, size, density, and safety zone? Range of Q-36, FA, and mortar coverage based on shell/fuze? Type of ammo?	BDE Staff (FSO)
Specified/implied tasks of fire support.		BDE FSO
Intent for maneuver and fire support guidance, including priorities for support.		
ACTION	**CONSIDERATIONS**	**RESPONSIBLITY**
COA development, war-game, and produce the decision support template. Targeting meeting conducted to determine initial high-payoff targets, assist in developing the R&S plan?	Conduct initial targeting meeting to determine high-payoff targets and plan for attack. DST documents include: Responsibilities for observing NAIs, TAIs, and decision points. Recommendations for attack of TAIs by weapon system and the associated trigger point. Bde directed obstacles. Initial Bde target list and target overlay. Input for the initial Bde synchronization matrix. Cdr states his target priorities and attack criteria based on target value analysis ammo available; maneuver cdr states his attack guidance by defining how, when, and with what restrictions he wants to attack different targets and in what priority. Maneuver cdr specifies the effects he wants to achieve for each type of target (suppress, neutralize, destroy, harass). FSO recommends S, N, D, H based on restrictions and effects tables (attack matrix).	S3, S2, FSO, ALO, Engr, Avn LNO, Tgt Off (+)

Formulate cdr's attack guidance (based on FA attack matrix and tgt value analysis). State priorities for support.	Fire support plan/annex include the following: Cdr's guidance for fire support? Fire support execution matrix? Priority of survey support for FA, mortars, obstacles, and radar? Fire support coordinating measures? Target refinement cutoff time? CAS sorties available and allocation? NGF available and allocation? Frequencies for voice calls for fire? Rehearsal schedule? CSR for FA and mortar ammo? Planned airspace coordination measures? Laser codes for use with smart munitions?	BDE CDR, FSO
Compute number of FA targets available for allocation. Allocate FA volleys and targets for planning based on cdr's priorities.	Top down tgt list? Tgt synch matrix? Cdr's attack guidance? Tgt allocation by unit? Priority tgt (or FPF) allocation by unit and phase? FA delivered FASCAM tgt allocation and safety boxes? CAS sorties available and allocation? NGF available and allocation? FSO disseminate tgt priorities to lowest levels of maneuver force, fire support staff and mortars?	BDE FSO
Develop cdr's attack criteria from cdr's attack guidance and enter it into TACFIRE.		BDE FSNCO
Develop fire support execution matrix as outlined in Appendix 1. Distribute to subordinate Bn FSOs and to Div FSE.		BDE FSO
Conduct rehearsals. Rehearsals will be conducted with as many members of the fire support system present as possible.	Members should include: subordinate FSEs with observers, the DS Bn S3 and FDO, 81mm mortar plt leaders, radar warrant, ALO, Engr, Avn LNO, and others as necessary. If time will not allow a face-to-face rehearsal, FM radio may be used as a back-up (dependent on the existing threat). As a minimum, war-gaming of the fire support plan will be conducted with the Bde FSO, DS Bn S3, and FDO present. The rehearsal should cover: (1) verification of tgt grids, numbers, and trigger points; (2) positioning of observers; (3) positioning and movement of FA and mortars and azimuth of fire; (4) commo nets and variables; (5) obstacle plan with fire support; (6) use of CAS and attack helicopters; (7) maneuver and fire support control measures, including FA, mortar, and air-delivered weapon MSDs.	BDE FSO, FA BN S3, FA BN CDR, BDE CDR
Planning for the immediate battle - BN FSE		
ACTION	**CONSIDERATIONS**	**RESPONSIBILITY**
Receive fire support plan from Bde FSE.		BN FSO
Cdr states his fire support guidance, defines areas where indirect fires are to be planned, engagement areas where fires must support maneuver, and any critical areas that require support.		BN CDR
Cdr states his attack guidance by defining how, when, and with what restrictions he wants to attack, different tgts, and in what priority.		BN CDR, FSO

War-gaming, identifying key terrain and engagement areas, obstacle requirements, and additional tgt requirements. Conduct initial bn targeting meeting to determine high-payoff tgts and means for locating and attacking them. Develop tgt overlay.	Identify those tgts Bde had directed for Bn coverage. Ensure enough assets remain to complete Bn intent. Ensure tgt overlay, sitemp, and friendly obstacle overlay are complementary.	BN CDR, S3, S2, FSO, Engr, ALO
Develop observation plan and submit to Bde. Specify observers responsible for Bde-directed targets and NAIs.	Assign primary and back-up observers for each tgt and supervise the following actions: (1) Each observer knows tgt responsibilities and trigger points; (2) Position each observer to observe tgts and trigger points he is responsible for; (3) Observer verifies trigger point on the ground and confirms timing for the trigger point based on enemy anticipated rate of movement; (4) Each observer knows weapon system to be used to attack tgt and how to call for fire for tgt attack; (5) Tgts are adjusted in as required (as a minimum, FPFs, priority tgts, and FASCAM minefield locations - for observer adjusted); (6) Observers know the exact location, on the ground, of all maneuver and fire support coordination measures.	BN FSO
Ensure tgt refinement is done by primary observers and disseminated to Co FSOs, Bde FSE, and DS Bn FDC, 81mm mortar plt, and 60mm mortars (though Co FSOs as necessary.	In accordance with Bde-directed tgt refinement cut-off time.	BN FSO
Ensure all FASCAM safety boxes are disseminated to subordinate elements.		BN FSO, Engr
Conduct rehearsals.	Fire support conducted as part of the combined arms rehearsal with all players present?	BN FSO

Execution Planning - All FSE(s)		
ACTION	**CONSIDERATIONS**	**RESPONSIBILITY**
FSO positions himself where he can best execute the fire support plan (not always with the cdr).	Observers verify or correct tgt locations and trigger points during refinement.	FSO/Plt FO
Commo systems checked with all elements.	Communicate with: (1) Supported cdr; (2) Subordinate/higher FSE; (3) FA Bn FDC, mortar FDC, other fire support assets (TACP, Avn LNO, SALT).	FSO/Plt FO
Call for fire on assigned tgts, render BDA.		FSO/Plt FO
Provide battle tracking at their level:		
ACTION	**CONSIDERATIONS**	**RESPONSIBILITY**
Current maneuver graphics, FSCMs, fire support unit locations, ranges of fire support sytems, and tgts posted. Tgt overlay checked periodically to ensure current enemy situation is reflected in targeting.	Plt FOs should know the location of all their maneuver elements to fire team level (and their future plans for movement); the location of fire support assets to include, as a minimum, supporting 60mm and 81mm mortar locations and the ammo status of these assets; their Co and Bn FSO locations; and the location of all current and proposed FSCMs.	Plt FO(s)

Current maneuver graphics, FSCMs, fire support unit locations, ranges of fire support systems, and tgts posted. Tgt overlay checked periodically to ensure current enemy situation is reflected in targeting.	Bn FSO should know the location of all their maneuver elements to plt level (and their future plans for movement); the location of fire support assets to include, as a minimum, supporting 60mm and 81mm mortar and DS FA Bn locations and the ammo status of these assets, location of attachments such as ADA or MI and COLTs; the assigned tgts and primary/secondary observers within their responsibility; their subordinate FO and FO's location; the location of the Bde FSO; and the location of all current and proposed FSCMs.	BN FSOs
Current maneuver graphics, FSCMs, fire support unit locations, ranges of fire support systems, and tgts posted. Tgt overlay checked periodically to ensure that current enemy situation is reflected in targeting.	Bde FSO should know the location of all maneuver elements to Co level (and their future plans for movement); the location of fire support assets to include, as a minimum, supporting radars, supporting 60mm and 81mm mortar, DS, and reinforcing FA Bn locations and the ammo status of these assets; the assigned tgts and primary/secondary observers within their responsibility; position of COLT teams; their subordinate FSOs location; the location of the Div FSE; and the location of all current and proposed FSCMs.	BDE FSO
Clear fires rapidly, positively, and safely within their maneuver cdr's area of operation. Ensure maneuver cdrs approve clearance.	Must battle track all elements within assigned area and know where Bde and Bn assets are located within area. Method to be used for battle tracking and clearance of indirect fires clearly understood by fire support elements and maneuver cdrs? Rehearsed?	FSOs/Plt FOs
Execute fires in accordance with the next higher level's fire support execution matrix. Fire support execution matrices will be produced as Co level and above.		FSOs/Plt FOs
Change priority tgts to support the maneuver cdr's scheme of maneuver throughout the operation.		FSOs/Plt FOs

Fire Support Planning Documents

Commander's Fire Support Guidance. The maneuver commander, in specific terms, establishes what, where, and how he wants fire support to influence the battle. This must be tied to specific phases or areas of the battle to allow the FSE to plan for massing of fires and the DS FA BN S3 to plan for FA battery positioning, movement, ammunition, and execution of targets.

Fire Support Execution Matrix. The fire support execution matrix is tied to the phases of the operation, assigns target execution responsibility (to include series and groups of targets), and allocates fire support resources to the task forces/battalions. Once assigned responsibility for a target's execution, the responsible agency will position a primary and secondary observer for the target, ensure a trigger point is established, and provide target refinement data as necessary. Priority targets, final protective fire (FPF), priority of fires, and fire support coordination measures (FSCM) will also be identified by phase in the fire support execution matrix.

Critical Information. This portion of Annex D provides the maneuver commander and fire support officer with the additional information necessary to execute the plan outlined in the fire support execution matrix. Not all "blocks" will be required for each operation. Entries should be self-explanatory. Note that smoke and illumination available reflect only FA assets, not the organic mortars of the maneuver battalions.

Commander's Attack Guidance. Priority will be assigned to each of the target categories: "When" to attack will be identified as I=immediate, A=as acquired, P=plan; "How" may include suppress, neutralize, destroy, or capture and may include the means (particularly when non-lethal); "Remarks" may include restrictions and targets to be nominated for CAS. The commander's attack matrix will be approved by the maneuver commander.

Field Artillery (and Mortar) Attack Matrix. The attack matrix is an unclassified tool for the maneuver commander and his FSO to use in determining commander's attack guidance. It allows the maneuver commander and FSO to assess the cost in terms of fire support assets to attack various target types. The attack matrix will be updated as necessary based on the enemy order of battle.

Coordinating Instructions. Self-explanatory.

Service Support. Will include, as a minimum, the controlled supply rates (CSR) for DS FA BN, 81mm and 60mm mortars.

Command and Signal. Any entries as determined by the FSO to support the current operation.

FIRE SUPPORT PLANNING - DEFENSIVE OPERATIONS

	Targeting meetings conducted at least each 24-36 hrs during the preparation for the defense to refine high-payoff target list and confirm *decide, detect, deliver, assess* methodology.
	Current maneuver graphics, FSCMs, fire support unit locations, ranges of fire support systems, and targets posted.
	Target overlay checked periodically to ensure that current enemy situation is reflected in targeting.
	Fire plans built at brigade and subordinate level based on allocation of resources and commander's fire support guidance. Fire plans (to include special munitions such as FASCAM) entered into LTACFIRE in time to conduct technical rehearsals and prepare for firing.
	Communications sytems checked with all elements.
	Time specified and met for all fire support systems to be ready based on scheme of maneuver.
	Determine how and when priority of fires will be shifted.
	Determine what will be the "trigger" for shifting priorities of fire.
Review defensive fire planning: FM 6-20-50. Plan fire support early and throughout the entire defensive sector. **a. Fires forward of the main battle area (MBA)**:	
	Counter-reconnaissance fires planned. Consider augmenting forward elements with observers and the use of laser-guided munitions if available.
	Plan fires to force the enemy commander to deploy his forces early.
	Position observers on templated avenues of approach.
	Plan fires on key chokepoints.
	Plan FASCAM and smoke to separate lead elements from follow-on forces.
	Plan counter-preparation fires.
b. Fires in the MBA:	
	Plan fires throughout the MBA.
	Mass to disrupt, delay, and destroy the enemy.
	Plan fires to assist maneuver during retrograde operations.
	Plan fires on key obstacles and assign redundant observers to execute the fire plan. –Know the engineer obstacle plan and types of obstacles. –Consider the terrain when targeting obstacles. Fires placed incorrectly will force the enemy to take an alternate course of action. –Consider the use of smoke to support the obstacle plan.
	Plan fires in support of engagement areas. –Use fire support to canalize the enemy. –Plan groups for simultaneous engagement within engagement areas. –Plan series to preclude enemy movement out of engagement areas. –Mass fires in engagement areas. –Plan coordinated attack in engagement areas with air assets (JAAT). –Consider the use of illumination in the engagement area.
c. Defensive fires:	
	Integrate fire support into direct fire defensive plan.
	Suppress enemy indirect and direct fire weapons.
	Assign priority targets and FPFs to battle positions, strong points, or perimeter defenses.
	Plan for contingencies to reallocate fire support to strengthen vulnerabilities.
d. Support hasty attack:	
	Use quick fire planning techniques.
	Place CFLs close to forward defensive positions to facilitate rapid engagements.

FIRE SUPPORT PLANNING - OFFENSIVE OPERATIONS

	Targeting meetings conducted at least once every 24 hrs during the preparation for the attack to refine high-payoff target list and confirm *decide, detect, deliver, assess* methodology.
	Current maneuver graphics, FSCMs, fire support unit locations, ranges of fire support sytems, and targets posted.
	Target overlay checked periodically to ensure that current enemy situation is reflected in targeting.
	Fire plans built at brigade and subordinate level based on allocations of resources and commander's fire support guidance. Fire plans (to include special munitions such as FASCAM) entered into LTACFIRE in time to conduct technical rehearsals and prepare for firing.
	Communications systems checked with all elements.
	Time specified and met for all fire support systems to be ready based on scheme of maneuver.
	Determine how and when priority of fires will be shifted. What will be the "trigger" for shifting priorities of fire.
	Consider developing an interdiction plan to disrupt enemy preparation of the objective.
	Plan fires short of the LD/LC: –Defensive fires (FPFs or targets) planned for unit assembly areas and trains. –Fires planned en route to the LD/LC. –Fires planned to support a hasty defense if attack fails. –Fires planned to impede enemy efforts at counter-reconnaissance.
	Plan fires from the LD/LC to the objective: –Provide priority of fires to lead elements. –Consider fires to suppress enemy direct fire weapons. –Consider smoke to restrict enemy observation of friendly maneuver elements. –Consider use of smoke to screen friendly obstacle breaching operations. –Consider planning fires on exposed flanks to disrupt counter-attacks. –Consider task organization of forward observers to ensure all critical targets are observed. –Consider preparatory fires. Ensure they are tied to maneuver events (not just time; what fires will be needed to suppress the enemy during breaching efforts?). Advantages must outweigh the loss of surprise. Fires must be accurate to be effective; consider how successful reconnaissance efforts have been or will there be a need to adjust preparation fires prior to actual execution of the assault? Ensure ammunition is available to accomplish commander's guidance. Consider whether the enemy will be able to recover from the effects of the preparation prior to the assault.
	Determine when and how fires will be shifted (particularly priority targets en route). Use: time (at a predetermined time fires will shift), location (fires shift when maneuver reaches a certain location, such as a phase line), on call (the maneuver commander directs when the fires shift), event (a predetermined event signals shifting of fires). Ensure the method to be used is understood by all fire support assets from observer to delivery means.
	Plan fires on the objective: –Consider fires to block enemy reinforcements and resupply by ground or air. –Consider fires to suppress enemy direct fire weapons. –Consider obscurants to screen friendly forces or obscure hostile ground observation when consolidating on the objective. –Designate a signal for lifting or shifting fires. Ensure the signal is understood by maneuver elements. –Plan fires in support of a hasty defense upon successful attack of the enemy objective.
	Plan fires beyond the objective: –To delay, disrupt, or limit enemy reinforcements. –To block avenues of approach for counter-attacking forces. Consider use of field artillery-delivered FASCAM to assist in this effort. –Consider planning fires to disrupt or delay enemy retreat.
	Subordinate elements maintain communications and report unit location and status hourly.

FIRE SUPPORT PLANNING - OPERATIONS OTHER THAN WAR (OOTW)

	Battle tracking matrix that is tied to terrain, integrated with maneuver graphics, developed, and disseminated to higher headquarters and to subordinate elements.
	Targeting meetings conducted at least once every 24 hrs during the operation to refine current high-payoff target list and confirm decide, detect, deliver, assess methodology.
	Battle tracking matrix posted on fire support map and maneuver map.
	Survivability of firing batteries and Q-36 radar planned; CINC engineer designated for field artillery battalion.
	Commander's fire support guidance developed with a focus on decentralization of assets to subordinate elements with the capability to quickly mass the brigade's fire support on high-payoff targets.
	Plan for delivery of accurate indirect fires through registration of assets.
	Review doctrinal considerations for OOTW in FM 6-20-50: –Review host nation rules of engagement. –Reduced capability for brigade-level control and coordination of fires within the operational area requires decentralization. –Increased security for firing positions of indirect fire weapons, to include planning direct fire for defense. –6400 mil capability normally required. –Indiscriminate use of fire support should be avoided. –Close cooordination with host country officials in the operational area is required. –Development of SOPs for every likely contingency (NEO, humanitarian assistance) is imperative. –Continuous contact between supported commander and FSO must be maintained. –Communications with host country forces and area control centers must be established and maintained.
	Hourly updates of company locations and planned movements provided to brigade fire support element. Company FSOs plan detailed fire support for patrols and ensure fire plans are submitted to battalion FSEs. FPFs planned for company patrol bases and assembly areas.
	Periodic updates of areas pre-cleared for engagement of indirect fires using battle tracking matrix.
	ROE clearly understood by FSO?

AIR ASSAULT FIRE SUPPORT CHECKLIST

	Based upon commander's guidance or METT-T, determine what fire support is required for the mission (LZ, prep, SEAD, preps of false LZs).
	Alert brigade/division FSE.
	Alert fire support delivery assets (FA, mortars, CAS, AH, NGF, EW).
	Query ATI/S2 files to assist in route/PZ/LZ selection.
	Determine flight routes, both ingress and egress, for the air asasult task force with the S3, S2, and aviation LNO.
	Query ATI/S2 to develop target list for fires in support of the loading plan, air movement plan, landing plan, and the ground tactical plan.
	Develop initial target list. Plan fires: –On known and suspected enemy positions. –On key terrain. –Around the LZ (suppressive fires during the air assault and blocking fires during consolidation). –On and around false LZs. –To support the ground tactical plan.
	Determine flight times, phase lines, checkpoints, and code words with the S3 and aviation LNO.
	Determine abort criteria and procedures. Request additional fire support assistance from BDE/DIV FSE if necessary.
	Develop tentative fire plan integrating all fire support assets available (FA, mortars, CAS, AH, NGF, and EW).
	Coordinate attack of targets with S3, S2, ALO, aviation LNO, ANGLICO, BDE/DIV FSEs.
	Resolve A2C2 issues.
	Develop execution matrix (who will initiate/observe fires).
	Develop primary and back-up communication plans.
	Send fire plan to battalion and/or DIVARTY FDC/FSE.
	Prepare fire support portion of air mission brief.
	Attend AMB and brief fire support plan.
	Conduct fire support coordination meeting with: –BN FDOs (DS and GS). –Firing battery commanders (DS and GS). –Company and battalion fire support officers. –Mortar platoon leaders and FDOs. –Assault and attack helicopter flight leads. –Air liaison officer (ALO). –Supporting arms liaison team officer (SALTO).
	Ensure all participants receive a correct and complete copy of the fire plan including: –Target list. –Schedule of fires (if used). –Execution matrix. –Communication plan. –Graphics showing ingress and egress routes, PZ and LZ, targets, position of delivery assets. –Gun-target lines, A2C2, and fire support coordination measures in effect.
	Determine time/place for fire support and combined maneuver rehearsals.
	Attend rehearsals.
	Continually update fire plan (minimize changes after rehearsals).

FSO AIR MISSION BRIEF CHECKLIST

	Fire support assets available.
	Concept of fires: --Target locations. –Purpose of targets. –Type/amount/duration of fires. –Delivery system associated with each target. –Primary and back-up executors. –Method of control (positive or programmed).
	PZ/LZ locations.
	Flight routes, aerial checkpoints, and phase lines.
	A2C2 information: –Gun-target line. –Maximum and minimum ords. –CAS attack heading and egress route.
	Location of fire support delivery systems.
	Sequence of events and code words (H-Hour).
	Abort criteria and code word.
	Abort/delay plan.
	SEAD plan.
	Fire support coordination measures in effect.
	Signal for last round of LZ prep (WP or ground burst illumination).
	Communication plan.
	SOI extract and variable. –Primary and alternate frequencies. –Emergency checkfiring procedures. –Retrans. –Commex/rehearsal times. –Net discipline. –Back-up radios.
	Dump grid.
	Location of C2 aircraft –Synchronize watches.

Joint Air Attack Team (JAAT) Operations

1. **References.**

a. **FM 90-21, *JAAT Multiservice Procedures for Joint Air Attack Team Operations,*** MCRP 3-23A, NWP 3-01.03, AFTTP(I) 3-2.10, Multi-service Procedures for Joint Air Attack Team Operations, Jun 98.

b. **FM 1-112, *Attack Helicopter Battalion,*** 7Apr 97.

2. **Joint Air Attack Team (JAAT) Operations.** JAAT is a coordinated attack on one target array by attack helicopters and fixed-wing attack aircraft, supported by artillery, mortars, or naval surface fire support. The JAAT must support the brigade's scheme of maneuver. Success depends on effective planning, continuous coordination, and execution of standardized procedures. Massed moving, armored formations in the open are the most lucrative targets for a JAAT. Normally, JAAT operations are integrated with the ground maneuver battle in an engagement area (EA). We conduct JAAT operations to achieve the synergistic effects of the brigade's combat power.

3. **JAAT Key Players and Equipment.**

a. The ground maneuver commander determines when to employ a JAAT and requests and integrates the assets with supporting fires into his battle plan.
b. The aviation commander coordinates the JAAT and makes the tactical plan, acts as the air mission commander (AMC), and executes the JAAT engagement.
c. The attack helicopter company commander positions attack helicopters and advises/informs the AMC.
d. An attack helicopter battalion employs by one of three techniques:
(1) Continuous attack; also known as the one-third rule.
(2) Phased attack.
(3) Maximum destruction.
e. The forward air controller is responsible for identifying the targets for the CAS aircraft. He is normally the individual who passes the 9-line briefing to the CAS eight lead, and then hands the CAS over to the AMC to be orchestrated into the JAAT.
f. The CAS lead is responsible for his flight. He is the individual who dictates the tactics his flight will use to attack the target. He is also responsible for keeping the AMC advised of the situation from his perspective.
g. Indirect fire support (artillery, mortars, and/or naval surface fire support) will be planned to support and augment the firepower of JAAT operations. Fire support roles during JAAT operations include close fires, fires in depth, and counterfires.

4. **Execution.**

a. Requests for JAAT assets:
(1) The ground maneuver commander is responsible for requesting, planning, and integrating JAAT assets into the battle plan.
(2) Pre-planned requests are done via an AIRSUPREQ (air support request) or DD1972. Specify "JAAT" in the remarks section.
(3) Immediate requests are done via the AFARN (Air Force Air Request Net). Specify "JAAT."

b. Conduct of the JAAT operation:
(1) When the TACAIR fixed-wing aircraft are en route to the contact point, the TACP/AFAC will pass the 9-line briefing and direct the flight lead to contact the AMC on a pre-coordinated radio frequency. The AMC will then provide a final coordination brief to the flight lead.
(2) A JAAT common frequency will be designated, and all team members should monitor it.
(a) Before the attack, the AMC and flight lead use this frequency to coordinate the attack, thus allowing everyone on the net to monitor the plan.
(b) During the attack, team members use this frequency to relay threat and target information as well as update the attack plan.
(3) The AMC will orchestrate JAAT fires with radio calls to the FSE, TACAIR flight lead, and the attack helicopters.

(4) A timing coordination call (TIME HACK) will be used to enhance situational awareness, concentration of firepower, timeliness of SEAD firings, and aircraft deconfliction.
(5) JAAT planners will ensure participating components have compatible joint authentication materials available.
(6) Ensure airspace coordination/control measures, such as routes, airspace coordination areas, and attack-by-fire areas, are identified.

c. Employment methods. Based on the factors of mission, enemy, terrain, troops, and time (METT-T), JAAT elements attack using either *combined* or *sectored* employment methods. The decision of which employment method to use rests with the aviation unit commander.
(1) A *combined* attack refers to a geographical avenue of approach. In a combined attack, all participants use the same operating area and avenue of approach to the target. A combined attack requires assets to monitor and deconflict flight paths and weapons employment since all JAAT aircraft will be maneuvering in the same general area.
(2) A *sectored* attack refers to the use of separate avenues of approach to the target area. A sectored attack allows assets to maneuver freely with knowledge that no other aircraft are in their respective sector.

d. Firepower timing options:
(1) Simultaneous: All JAAT elements fire at the same time.
(2) Sequential: JAAT elements are employed one at a time.
(3) Random: JAAT elements fire at will.

e. JAAT operations using a combination of employment methods and firepower timing options will be used.
(1) Combined
- Simultaneous
- Sequential
- Random

(2) Sectored
- Simultaneous
- Sequential
- Random

f. The JAAT clock:
(1) Used to execute the sequential firepower timing option.
(2) Limits the number of radio transmissions.
(3) Effective in a communications jamming environment.

5. **JAAT Planning Guideline.**

a. JAAT planning will normally be conducted at the brigade level; however, any battalion task force may request a JAAT.

b. JAAT planning considerations:
(1) Type and size of target.
(2) Target activity.
(3) Target priorities.
(4) Alternate targets/contingency plans.
(5) Enemy avenues of approach.
(6) Enemy air threat/type/location (including air and ground means).
(7) Friendly artillery assets and locations that can support the operation.
(8) Provisions for SEAD/JSEAD.
(9) Friendly air defense artillery weapons' coordination.
(10) Communications (frequencies, have quick procedures, authentications).
(11) Laser codes.
(12) Electronic warfare considerations.
(13) Lost communications procedures.
(14) Downed aircraft procedures/combat search and rescue.

(15) Tactics and attack options.
(16) Initiation time/event.
(17) Emergency procedures.
(18) Weapons' loads.
(19) Target marking options.
(20) Contact points/initial points.
(21) Ingress/egress routes.
(22) Location of friendly units.
(23) Mission abort criteria/notification procedures.
(24) Airspace coordination.
(25) Weather.
(26) Use of helicopter for ALO or ETAC.

6. **Responsibility.**

Bde Commander/XO/S3	Develop/approve concept for JAAT employment to support scheme of maneuver. Supervise staff planning effort.
Aviation Commander	Execute JAAT operations. Coordinate with ground maneuver unit. Coordinate with other members of the JAAT. Provide detailed planning guidance to crews.
S3 Air	Coordinate airspace. Ensure timely submission of preplanned TACAIR requests through G3 Air.
S2	Prepare IPB. Develop intelligence. Conduct target value analysis to identify high-payoff targets to the commander.
ALO/TACP	Recommend best employment of TACAIR to support scheme of maneuver. Coordinate preplanned TACAIR requests through air request net. (Requests should specify "JAAT" and contain frequencies, call signs, laser codes, and authentication procedures.)
FSO	Plan and coordinate fire support in target area and SEAD.
AVN BDE LNO	Recommend best employment for Army aviation assets. Coordinate with and pass missions to aviation unit.
MICO	Request and coordinate electronic warfare support.
Air Defense Artillery LNO	Coordinate air defense weapons' control status and air defense plans. Coordinate airspace control with the S3 Air.

7. **Threat Air Defense Environment.** Threat air defenses must be considered and J-SEAD planned to suppress it. Destructive SEAD by the employment of direct and indirect fire weapons will be used. Disruptive SEAD will be used to temporarily suppress enemy air defenses by jamming, chaff, and flares.

a. A low air threat environment permits combat operations and support without prohibitive interference. Target location for engagement is enhanced by effective communications, accurate target identification, and reattacks, if necessary.

b. In a medium air defense threat environment, the specific aircraft performance and weapons systems' capabilities allow acceptable exposure time to enemy air defenses. This air threat environment restricts the flexibility of attack tactics in the immediate target area. The medium air threat environment normally allows medium-altitude mission and attack deliveries with a low probability of engagement by enemy air defenses.

c. A high air threat environment includes a significant air defense combat power with integrated fire control systems and electronic warfare capabilities that would seriously diminish the ability of friendly forces to provide necessary air support. This air threat environment might preclude missions such as immediate CAS, since effective radio communication and coordination may not be possible.

8. **Laser Operations.**

a. The OH-58D target lasing capability, coupled with TACAIR fixed-wing laser spot tracking, offers greater efficiency and total integration and distribution of fires.

b. Laser-capable helicopters will provide laser designation, target handover, and greater target-killing capabilities when possible.

c. Laser codes will be exchanged during coordination to ensure successful laser operations.

d. *Laser-to-target* line will be added to the *type of mark* section of the 9-line briefing.

e. Required radio calls for laser operations:
(1) Departing IP call.
(2) Timing coordination call and type weapon.
(3) 10 seconds call.
(4) Laser on call.
(5) Spot call.
(6) Lock-launch call.
(7) Shift call.
(8) Terminate call.

9. **Communications.** Communications is key to the effectiveness of the mission. Once designated, the commo plan must be disseminated to the key participants, to include the Air Force and ground air defense units.

a. A JAAT communications net has no set configuration.

b. AMC uses the maneuver commander's net to coordinate the JAAT with other maneuver units and keep the maneuver commander informed. This will be a secure FM frequency.

c. All aircraft will monitor the common JAAT frequency.

d. All JAAT communications should occur over secure radios. If not possible, authentication between JAAT elements must occur.

JAAT Briefing Guide

1. Tactical Situation
   A. Friendly order of battle
   B. Enemy order of battle
2. Target Area Operations
   A. Attack roles
   B. Weapons' selection considerations
3. Coordination with Attack Helicopters
   A. Type of attack: sectored/combined/sequential/random
   B. Ordnance considerations
4. Target Acquisition
   A. Marking
   B. Laser code
5. Threat Suppression
6. Re-attack Considerations
7. Egress
8. Remarks

Fire Support Rehearsals

1. **FM 7-20, *The Infantry Battalion,* page 2-24:** Combat rehearsals are conducted to help a unit gain agility, to ensure synchronization, to increase initiative, and to improve depth of a force through practice. Both fire support and maneuver actions should be rehearsed, which reinforce the scheme of maneuver and fire plan.

2. **FM 6-20-1, *Field Artillery Cannon Battalion,* pages 3-12 to 3-15:** Rehearsals are an integral part of the planning process. It should both practice and test the plan. If at all possible, it should be combined with maneuver.

a. Rehearsal procedures should be established as a part of unit SOPs. At a minimum, SOPs should identify the following:
(1) Who will participate in the rehearsal?
(2) What should be rehearsed?
(3) What will the sequence of the rehearsal be?
(4) What will the priority of methods for rehearsals be (suitable or actual terrain, model, map, sand table, wire, or radio)?

b. Generally, successful units conduct both a combined maneuver and fire support rehearsal and a FSCOORD/FSO fire support rehearsal. Often units must conduct both rehearsals to ensure that maximum synchronization is gained in supporting the scheme of maneuver with fires. Normally, time is not available during the combined maneuver and fire support rehearsal to allow for a "technical rehearsal."

3. **Combined Maneuver and Fire Support Rehearsal.**

a. Key players include the maneuver staff, all fire support cell members, the mortar platoon leader, chemical officer, aviation liaison officer, CEWI company commander, and engineer officer.

b. Normally, the unit S3 directs the rehearsal using a synchronization matrix and/or execution checklist; the FSCOORD/FSO should use his fire support execution matrix. In doing so, the rehearsal is normally executed by reciting and/or performing:
(1) Actions to occur.
(2) Possible friendly initiatives.
(3) Possible reactions to enemy initiatives.
(4) Control measures.
(5) Significant events that are to occur in relation to time or phases of the operation.

c. At a minimum, for each phase or time period of the operation, the FSCOORD/FSO should cover the following:
(1) Grid locations for critical targets.
(2) Trigger points verified for each target.
(3) Target engagement criteria (such as "Initiate fires on target AD3001 when five enemy dismounts pass trigger point 6").
(4) Primary and backup observer established for each target/triggers.
(5) Primary and backup communications links identified for each observer.
(6) Priority and purpose for each target (what effects are to be achieved). The FSO must address why fires are needed in relation to specific maneuver events and the commander's intent for fires. For example: "As Alpha Company crosses Phase Line Bucs, Alpha Company FSO will initiate fires on AE2003 to suppress the combat outpost located vic hill 200."
(7) Method of fire and control (at my command, time on target, or when ready).
(8) Method of engagement, such as shell-fuze combination, number of volleys, and unit(s) to fire, is specified for each target.
(9) Movement plan specifying when and where units will move.

4. **FSCOORD/FSO Fire Support Rehearsal.**

a. Although units conduct combined maneuver and fire support rehearsals, not all members can attend. Combined rehearsals are normally followed by a "technical rehearsal" where platoon FOs and gun sections participate to refine the fire support plan, ensure understanding by all fire support personnel, and prove the feasibility of executing the current plan.

b. This rehearsal is executed using the fire support execution matrix (FSEM) as a script for executing fires to support the scheme of maneuver. The FA battalion uses and verifies the FA support plan.

c. The FSCOORD/FSO uses the friendly scheme of maneuver and a valid FSEM as a script for the rehearsal. The FSCOORD/FSO establishes the time for all key participants to be ready to conduct the rehearsal. The FSCOORD/FSO begins the rehearsal by announcing key times or phases of the operation. Each participant executes the actions he will take. These are:

(1) **FSOs (to include the FSO conducting the rehearsal):** Verify that they can observe their assigned targets and trigger points, fire their assigned targets, place fire support coordinating measures into effect, and generate the reports the fire support system depends on for its combat information.

(2) **Forward observers (FO):** Same as FSOs, ensuring that high-priority missions (such as FPFs or priority targets) are loaded in the buffers of their FED/HTU, and ensuring that signals for lifting and shifting fires are understood.

(3) The **ALO** monitors airspace coordination, clears aircraft to depart from their initial point, calls for target marking and marking of friendly locations, and requests initiation of SEAD.

(4) The **DS battalion or mortar platoon/section leader** monitors and ensures:

(a) Units are positioned to support the plan.

(b) The FDC issues fire orders and passes message to observers.

(c) The transfer of control of fires for displacement of the battalion FDC (FA battalion only).

(d) Radars are cued on assigned azimuths (FA battalion only).

(e) Firing unit FDC(s) compute firing data and issue fire commands, acknowledge FSCM(s), and ensure it can fire its assigned mission.

(f) Howitzer and mortar section leaders have determined if ammunition is on-hand and if mission is within traverse limits.

d. If a combined maneuver and fire support rehearsal has not been conducted, the FSO should also cover those items in paragraph 4 above. Alternative friendly courses of action (branches and sequels to the plan) may also be rehearsed if time permits; however, be careful not to allow these to become the focus of the rehearsal.

e. The important features of the rehearsal are:

(1) The plan is complete.

(2) Actual players, not stand-ins, participate down to the lowest level.

(3) Problems are corrected as they arise.

(4) The plan is rehearsed as it will be executed.

(5) The fire support matrix is updated on the spot with any changes.

(6) Final scrub of the target list is conducted.

5. **Rehearsals should conclude with a summary of each unit's status (to include firing unit ammunition status) and location.** This will facilitate planning of future operations.

REHEARSAL SEQUENCE

Note: The following checklist is not designed to cover every possible contingency that could be discussed during the conduct of a rehearsal. However, it is provided as a possible suggestion on areas to cover. This checklist can be expanded as necessary, modified, and tailored to offensive or defensive operations.

_____ Conduct a key player roll call.
_____ Orient participants to the map/sand table and the maneuver graphics that will be used for the operation/rehearsal.
_____ Scrub target list.
_____ S2 gives enemy overview and current disposition and mission. Discusses enemy actions by phase.
_____ S3 gives current friendly status and brigade mission.
_____ Event by event discussion. (This applies to an integrated maneuver/fire support rehearsal or a separate FS rehearsal.)
_____ Maneuver event identified.
_____ Supporting fire support action identified and discussed in terms of the 5W's.

5 W's IAW PLOTCR: The fire support execution matrix and target list should be the base documents for the rehearsal process. While rehearsing key targets during the fire support rehearsal, FSOs may use PLOTCR to discuss each target in depth. (P - target **Purpose**, L - **Location**, O - **Observer** responsible, T - **Trigger**, C - **Communication** [C/S, frequencies], R - **Rehearsal**).

_____ Where - Target location and number.
_____ Who - Execution responsibility and communication links (primary, alternate, and backup).
_____ Why - Purpose described (i.e., *execute AE4000 to suppress the enemy combat outpost located near hill 201 as Alpha Company maneuvers to the west and bypasses*).
_____ When - Trigger or engagement criteria (*as Alpha Company crosses PL Apple, which is the east/west road north of hill 201, the lead platoon FO will execute AE4000 to suppress the COP*).
_____ What - Desired effects (ammunition and shell/fuze combination required to render neutralization, destruction, or suppression).

_____ Continue event by event. Discuss the 5W's for any maneuver event requiring an associated fire support action.
_____ Recap all critical fire support actions by individual responsible (BDE FSO, Bn FSO, A FSO, B FSO, C FSO, attachments).
_____ ALO recap critical CAS events.
_____ FSO verifies all applicable frequencies, call signs, and code words.
_____ Final scrub of target list and fire support execution matrix.
_____ Exchange information - updated ammo counts, etc.
_____ FSO quickly recaps all critical fire support events using the EFST format.

- Task
- Purpose
- Method: Priority, allocations, and restrictions
- Effects

CHAPTER 4

Radar Planning

Zone Considerations

The firing unit locations the radar has developed as targets are displayed for transmission in the order of priority of the zones in which the targets were acquired (CFFZ [call for fire zone], ATIZ [artillery target intelligence zone]) or in which the weapons locating radar (WLR) has determined as point of impact (CFZ [critical friendly zone]). The zone priorities are displayed in the following precedence:

(Priority 1) Locations of weapons firing into a CFZ
(Priority 2) Weapons firing from a CFFZ
(Priority 3) Weapons firing from an ATIZ

All other weapon firing locations are displayed after locations associated with these zones as Priority 3. All locations other than those associated with a CFZ or CFFZ are formatted by the radar computer as Initial Fire Support Automated System (IFSAS) target reports in ATI;CDR format. If the radar has no zones loaded, then all locations are transmitted in the ATI;CDR format. The WLR will not develop weapon locations that originate from within a censor zone.

Critical Friendly Zones

A CFZ is an area, usually a friendly unit or location, that the maneuver commander designates as critical. It is used to protect an asset whose loss would seriously jeopardize the mission. When the computer predicts that an enemy round will impact in a CFZ, the location of the weapon that fired the round will be reported by the computer in precedence above all other acquisitions. Any location of a weapon firing into a CFZ will result in a Priority 1 message, FM;CFF format. A CFZ provides for the most responsive submission of targets to the fire direction center/fire coordination cell. CFZs are activated, de-activated, and refined continuously. Below are examples of possible CFZ nominations:

- Battle positions (BPs)
- Air asault/Airborne LZs and PZs
- Support-by-fire positions
- Chokepoints along maneuver routes
- Breach points
- Forward COLT/Scout positions
- Attack-by-fire positions
- Aviation FARP sites

Call for Fire Zones

A call for fire zone (CFFZ) designates a search area forward of the FLOT that the maneuver commander wants suppressed, neutralized, or destroyed. An area designated a CFFZ would likely be on enemy fire support positions and is closely tied to information developed during the construction of the HPTL/TSS/AGM worksheet. A CFFZ provides the second most responsive priority of request for fire generated by the radar. A target identified in a CFFZ will generate an FO;CMD Priority 2 message. However, the commander may upgrade this to a Priority 1 message for certain CFFZs. The following would be likely CFFZ nominations:

- Enemy mortar position
- Divisional artillery groups (DAG)
- Regimental artillery groups (RAG)
- Enemy missile positions

Artillery Target Intelligence Zones

An artillery target intelligence zone (ATIZ) is an area in enemy territory that the maneuver commander wishes to monitor closely. Any weapons acquired in this zone will be reported before all target detections except CFZ and CFFZ violations, but detections will only result in a target report (ATI;CDR). ATIZ examples are the same as the examples for CFFZs.

Censor Zones

A censor zone (CZ) is an area from which the commander wishes to ignore all acquisitions. CZs must be managed very judiciously, since the WLR does not report to the operator any rounds fired that originated from a CZ. A CZ can be used to deconflict rounds being fired from a friendly artillery or mortar position that, because of its aspect angle to the radar, could be detected as enemy artillery or mortar fire. CZs can be used when an uneven FLOT (forward line of own troops) exists or when friendly forces are located in enemy territory. CZs can also be used if firing in support of rear operations.

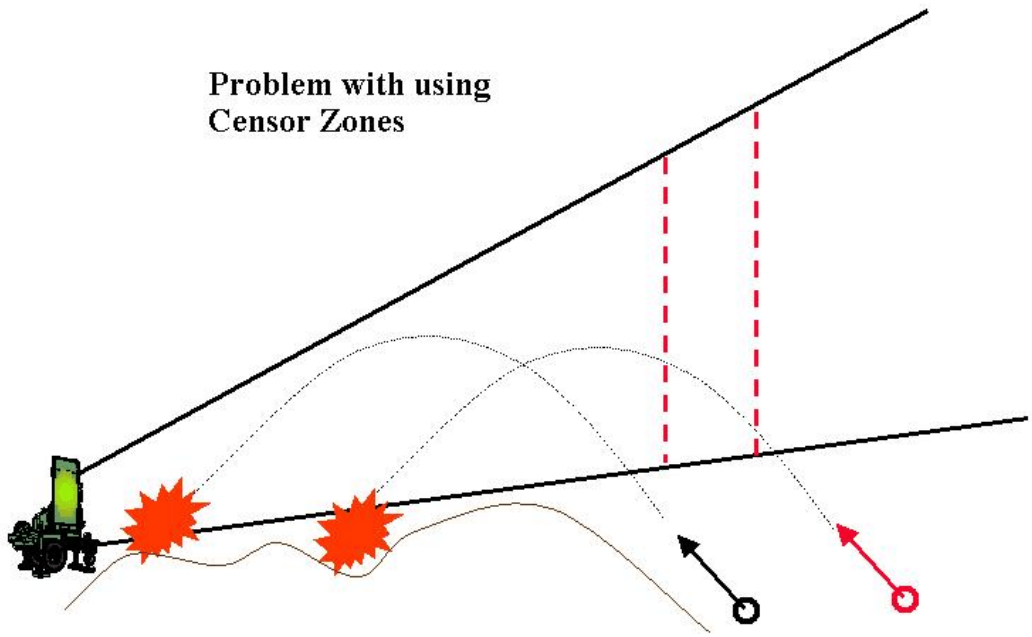
CAUTION

The use of CZs and CFZs simultaneously can cause rounds originating from a CZ and firing into a CFZ to not be detected. It is essential that the targeting officer and S2 monitor the combined use of CZs and CFZs closely to ensure that the radar capability of providing target data to protect critical friendly zones is not inhibited. Censor zones, unlike other zones, reside inside the radar's beam rather than in reference to the ground plane of existence. This is meant to save beam energy, and caution must be taken when placing them around low angle weapons. Most rounds will not pass through the CZ, and weapons wanted may be censored. Solid battle tracking can alleviate the need for CZs. See diagram on page 51.

Zone Management

Fighting the counterfire is also the responsibility of the maneuver commander. Zone management is a difficult but worthwhile task that will greatly enhance the effort. The brigade FSE must prioritize the BCT sector and allocate radar zones to support the scheme of maneuver based on the commander's planning guidance. Critical to the success of the brigade combat team will be the coordination and availability of redundant radar coverage by the DivArty (Q-37). This coverage must be built into the planning guidance and coordinated as early as possible.

The brigade FSE is responsible for coordinating directly with the DivArty counterfire officer (CFO), who has the dual responsibility of planning divisional target acquisition and redundant coverage for the maneuver brigades, to ensure a complete understanding of the brigade's target acquisition requirements. The targeting officer and the DS battalion S2 must ensure coordination for available GS fires and radar coverage is completed with the DivArty CFO. The coordination between the DivArty CFO and the brigade's fire support element is crucial to the success of the counterfire battle.



To save radiated energy, the CZ is inside the beam rather than in reference to the ground plane.

Guides to assist in the zone planning effort:

- Use top-down planning and bottom-up refinement.
- Bottom-up refinement from TF FSEs should reflect the current SITEMP, force protection, and scheme of maneuver.
- The radar technician should handle zone management and execution.
- The maneuver order should contain the top-down radar zone plan.
- Resolve duplications; time phasing by priority; zones should be on the brigade execution matrix.
- Zones are dynamic and must be planned and refined continuously.

Zone Management Planning Sequence

- Prioritize operational sector and scheme of maneuver for critical events.
- Develop zones during course of action (COA) war gaming.
- Allocate zones to subordinate FSEs and scrutinize zone requests.
- Develop and assign decision points as triggers for the execution of planned zones.
- Incorporate decision points (triggers) for planned zones and radar movement into the appropriate DST, synchronization/execution matrix, and intelligence collection plan.
- Refine to ensure nominated zones facilitate the scheme of maneuver and the maneuver commander's intent for force protection.
- Rehearse zone plan.

- Refine zones during execution as the IPB improves or scheme of maneuver changes.
- Develop positioning guidance for the radar that optimizes the probability of acquisition and supports the coverage of planned zones.

Zone Management Responsibilities

Responsibilities for radar employment and zone management must be fixed to focus the planning process and execution.

- **BCT FSCOORD/BDE FSO:** Translates the commander's intent for force protection and engagement of enemy indirect fire weapon systems. Ensures force protection and counterfire priorities are articulated in the commander's intent for fires. Recommends zones to the commander during the planning process.

- **BCT TARGETING TEAM:** Synchronizes all collection assets and provides zone management. Allocates, verifies, and updates zones. Assigns cueing agents to corresponding NAIs, PIRs, and IRs covered by planned zones. The designated agents should correspond with the R&S plan to be in position to activate the zone.

- **BCT TARGETING OFFICER:** Provides guidance to lower echelon FSOs and targeting officers for the planning and execution of zones. Ensures priorities and triggers are developed for the activation of zones. Integrates the triggers with the synchrination matrix. Integrates the zones/radar plan into combined arms/fire support rehearsals. Ensures zones are sent to the FA S2 and the DivArty CFO for inclusion in the radar deployment order (RDO).

- **TASK FORCE FSO:** Develops priority zones to support the task force plan (CFZs/CZs). Nominates zones to the brigade FSE for approval/priority. Develops precise triggers, along with identifying and assigning cueing agents to activate the zones. Syncs the sync matrix. Establishes ownership and responsibility for each zone. Ensures any changes to the scheme of maneuver are compared against the planned zones. Ensures refinement is completed and sent to the DS BN S2 for transmission to the radar. Activates and refines zones during execution.

- **FA BN S2:** Develops CFFZs. Nominates zones to the targeting team. Receives approved zones for inclusion in the RDO. Coordinates directly with the BCT targeting officer and radar technician to construct RDOs. Refines zones continuously as needed.

Communications

Cueing is the process designed to prompt or notify the radar to begin radiating. It is inherently difficult to determine when and where to cue. Both the authority to cue and the cueing guidance must be thoroughly planned and rehearsed prior to execution. Cueing may be event-driven (situational cueing) or planned (demand cueing). Random cueing schedules based on the time of day is inefficient; it unnecessarily exposes the radar to enemy direction-finding systems.

Radar cueing must be responsive in order to be effective. The ultimate goal is first volley acquisitions of threat indirect weapons systems. There are two types of cueing: situational (proactive) and demand (reactive). Situational and demand cueing may be used separately or in combination.

- **Situational** is the preferred method for cueing radars and is the most responsive. This method ties cueing to events and/or triggers that are determined in the planning process, such as a breach or assault. Situational cueing can also be tied to suspected enemy courses of action based on the enemy decision support template (DST). Situational cueing focuses the radar on the commander's intent and what is critical.

- **Demand** is the activation of a radar once the enemy is known to have already begun firing. Key to successful demand cueing schedules are responsiveness and solid lines of communication. Specific cueing guidance must also be established to fully exploit the radar's capabilities and minimize unnecessary radiation emissions.

Cueing Control. Control over who cues the radar and when can be either centralized or decentralized. If the cueing control is going to be decentralized a thorough cueing plan must be established, including: authorized agents, communications links, and conditions under which the radar may be cued.

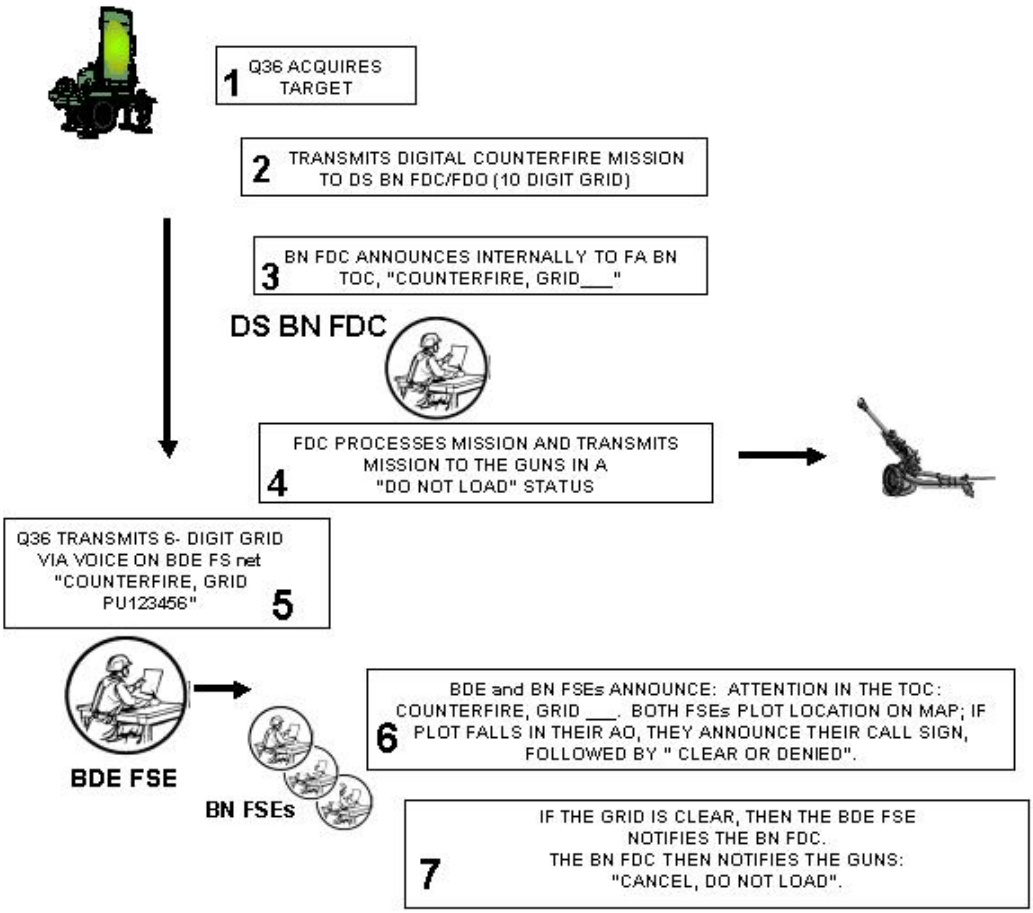
NOTE: If no EW threat exists, the radar may radiate continuously, maximizing the detection of enemy indirect fire systems.

Zones in Low-Intensity Conflict (LIC)

In the 6400-mil battlefield, the planning of zones becomes more difficult. The brigade targeting officer must identify the enemy indirect threat. Often the enemy will have a limited number of indirect assets, most of which consist of mortar systems. These systems are often self-contained and not under a centralized command, thus unable to mass fires on any one target. The limited range of these systems also contributes to the enemy's difficulty in coordinating mass fires.

When an acquisition arrives at the FA BN FDC, it is always considered a Priority 1 mission regardless of the message format received. Light infantry units are highly susceptible to these systems and, therefore, must react quickly due to the short dwell time of these highly mobile assets.

The targeting officer should measure the number of systems against the number of available enemy systems. With enough assets to engage the possibility of multiple acquisitions, the need for numerous zones greatly decreases.



With the short dwell time of these assets (usually no more than a few minutes), the clearance of fires procedures must be accurate and expedient. This chart shows how light units can expedite the process.

Q-36(V8) Firefinder Radar Capabilities and Limitations

The AN/TPQ-36 radar is optimized to locate short-range high-angle indirect fire weapons such as mortars. For planning purposes, the radar has a minimum range of 750 meters and a maximum range of 24,000 meters. The radar has an extended azimuth function, which allows 6400-mil coverage. When extended azimuth is selected, the radar divides the 6400-mil area into four 1600-mil search areas, rotating in a clockwise direction automatically (with assignable search times of 10 to 300 seconds). Caution must be used in selecting this function due to the loss of coverage in any of the other 4800-mil areas while the radar is looking in a specific direction. The decision to use this function must be weighted against the most likely areas of interest. The radar is normally located 3-6 kilometers behind the forward line of troops (FLOT) or within a reasonable distance of the designated supporting battery from the DS FA BN. The AN/TPQ-36 can be emplaced within approximately 15 minutes and march ordered in approximately 5-10 minutes depending on the section's level of training.

Generally, the probability of the radar detecting and locating mortar and artillery fires is considered to be excellent out to about 12 kilometers. Detection is good out to about 24 kilometers for rockets because of the larger size; however, the velocity threshold for the Q-36 is considerably lower than the threshold for velocity on the Q-37. Consider that artillery and mortar acquisitions beyond 12 kilometers continue to degrade as the range between the weapon and radar increases. The bottom line is that the radar's ability to track and acquire a target is related to the size and velocity of the round and distance to the target (assuming all standard technical employment requirements are met).

Video integration (VI) is a function within the system that increases the probability of detection of mortar and artillery projectiles by trying to extract greater range performance from the system. By integrating two or four dwells, a range enhancement of about 2.8 dbsm (18% range) is achieved. VI is not needed at close-in ranges, as the additional time the radar takes to process the acquisition may result in the round passing through the beam before the computer can reach a solution. The following two tables show the performance guidelines with and without VI on and some VI decision points.

Location and Accuracy Capabilities on Specific Weapon Systems

AN/TPQ-36(V8) PERFORMANCE GUIDE

WEAPON	PL and RANGE: VI ON	(50%) CEP: VI ON	PL and RANGE: VI OFF	(50%) CEP: VI OFF
81 mm mortar	90% to 18km	40m or .4% range (whichever is greater)	90% to 15.3 km	40m or .4% range (whichever is greater)
155mm arty	70% to 14.5km	65m or .65% range (whichever is greater}	70% to 12.3km	65m or .65% range (whichever is greater}
Rocket 122mm	70% to 24km	120m or 1% of range (whichever is greater)	70% to 20.3km	120m or 1% of range (whichever is greater)
Rocket 122mm w/ drag rings	70% to 24km	120m or 1% of range (whichever is greater)	70% to 20.3km	120m or 1% of range (whichever is greater)
MLRS 227mm	70% to 24km	120m or 1% of range (whichever is greater)	70% to 20.3km	120m or 1% of range (whichever is greater)
MLRS RRPR 227mm high drag training round	70% to 24km	120m or 1% of range (whichever is greater)	70% to 20.3km	120m or 1% of range (whichever is greater)

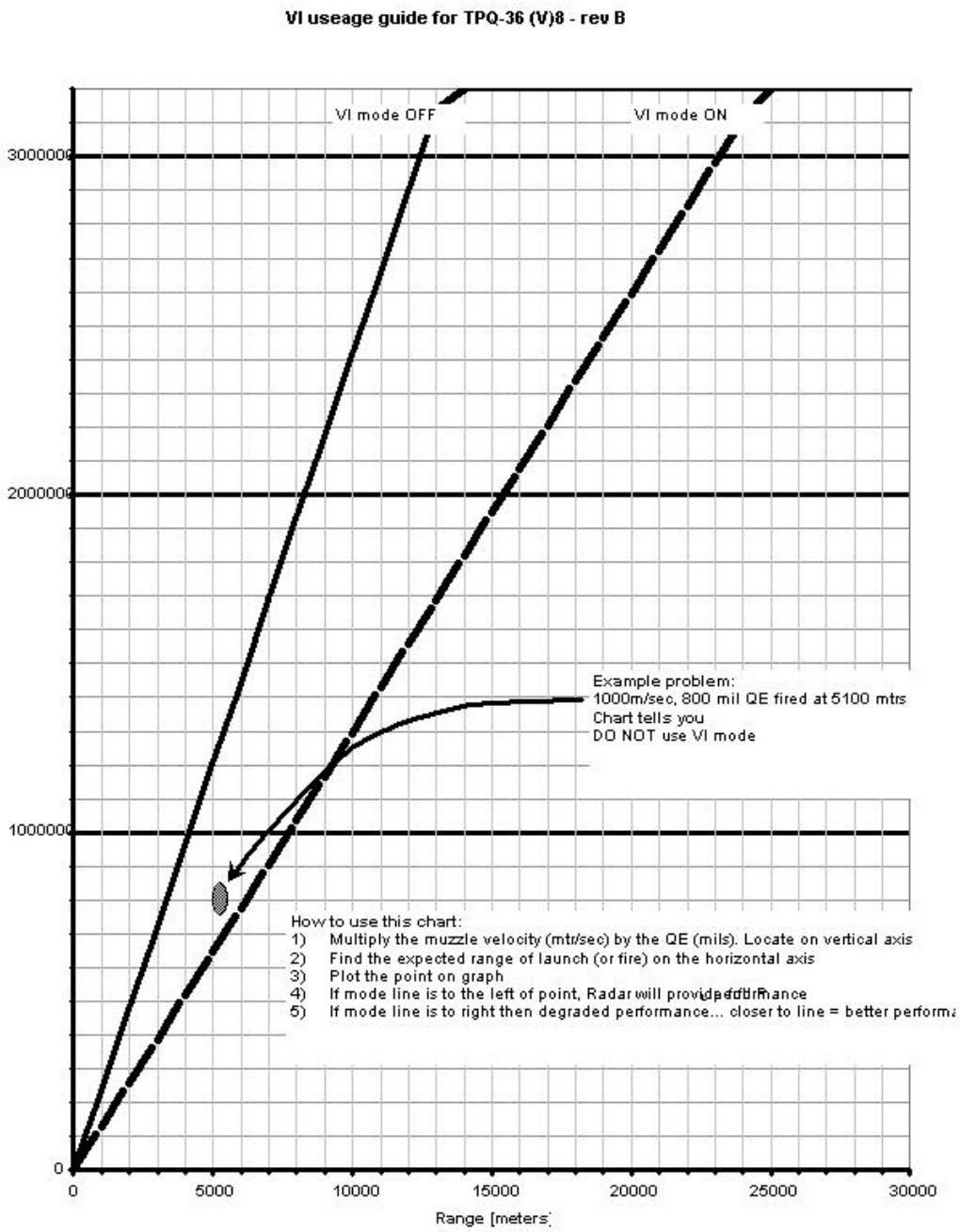
VI On/Off Decision Points

Look at the desired target you wish to track and locate its data within the TFT FFPAS (or other means) for determining the round's *muzzle velocity* (arty and mortars) or *velocity at end of burn (*rockets). Then find the radar-target range. Once these two factors have been determined, apply the following table to determine if VI should be shut off.

WEAPON TYPE	MUZZLE VELOCITY/ VELOCITY AT END OF BURN	VI MUST BE OFF IF RANGE LESS THAN
ARTILLERY: 105mm	400m/s	4.2km
	600m/s	6.2km
ARTILLERY: 155mm	400m/s	4.2km
	600m/s	6.2km
ARTILLERY: 175mm	600m/s	6.2km
	800m/s	8.3km
	1000m/s	10.3km
	800m/s	8.3km
MORTAR: 81 & 120mm	104m/s	1.1km
	268m/s	3.0km
ROCKETS: 3.5 inch	385m/s	4.5km
(114mm)		
ROCKETS: 122mm	690m/s	8.0KM
ROCKETS: 122mm w/drag rings	550-600m/s	7.8km
ROCKETS: MLRS 227mm	800m/s	9.2km
ROCKETS: MLRS ER 227mm	1000m/s	11.7km
ROCKETS: MLRS RRPR 227mm training rocket	650-700m/s	8.3km
ROCKETS: NK 240mm	1000m/s	11.7km

Notes:

1. QE is assumed to be worst case possible by weapon type. Worst type QE reduces time within the beam to a minimum. Worst case QEs are as follows: Arty: 1350mils; Mortar: 1500mils; Rockets: 1500mils.
2. Aspect angle is assumed to be worst case as well. This would normally be a zero degree (head on) shot. Rounds fired at greater aspect angles may stay in beam longer and be easier to track.
3. Muzzle velocity (artillery) and velocity at end of burn (rockets) will increase with altitude due to the fact that, at higher altitudes, air pressure decreases and the projectile will gain speed.
4. Velocities for MLRS RRPR and 122mm with drag rings are initial estimates pending confirmation.
5. VI usage guide for AN/TPQ-38V8 – Rev B (as seen on page 57) provides a graphical tool where VI on/off state can be determined for other known projectile parameters.
6. Decision point ranges provided in this version of the table are from Malibu Research and N-G.


VI useage guide for TPQ-36 (V)8 - rev B
VI mode OFF
VI mode ON
3000000
2000000
1000000
0
0
5000
10000
15000
20000
25000
30000
Range [meters]
Example problem:
1000m/sec, 800 mil QE fired at 5100 mtrs
Chart tells you
DO NOT use VI mode
How to use this chart:
1) Multiply the muzzle velocity (mtr/sec) by the QE (mils). Locate on vertical axis
2) Find the expected range of launch (or fire) on the horizontal axis
3) Plot the point on graph
4) If mode line is to the left of point, Radar will provide performance
5) If mode line is to right then degraded performance... closer to line = better performa

Target Identification and Validation

The Q-36 is designed to determine whether or not an acquisition is mortar, artillery, or rocket, with approximately 80-percent probability accuracy. As an additional estimate tool, the S2 and targeting officer will plot and determine the range capability of the weapon system firing in order to classify the target. The radar groups the targets into three classifications:

- **Wanted targets** - mortars, artillery, and rockets detected, verified, and tracked by the main beam.
- **False targets** - targets that appear to be valid caused by electronically induced signals, side lobe radiation (helicopters and other aircraft), and ground clutter (normally vehicles).
- **Unwanted targets** - targets other than mortar, artillery, or rocket tracked by the main beam of the radar. These targets usually represent objects flying through the radar main beam that behave in a ballistic manner (tank rounds skipping ricochets, small arms rounds, bursts of small arms fires, shrapnel from explosions).

Distinguishing between wanted, false, and unwanted targets will present some unique challenges. Radar crews will report all acquisitions to the FA battalion. Therefore, the process of eliminating unwanted and false targets rests entirely on the DS battalion S2 and targeting officers. Acquisition pattern analysis, known threat weapons' characteristics, IPB, terrain analysis, situational awareness, and the brigade commander's guidance should all be considered in determining the validity of target acquisitions.

The FSCOORD, BDE FSO, G2/S2, and targeting officer are responsible for developing and recommending the target priorities for acquisition, decision points and time lines for radar execution, radar sectors of search and zones, and development of the TA tab and radar deployment orders (RDO). Development of these products will enhance the effectiveness of the target acquisition plan and aid in the elimination of unwanted or false targets.

Techniques for Optimum Radar Planning and Execution

Planning. The FSCOORD, BDE FSO, S2, and targeting officer will recommend to the maneuver commander the HPTL/TSS/AGM, radar decision points and timelines for execution, radar search sectors and zones as appropriate, positioning guidance and support, radar security plan, and the TA tab.

Execution. The FSCOORD, BDE FSO, S2, and targeting officer will monitor execution of the plan through the employment of supporting artillery and rocket fires to assist in the counter-fire fight. Direct coordination with the BDE ALO for allocated TACAIR should be conducted to alleviate radar frequency issues that may arise during the use of anti-radiation missiles such as HARM. Coordinate with the aviation FSO to employ attack helicopter assets and with the division FAIO at the ACE for requesting EW support. During operations, the main duties of target acquisition will be monitored by:

- Maintaining the current status and capability of the Q-36 radar.
- Preparing the TA tab and subsequent RDOs.
- Coordinating the implementation of the TA tab.
- Scheduling the fires of the firing units.
- Ensuring targets are attacked in accordance with the commander's guidance.

Staff Considerations and Responsibilities. The BDE/BN staff is required to develop, maintain, and coordinate plans for the employment of the Q-36 radar. Factors to consider in the deployment of the Q-36 radar:

- Command and support relationships (task a battery for primary support/security).
- Sectors of search.
- Zone management.
- Cueing (based on current EW threat).
- Communications links.
- Positioning considerations.

- Survivability considerations.
- Specific offensive and defensive considerations.
- Re-supply and maintenance issues.

The FA battalion S2, in conjunction with the BDE targeting officer, is responsible for the determination of:

- The designation of general positioning areas, sectors of search, and zones.
- Establishing cueing guidance based on the EW threat.
- The designation of cueing agents.
- Controlling movement of the radar and implementing a security plan.
- Designating to whom the radar passes targets.

Sectors of Search. The sectors of search are determined during the "decide" function of the targeting process, based on a thorough IPB. The determination must be made on which targets should be acquired and attacked; where and when targets are likely to be found; and how best to position the radar to support the search sector, targeting, and radar security requirements. In addition to the S2 products, location of friendly forces, boundaries, and fire support coordination measures may also affect the assignment of search sectors. Common sensor boundaries (CSBs) will be employed to avoid target duplication while facilitating maximum coverage across the division front when multiple radars are operating in the same area.

Survivability Considerations. Despite built-in electronic counter-measure (ECM) devices, all radars are vulnerable to enemy detection and jamming. The controlling headquarters, S2, and radar personnel must know the appropriate radar survivability measures. The radio frequency (RF) signature of a radar is its greatest vulnerability. The enemy, through signal analysis, can determine the type and location of the radar. Knowledge of U.S. doctrine would give the enemy an indication of the artillery organization to which the radar reports. Ground-based direction finding (DF) of the radar signal can accurately locate the radar if three or more of these systems are able to lock on to the radar. These measures must be weighed against the maximum detection probability of the radar based on positioning, radiation time, mask angle, and so forth. The EW threat will dictate how long the radar can remain in position and will therefore affect cueing time. The following survivability measures must be considered:

- **Optimum Site.** The radar on level terrain (7-degree slope or less as discussed previously). Dense surrounding (sides and rear of system) vegetation to produce a tunneling effect on the radar's side lobe radiation patterns. A gentle downward slope out to 200 or 300 meters, then rising to a 15-22-mil screening crest.
- **Screening Crest.** While not essential, screening crests enhance survivability by reducing susceptibility from ground-based electronics intelligence (ELINT) systems. An optimum crest is located 1,000 meters in front of the radar in friendly territory.
- **Tunneling.** Reduces the side, tip, and back lobes of radiation by positioning natural or manmade objects around the sides and rear of the system to absorb radiation.
- **Reduce radiation time.** In a high ECM threat environment, the maximum radiation time should never exceed two minutes.
- **Survivability moves.** With an EW threat, these are quick moves of about 500 meters or more.
- **Positioning within firing battery perimeter.** In low-intensity conflicts, the radar can often occupy within the DS 105mm battery perimeter. This provides additional situational awareness as well as added defensive measures. The radar can tie its defensive measures in with the battery and take advantage of the battery's direct fire capability and fire base configuration. If this method is chosen, the FA battalion must coordinate with brigade for priority of engineer support to dig in its vehicles and build a berm large enough to place the ATG to clear the guns and the battery's equipment.

DEPLOYMENT OF AIR DEFENSE ASSETS IN SUPPORT OF THE RADAR

OFFENSE	DEFENSE
ESTABLISH ADA PRIORITIES.	ESTABLISH ADA PRIORITIES.
INTEGRATE THE SYSTEM'S MOVEMENT WITH THE RADAR'S MOVEMENT.	AREA - V-POINT DEFENSE.
INTEGRATE THE SYSTEM WITH ANY SUPPORTING ARMOR FOR MOVEMENT.	POSITION VULCANS WITH TOP AIR DEFENSE PRIORITY.
POSITION THE STINGER IN OVERWATCH POSITIONS.	POSITION THE STINGER TO PROTECT THE RADAR'S FLANKS.
AVOID LIKELY AMBUSH SITES.	DEDICATE A PORTION OF THE RADAR SURVIVABILITY EFFORT TO ADA.
POSITION SO THAT 2/3 OF THE WEAPON RANGE IS FORWARD.	INTEGRATE THE VULCAN AT NIGHT TO SUPPLEMENT GROUND FIRES.
CONDUCT ACTIVE/PASSIVE AIR DEFENSE.	CONDUCT PASSIVE/ACTIVE AIR DEFENSE.
MONITOR/PASS EARLY WARNING AND WEAPONS' CONTROL STATUS.	MONITOR/PASS EARLY WARNING AND WEAPONS' CONTROL STATUS.

CHAPTER 5

Weapons Capabilities

(See pages 62-69 for listing of Tanks, Assault Guns, and Tank Destroyers)

SYSTEM	MAIN GUN	ORIGIN	AMMO	MAIN GUN RANGE	ALT GUN RANGE	TYPE AA GUN	RANGE KM	SPEED KMPH	Remarks
AMX 13	105 mm	FR	12	1800 +	7.62 mm	7.62 mm	350 +	60	SAME AS 90 MM AMX 13 W/105MM RETROFITTED
AMX 13	75 mm	FR	12	900 +	7.62 mm	7.62 mm	350 +	60	LARGELY WITHDRAWN FROM SERVICE/ UPGRADED TO 90MM/105 MM; FIRES FROM 12 RD AUTOLOADER, WHICH MUST BE LOADED OUT OF ACTION; OSCILLATING TURRET; MAY BE FITTED WITH ATGMS ON TURRET; WIDE USE IN FRANCOPHONE AFRICA, AUSTRIA, & SOME 3D WORLD NATIONS
AMX 13	90 mm	FR	12	1500 +	7.62 mm	7.62 mm	350 +	60	SAME AS 75MM AMX 13 W/90MM GUN RETROFITTED
AMX 30	105 mm	FR	47	1800 +	20 mm	7.62 mm	600	65	EXPORTED
ASU-57	57 mm	Russia	30	750	NONE	NONE	250	45	ABN USE IN CIS, YUGOSLAVIA; NO NIGHT VISION
ASU-85	85 mm	Russia	40	900	7.62 mm	12.7 mm	260	45	ABN USE IN GERMANY, CIS, POLAND; IR NV; NBC PROTECTION
CENTURION Mk13	105 mm	UK	64	1800 +	7.62 mm	7.62 mm	190	34.6	LARGELY WITH-DRAWN FROM SERVICE OR UPGRADED; WIDELY EXPORTED AND USED WITHIN COMMONWEALTH NATIONS
CENTURION Mk5	83.8 mm	UK	65	900+	7.62 mm	7.62 mm	102	34.6	LARGELY WITH-DRAWN FROM SERVICE OR UP-GRADED; WIDELY EXPORTED & USED WITHIN COMMON-WEALTH NATIONS
CHALLENGER I	120 mm	UK	52	3000 +	7.62 mm	7.62 mm		56	THERMAL IMAGER; CHOBHAM ARMOR; 120mm AMMUNI-TION IS SEMI FIXED (2 PIECE) AND IS NOT INTER-CHANGABLE W/ M1A1/LEOPARD II GUNS
CHALLENGER II	120 mm	UK	52	3000 +	7.62 mm	7.62 mm		56	IMPROVED CHALLENGER I; UP-GRADED TRANSMISSION, FIRE CONTROL, & SUSPENSION; INDEPENDENT STABILIZED SIGHT FOR CDR; CHALLENGER I TO BE UPGRADED TO MK II STANDARD

CHIEFTAIN Mk3	120 mm	UK	53	3000 +	7.62 mm	7.62 mm	500	48	BRITISH CHIEF-TAINS RETRO-FITTED WITH ADD-ON CHOBHAM ARMOR KITS, LASER RANGING & FIRE CONTROL COMPUTERS; IRANIAN, KUWAITI, OMANI, JORDANIAN, AND IRAQI USE; ARMORED WHITE/ RED SEARCHLIGHT STANDARD
CHIEFTAIN Mk5	120 mm	UK	64	3000 +	7.62 mm	7.62 mm	500	48	BRITISH CHIEF-TAINS RETRO-FITTED WITH ADD-ON CHOBHAM ARMOR KITS, LASER RANGING & FIRE CONTROL COMPUTERS; IRANIAN, KUWAITI, OMANI, JORDANIAN, AND IRAQI USE; ARMORED WHITE/ RED SEARCHLIGHT STANDARD
GORILLA	126 mm	POLAND	40?	2400+	7.62	12.7 mm			THERMAL SIGHT, CERAMIC ARMOR, REACTIVE ARMOR, RADAR-ABSORBING COATING, CDR INDEPENDANT THERMAL VIEWER,
Ikv 103	105 mm	SWEDEN	50	1200+	2 X 7.62 mm	7.62 mm	390	50	"S-TANK"; SWEDISH OSCILLATING TANK; FED FROM MAGAZINE & AUTO-LOADER; NO NVG ON ORIGINAL MODELS; AMPHIBIOUS; CARRIES 1 SPARE/ RESTING CREW-MAN; TWO DRIVING POSITIONS (FWD/REAR)
JAGUAR 1		GE				7.62 mm	400	70	JGPZ KANONE W/ GUN REMOVED & EUROMISSILE HOT FITTED
JAGUAR 2		GE				7.62 mm	400	70	JGPZ KANONE W/ GUN REMOVED AND TOW MISSILE FITTED
JGPZ KANONE	90 mm	GE	51	1200+	7.62 mm	7.62 mm	400	70	BEING WITH-DRAWN; SAW SERVICE WITH BUNDESWEHR, BELGIAN, SWISS, AND AUSTRIAN FORCES
JS-2	122 mm	Russia	28	1000+	3 x 7.62mm	12.7 mm	150	37	REAR TURRET MG; OBSOLETE; CUBAN, CHINESE SERVICE
JS-3	122 mm	Russia	28	1000+	7.62 mm	12.7 mm	150	37	OBSOLETE; CIS RESERVE; LIMITED USE IN 3D WORLD
K1A1	120mm	ROK	40	2000+			500	55	IMPROVED TYPE 88

LECLERC	120 mm	FR	22	2000 +	12.7 mm	7.62 mm	550	75	AUTOLOADER; PASSIVE NIGHT SIGHT; LASER DETECTION AND SCREENING SYSTEM; LOW-LIGHT TV SIGHTS
LEOPARD 1A3	105 mm	GE	55	1800 +	7.62 mm	7.62 mm	600	65	LEOPARD 1A2 W/ NBC OVER-PRESSURE; IR SIGHTS AND SEARCHLIGHT
LEOPARD 1A4	105 mm	GE	55	1800 +	7.62 mm	7.62 mm	600	65	STEREOSCOPIC RANGING; IR SIGHTS AND SEARCHLIGHTS; STABILIZATION AND STABILIZED SIGHTS; FIRE CONTROL COMPU-TER; ADD-ON ARMOR PACKAGE TO TURRET
LEOPARD 1A5	105 mm	GE	55	1800 +	7.62 mm	7.62 mm	600	65	LEOPARD 1A4 W/ THERMAL SIGHTS
LEOPARD 1A6	105 mm	GE	55	1800 +	7.62 mm	7.62 mm	600	65	LEOPARD 1A5 W/ ADD-ON BALLISTIC PROTECTION & ARMOR PACKAGES
LEOPARD 2	120 mm	GE	42	2000+	7.62 mm	7.62 mm	550	72	ENHANCED ARMOR; EXPORTED TO NETHERLANDS, SWITZERLAND; THERMAL SIGHTS; LASER RANGING
M1	105 mm	USA	55	1800 +	2 X 7.62 mm	12.7 mm	498	72	ORIGINAL M1 DESIGN W/105MM; UNDERGOING UPGRADES TO M1A1 & M1A2 STANDARDS IN USA AND USMC; PROVIDED IN SOME FORM TO SEVERAL COUNTRIES FOR CO-PRODUCTION OR EXPORT
M18	76 mm	USA	45	1000	NONE	12.7 mm	240	88	TAIWAN, VENEZUELAN, OTHER 3D WORLD USERS
M18	76 mm	USA	45	900	NONE	12.7 mm	240	80	LIMITED USE WORLDWIDE; DOUBTFUL CONDITION; USE IN YUGOSLAVIA AND SOUTH AMERICA KNOWN; OPEN TOP TURRET
M1985	85mm	N KOREA		1150	7.62 mm	12.7 mm	260	44/10	LIGHT AMPHIBIOUS TANK
M1A1	120 mm	USA	40	2500+	2 X 7.62 mm	12.7 mm	465	66	M1 W/120MM GUNRETROFITTED; AUXILLIARY POWERPLANT, ENHANCED ARMOR, & NBC SYSTEM

M1A2	120 mm	USA	40	2500+	2 X 7.62 mm	12.7 mm	465	66	M1A1 W/ ENHANCED FIRECONTROL, C3I SUITE,DRIVER THERMAL VIEWER, & TC INDEPENDENT THERMAL VIEWER
M24	75 mm	USA		1000	2 x 7.62mm	12.7 mm	160	48	LIMITED USE WORLDWIDE; NORWEGIAN & OTHER UPGRADE KITS AVAILABLE; WIDE EXPORT INTO 3D WORLD
M36	90 mm	USA	47	1000	7.62 mm	12.7 mm	180	42	YUGOSLAV, SOUTH KOREAN, & PAKISTANI USE
M4 SUPER SHERMAN	106 mm	USA / IS			1-2 X 7.62 mm	12.7 mm	160+	42+	ISRAELI DESIGN (ALSO CALLED M51);OBSOLETE; CONSIDERABLE USE AS SP GUN CHASSIS; RESOLD BY ISRAEL TO SEVERAL NATIONS; FRENCH 105mm RETROFITTED TO MODIFIED TURRET OF M4/76 (M4 "EASY EIGHT"); RE-ENGINING VARIES
M4/75	75 mm	USA		1000	2 X 7.62 mm	12.7 mm	160	42	OBSOLETE; CONSIDERABLE USE AS SP GUN CHASSIS; WIDE 3D WORLD USE
M4/76	76mm	USA		1000	1-2 X 7.62 mm	12.7 mm	160	42	OBSOLETE; CONSIDERABLE USE AS SP GUN CHASSIS; WIDE 3D WORLD USE
M41	76 mm	USA	65	900+	2 x 7.62mm	12.7 mm	160	72	DANISH, SPANISH, BRAZILIAN USE; OTHER 3D WORLD USE BUT DOUBTFUL CONDITION; VERY LIGHT ARMOR
M47	90 mm	USA	71	1500+	2 X 7.62 mm	12.7 mm	130	48	IRANIAN, GREEK, ITALIAN, SOMALI, SPANISH, PAKISTANI, YUGOSLAV, TURKISH, & PORTUGUESE USE; UPGRADE PRO-GRAMS ONGOING; VERY HIGH, NARROW TURRET; LAST U.S.-BUILT MBT WITH BOW MG
M48A2	90 mm	USA	64	1500+	7.62 mm	12.7 mm	258	48	CONSIDERABLE EXPORT WORLD-WIDE; MANY UP-GRADED TO M48A5 STANDARD OR CONVERTED INTO SP GUNS, AVLB, & OTHER USES

M48A5	105 mm	USA	54	1800 +	2 X 7.62 mm	12.7 mm	499	48	ORIGINAL M48 UPGRADED TO 105mm; SOME MODELS FITTED W/LASER RANGING; WIDE EXPORT; WITHDRAWN FROM U.S. SERVICE OR CONVERTED TO AVLB/AVLM; VIETNAMESE, LEBANESE, TURKISH, ISRAELI USE
M551	152 mm	USA	20	3750	7.62 mm	12.7 mm	600	70	AIR-DROPPABLE; AMPHIBIOUS; LASER RANGING; LATE MODELS RETROFITTED THERMAL SIGHTS; CONVENTIONAL AMMO CAN FIRE INDIRECT TO OVER 9000 M; LIMITED USE IN US FORCES
M60A1	105 mm	USA	63	1800 +	7.62 mm	12.7 mm	500	48	BASIC M60 WITH IMPROVED TURRET, INFRARED AND PASSIVE SIGHTS, & LIMITED STABILIZATION
M60A3	105 mm	USA	63	1800 +	7.62 mm	12.7 mm	480	48	M60A1 UPGRADED W/COMPUTERIZA-TION, FULL STABILIZATION, CROSS-WIND SENSING , THERMAL SIGHTS & OTHER FIRE CONTROL IMPROVEMENTS
M84	125 mm	YUGOSL AVIA	42	2000 +	7.62 mm	12.7 mm	700	60	YUGOSLAV T-72 VARIANT; PASSIVE NVD & ACTIVE IR; EXPORTED
MAGACH-7	105 mm	ISRAEL	63	1800 +	7.62 mm	2 x 7.62 mm			M48A5 UPGRADE; REACTIVE ARMOR SUITE; LASER RANGING RETROFITTED
MERKAVA 1	105 mm	ISRAEL	62	1800+	7.62 mm	2 x 7.62 mm	400	46	REAR STOWAGE AREA CAN BE FITTED AS AMBULANCE, COMMAND POST, EXTRA AMMUNI-TION HOLD (UP TO 45 ROUNDS), 10 INFANTRY CAN BE CARRIED
MERKAVA 2	105 mm	ISRAEL	62	1800+	7.62 mm	2 x 7.62 mm	400	46	IMPROVED MERKAVA 1; UPGRADED LASER, COMPUTER & MORTAR SITING; THERMAL VIEWER FITTED
MERKAVA 3	120 mm	ISRAEL	50	2500+	7.62 mm	2 x 7.62 mm	400	46	ORIGINAL MERKAVA 2 DESIGN MODIFIED TO ACCEPT 120mm RHEINMETAL GUN (AS M1A1); ADD-ON AND UPGRADED ARMOR

PATTURION	105 mm	ISRAEL	*	1800+	2 x 7.62mm	12.7 mm	*	*	WARTIME CONVERSION USING COMBINATION OF PATTON AND CENTURION HULLS & TURRETS; NO LONGER IN ACTIVE ISRAELI SERVICE; MANY SOLD OFF INTO 3D WORLD; MANY CONVERTED TO SP GUNS & OTHER USES; STORAGE, RANGE, & SPEED VARY ON PARTS USED
PT 85	85 mm	N KOREA	85 mm	47	1150	7.62 mm	370	64	VARIANT OF CHINESE TYPE 63 AMPHIBIOUS LIGHT TANK
PT-76	76 mm	USSR	40	650	7.62 mm	12.7 mm	260	44	RECON; 3D WORLD USE; NAVAL INFANTRY USE; SOME IR VISION FITTED ON LATER MODELS; WIDE EXPORT
SHO'T	105 mm	ISRAEL	64	1800 +	7.62 mm	2 x 7.62 mm	480	45	M60A1 & CENTURION UPGRADE; LASER RANGING,
SU-100	100 mm	USSR	34	1000	NONE	NONE	300	55	WIDE 3D WORLD USE; CIS RESERVES
SU-76	76 mm	USSR	60	1000	7.62 mm	NONE			WIDE EXPORT; OBSOLETE 3D WORLD USE
SU-85	85 mm	USSR	48	1500	NONE	NONE	300	55	NORTH KOREAN USE; OBSOLETE
T-10	122 mm	USSR	30	1000+	12.7 mm	12.7 mm	250	42	CIS RESERVE; LIMITED EXPORT
T-10M	122 mm	USSR	30	1000+	14 .5 mm	14.5 mm	250	42	CIS RESERVE; LIMITED EXPORT
T-34/100	100 mm	USSR	30	1000	7.62 mm	12.7 mm	300	55	EGYPTIAN SERVICE; NO NV
T-34/85	85 mm	USSR	56	900	4 x 7.62mm	12.7 mm	300	55	OBSOLETE; WIDE 3D WORLD USE; NO NVD
T-54	100 mm	USSR	34	1500	2 x 7.62mm	12.7 mm	400	48	WIDE EXPORT; REACTIVE ARMOR RETROFITTED; LASER RANGE FINDERS; ATGM FIRING; ACTIVE IR NV; LASER WARNING SYSTEM ON SOME MODELS
T-55	100 mm	USSR	43	1500	7.62 mm	12.7 mm	500	50	WIDE EXPORT; LIMITED NBC PROTECTION; REACTIVE ARMOR RETROFITTED; ATGM FIRING; ACTIVE NV; LASER WARNING SYSTEM ON SOME MODELS
T-62	115 mm	USSR	40	1600	7.62 mm	12.7 mm	450	50	WIDE EXPORT & USE; NBC PROTECTION; AUTO LOADER; LASER RANGE FINDERS, ARMOR IN SOME COUNTRIES; SMOKE DISCHARGERS

T-64	125 mm	USSR	40	2100	7.62 mm	12.7 mm	300	85	FIRE ATGMs; NBC PRO; LASER RANGE FINDER; SMOKE DIS-CHARGER; REACTIVE ARMOR; AUTO LOADER; REMOTE AAMG; SELF ENTRENCH-ING KIT
T-72	125 mm	USSR	40	2100	7.62 mm	12.7 mm	400	60	WIDE EXPORT; FIRE ATGMs; AUTO LOADER; REACTIVE ARMOR; SMOKE DISCHARGERS; LASER RANGE FINDERS; SELF ENTRENCHING KIT, WEAPON UPGRADE PACKAGE AVAIL
T-80	125 mm	USSR	40	2400	7.62 mm	12.7 mm	385	85	REACTIVE ARMOR; NBC PROTECTION; SELF ENTRENCH-ING KIT; SMOKE DISCHARGERS; CIS SERVICE
T-82	125 mm	CIS		2400 +	7.62 mm	12.7 mm			FOLLOW-ON TO T-80
T-84	125 mm	UKRAINE	40	2400 +	7.62 mm	12.7 mm	385?	85+	FOLLOW-ON TO T-80; LASER DETECTION & COUNTERMEASUR ES; IMPROVED REACTIVE ARMOR SUITE; IMPROVED T-80 DIESEL ENGINE, IMPROVED TRACK, AIR CONDITIONING, AND THERMAL PROTECTION; ATGM JAMMING SYSTEM
T-90	125 mm	RUSSIA		2400 +	7.62 mm	12.7 mm	550	60	LASER WARNING PACKAGE, T72BM HULL & TURRET, 125mm AT-11 LASER GUIDED WEAPON THERMAL SIGHT, ATGM JAMMER SYSTEM; BEING OFFERED FOR EXPORT
TYPE 59	100 mm	PRC	34	1300	2 x 7.62 mm	12.7 mm	600	50	CHINESE COPY OF T-54; TURRET STABILIZATION; LASER RANGING & IR NV; SOME PASSIVE SIGHTS AVAILABLE
TYPE 60	2 X 106M M	JAPAN	8	1100	NONE	NONE	130	55	TANK DESTROYER; TWO ELEVATING RECOILESS-RIFLES MOUNTED EXTER-NALLY; CANNOT BE RELOADED UNDER ARMOR
TYPE 61	90 mm	JAPAN		1200+	7.62 mm	12.7 mm	200	45	LIMITED TO JAPANESE SELF-DEFENSE FORCE USE; BEING REPLACED BY TYPE 74 AND TYPE 90; OBSOLETE

TYPE 62	85 mm	PRC	47	1150	2 x 7.62 mm	12.7 mm	500	60	LIGHT TANK; SCALED-DOWN TYPE 59
TYPE 63	85 mm	PRC	47	1150	7.62 mm	12.7 mm	370	64	AMPHIBIOUS LIGHT TANK
TYPE 69	100 mm	PRC	34	1300	7.62 mm	12.7 mm	440	50	IMPROVED TYPE 59; WIDE EXPORT, ESPECIALLY TO IRAQ
TYPE 74	105 mm	JAPAN	55	1500+	7.62 mm	12.7 mm	300	53	RESEMBLES AMX-30 & VERSIONS OF LEOPARD 1
TYPE 79	105 mm	PRC	44	1600 (EST)	2 x 7.62 mm	12.7 mm	440	50	TYPE 69 REFITTED W/NATO M68 CANNON; IMPROVED FIRE CONTROL & SIGHTS
TYPE 80	105mm	PRC	44	1600 (EST)	7.62mm	12.7mm	500	60	COMPUTERIZED FIRE CONTROL AND LASER RANGING SYSTEM; INDIVIDUAL NBC SYSTEM; SOME MAY HAVE COLLECTIVE NBC PROTECTION
TYPE 88	105 mm	S KOREA	47		2 X 7.62 mm	12.7 mm	500	55	KOREAN VERSION OF M1 W/DIESEL POWER INSTEAD OF TURBINE
TYPE 90	120 mm	JAPAN			7.62 mm	12.7 mm	300	70	ADAPTATION OF 120mm TECHNOL-OGY AND FEA-TURES OF WESTERN TANKS; RESEMBLES LEOPARD II
XM8	107 mm	USA		1800+	7.62 mm	12.7 mm			US ARMY AND TAIWANESE USE; AIRDROPPABLE LIGHT TANK; AMMO IS KNOWN US 105mm CARTRIDGES - XM8 MAY NOT CARRY ALL OF THESE
AMX 13	105 mm	FR	12	1800 +	7.62 mm	7.62 mm	350 +	60	SAME AS 90 MM AMX 13 W/105MM RETROFITTED
AMX 13	75 mm	FR	12	900 +	7.62 mm	7.62 mm	350 +	60	LARGELY WITHDRAWN FR SERVICE/ UPGRADED TO 90MM/105 MM; FIRES FROM 12 RD AUTO LOADERTHAT MUST BE LOADED OUT OF ACTION; OSCILLATING TURRET; MAY BE FITTED W/ATGMs ON TURRET; WIDE USE IN FRANCOPHONE AFRICA, AUSTRIA, AND SOME 3D WORLD NATIONS
AMX 13	90 mm	FR	12	1500 +	7.62 mm	7.62 mm	350 +	60	SAME AS 75MM AMX 13 W/90MM GUN RETROFITTED
AMX 30	105 mm	FR	47	1800 +	20 mm	7.62 mm	600	65	EXPORTED

(See pages 71-78 for listing of Artillery, Mortar, and Rocket Systems)

SYSTEM	CAL	TYPE	ORIGIN	RANGE (M)	RAP (M)	ECHELON	REMARKS
25 PDR	87.6	GUN-HOW	UK	12250		DIV	HIGHLY MOBILE; TURNTABLE MOUNT ALLOWS FOR RAPID AIMING IN 360 DEGREES; OBSOLETE BUT FORMERLY IN WIDE UK AND COMMONWEALTH USE
2A36	152	GUN	USSR	28000	33000	ARMY	TWD VERSION OF 2S5 GUN
2A45M	125	AT GUN	USSR	12200		RGT	T-12 F-O SYSTEM; AT-11 CAPABLE
2A61	152	HOWITZER	USSR	15100		DIV +	D20 F-O SYSTEM ?
2A65	152	GUN	USSR	30000	40000	ARMY	TWD VERSION OF 2S19 GUN
2B16	120	COMBO GUN	USSR	8800		ABN/NAV AL RGTS	TOWED VERSION OF 2S23 AND 2S9 GUN; NAVAL INFANTRY USE
2B9	82	AUTO MORTAR	USSR	5000		BN	2 RDS/SE; 4 RD CLIP FIRED
2S1	122	SP HOW	USSR	15300	21900	RGT	AMPHIBIOUS
2S12	120	SP MORTAR	USSR	8700	13000	BN	TRUCK MTD M120
2S19	152	SP GUN/HOW	USSR	30000	40000	ARMY	T-72HULL; AUTOLOADING
2S23	120	SP COMBO GUN	USSR	8800			BTR-80 HULL; CAN FIRE NATO 120MM MTR RDS
2S3	152	SP HOW	USSR	17230	20500	DIV	MAY HAVE 12.7 mm AAMG; NOT AMPHIBIOUS
2S31	120	SP COMBO GUN	USSR	8800+			IMPROVED 120mm GUN SYSTEM; LIMITED INFORMATION
2S4	240	SP MORTAR	USSR	9700	20000	THEATER	MT-LB CARRIER OF M240 MORTAR
2S5	152	SP GUN	USSR	28000	33000	ARMY	12.7 mm AAMG;
2S7	203	SP GUN	USSR	37500	50000	FRONT +	NBC OVERPRESSURE;
2S9	120	SP COMBO	USSR	8800		ARMY+	ABN/AASLT USE; BMD HULL; CAN FIRE NATO 120MM MTR RDS
5.5 IN	139.7	GUN	UK	14800		CORPS	LIMITED DEPLOYMENT; WIDE USE IN FORMER COMMONWEALTH NATIONS; CONDITION DOUBTFUL IN ALL BUT UK
9A52 BM-30	300	MRL	USSR	70000		FRONT	12 RDS
9P113M	FROG 7	FREE ROCKET	USSR	70000			WIDE WP AND 3D WORLD USE
A-19	122	GUN	USSR	20800		CORPS	OBSOLETE; 3D WORLD USE
ABABEEL 50	262	MRL	IRAQ	50000			COPY OF YUGOSLAV M-87 MRL; 12 RDS
ABABEEL 100	400	MRL	IRAQ	100000			4 RD LAUNCHER
ABBOT	105	SP HOW	UK	17200		DIV	INDIAN, CANADIAN, UK USE; AMPHIBIOUS
AL ABBAS	MOD SS-1C	SSM	IRAQ	500000			STRETCHED SCUD-C; DECREASED ACCURACY; IMPROVED RANGE

AL FAO	210	GUN	IRAQ	45000			
AL HUSSEIN	MOD SS-1C	SSM	IRAQ				MODIFIED SS-1C
AS90	155	SP HOW	UK	24700	40000		ENTERED UK SERVICE IN 1992; POWERED LOADING ASSIST FOR 3 ROUNDS IN 10 SECONDS
ASTROS SS-40	180	MRL	BRAZIL	35000			16 RD LAUNCHER; NORMALLY ON 6 X6 TECTRAN ARMORED TRUCK
ASTROS SS-30	127	MRL	BRAZIL	30000			32 RD LAUNCHER; NORMALLY ON 6 X6 TECTRAN ARMORED TRUCK
ASTROS SS-60	300	MRL	BRAZIL	60000			4 RD LAUNCHER; NORMALLY ON 6 X6 TECTRAN ARMORED TRUCK
B4/M	203	HOWITZER	USSR	18025		FRONT	TRACKED AND WHEELED CARRIAGE VERSIONS
BK 1A	155	SP GUN	SWEDEN	25600			"BANDKANONE 1A"; S-TANK CHASSIS; 14 ROUND AUTOLOADER
BM-11	122	MRL	PRNK	20500			MOUNTED ON URAL 375D, NORTH KOREAN COPY OF RUSSIAN BM-22
BM-13	132	MRL	USSR	9000		RESERVE/ TNG	16 RDS; 3D WORLD USE
BM-14	140	MRL	USSR	9810		RESERVE/ TNG	16 OR 17 RDS; 3D WORLD USE
BM-21	122	MRL	USSR	20380	30000	DIV	40 RDS; WIDE EXPORT AND USE
BM-21-1	122	MRL	USSR	20380	30000	DIV	36 RDS
BM-21B	122	MRL	USSR	20380	30000	DIV	30 RDS
BM-21V	122	MRL	USSR	20380	30000	ABN UNITS	12 RDS
BM-22	220	MRL	USSR	40000		ARMY +	16 RDS
BM-24	240	MRL	USSR	11000		RESERVE/ TNG	12 RDS (TRACKED CARRIER = BM-24t)
BM-25	250	MRL	USSR	30000		RESERVE/ TNG	6 RDS; 3D WORLD USE
BMD-20	200	MRL	USSR	20000		RESERVE/ TNG	4 RDS; 3D WORLD USE, ZIL-151 MOUNTED
Ch-26	57	AT GUN	USSR			AIRBORNE	TOWED VERSION OF ASU-57 GUN
D1	152	HOWITZER	USSR	12400		DIV	OBSOLETE
D20	152	HOWITZER	USSR	17230	24000	DIV+	2D LINE UNITS
D30	122	HOWITZER	USSR	15300	21900	RGT +	BTR/ABN/AASLT/NAVAL INFANTRY USE; WIDE EXPORT
D44	85	FLD GUN	USSR	15650		ABN AT BN	SD-44 HAS SP ATTACHMENT (25 KM/H SP/60 KM/H TOWED) IR SIGHTS
D48	85	FLD GUN	USSR	18970		AT BN/RGT	IR SIGHTS; REPLACED BY T-12
D74	122	FIELDGUN	USSR	23900		ARMY	LIMITED DEPLOYMENT
DANA	152	SP HOW	CZECH	18000		DIV	8 X 8 ARMORED TRUCK CARRIER

FIROS 6	51	MRL	IT	6550			48 RD LAUNCHER; MOUNTED ON VARIOUS CARRIERS
FIROS 25	122	MRL	IT	25000			40 RD LAUNCHER (2 X 20)
FIROS 30	122	MRL	IT	34000			40 RD LAUNCHER (2 X 20)
FH70	155	HOW	INT	24000			
FH77	155	HOW	SWEDEN	24000			INDIAN AND NIGERIAN SERVICE
G5	155	GUN	SA	30800	39000		EXPORTED
G6	155	SP GUN	SA	30800	39000		WHEELED CARRIER; EXPORTED
GBT155	155	SP HOW	UK	27400	31500		
GC45	155	GUN-HOW	BELGIUM	30000	39000		
GCT	155	SP GUN	FR	23000	30500		
GH N 45	155	HOWITZER	AUSTRIA		33000		
GIAT TR	155	GUN	FR	18500	32000		
GM 45	155	GUN-HOWITZER	PRC		39000		
KOORYONG	130	MRL	ROK	32000			RESEMBLES BM-21; 36 RD LAUNCHER ON 4 X 4 TRUCK
KUNG FENG III/IV	126	MRL	ROC	9000			40 RD LAUNCHER; TOWED, TRUCK, M113, AND LVTP MOUNTED VERSIONS; TAIWANESE USE
KUNG FENG VI	117	MRL	ROC	15000			45 RD LAUNCHER ON M52 TRUCK; TAIWANESE USE
51MM	51MM	MORTAR	UK	800		PLT	STANDARD BRITISH PLATOON MORTAR; WIDE COPYING AND USE, ESPECIALLY IN FORMER UK TERRITORIES AND COMMONWEALTH NATIONS
L16 ML / M252	81	MORTAR	UK / US	5650		BN	ADOPTED BY US; STANDARD UK MORTAR; CAN BE VEHICLE MOUNTED (FV432); WIDE EXPORT AND USE; CAN FIRE MERLIN GUIDED ROUND
LARS	160	MRL	IS	30000			ADOPTED BY VENEZUELA; FIRES FROM 18-RD PODS
LARS	110	MRL	GE	14000	25000	DIV	WHEELED (6 x6); 36 RD LAUNCHER; FIELDGUARD RADAR FOR ADJUSTING FIRE; AIR TRANSPORTABLE; ALSO CALLED ArtRktWfr 110 SF.
LAITH 90	550	FREE ROCKET	IRAQ	90000			MODIFIED FROG-7
L118 / M119	105	HOW	UK / US	17200	20000	DIV	LIGHT CARRIAGE; DESIGNED FOR AIR-MOBILE AND AIRBORNE OPERATIONS;WIDE USE AND EXPORT
MAKSAM RA-7040	70	MRL	TURKEY	7400			40 RD LAUNCHER ON TRAILER; TURKISH ARMY AND AIR FORCE USE
MAR 290	290	MRL	IS	25000			4 RD LAUNCHER MOUNTED ON CENTURION TANK CHASSIS

MCB 81	81	COMBO GUN	FR	8000			EXPORT SALES; SHIPBOARD AND ARMORED VEHICLE MOUNTS; EXPORT SALES
MO-120-60	120	MORTAR	FR	6610			MANPORTABLE; EXPORTED AND IN FRENCH SERVICE; CAN FIRE DIEHL "BUSSARD" GUIDED ROUND
MO-120-LT	120	MORTAR	FR	7000	8000 +		WHEELED CARRIAGE; CAN BE OPERATED AND TOWED BY ONLY TWO MEN; CAN FIRE DIEHL "BUSSARD" GUIDED ROUND
MO-120-RT-61	120	MORTAR	FR	4250	13000		RIFLED MORTAR; WILL FILL ALL 120MM (BRANDT) AMMUNITION FOR SMOOTHBORE MORTARS;CAN FIRE DIEHL "BUSSARD" GUIDED ROUND
m/41D	120	MORTAR	SWEDEN	6400	7500	BDE	STANDARD SWEDISH MORTAR; IRISH SERVICE; CAN FIRE STRIX GUIDED ROUND
M19	60	MORTAR	USA	1814		CO	LIGHT UNIT COMPANY MORTAR; RANGES ARE FOR HEAVY (M5) BASEPLATE
M29	81	MORTAR	USA	4737		CO / BN	FORMERLY COMPANY-LEVEL MORTAR; USED AS BATTALION MORTAR IN LIGHT UNITS; WIDE EXPORT AND COPIES
M30	107	MORTAR	USA	6800		BN	FIN-STABILIZED, RIFLED MORTAR; WIDE US AND ALLIED USE; BEING PHASED OUT SLOWLY FOR A 120MM REPLACEMENT; DPICM ROUNDS AVAILABLE BUT NOT IN US USE
M31	81	MORTAR	YUGOSLAV	4100			
M57	60	MORTAR	YUGOSLAV	1700			
M68	81	MORTAR	YUGOSLAV	5000			
M69	82	MORTAR	YUGOSLAV	3150			
M8	50	MORTAR	YUGOSLAV	480			
M101	105	HOW	US	11270	14600	DIV	WIDE EXPORT; US VERSIONS UPGRADED TO M102
M102	105	HOW	US	11500	15100	DIV	WIDE EXPORT; US USE IN LIGHT AND AIRBORNE UNITS
M106	107	SP MORTAR	USA	6800		BN	M 30 MORTAR IN M113
M107	175	SP GUN	USA	32700		CORPS	OBSOLETE; INTERNATIONAL USE;
M108	105	SP HOW	USA	15000		DIV	
M109	155	SP HOW	USA	18100	30000	DIV	M109A6 CAN FIRE TO 24000 WITHOUT RAP; WIDE USE AND EXPORT
M110	203	SP HOW	USA	21300			

M114	155	HOW	USA	14600			JAPANESE,ITALIAN, IRANIAN, SPANISH, TAIWANESE, GREEK, INDIAN, JORDANIAN USE
M114 F	155	HOW	FR	24000	32000		FRENCH VERSION OF M114
M115	203	HOW	US	16800			TOWED VERSION OF BASIC GUN FROM M110
M116	75	PACK HOW	US	8790			3D WORLD AND RESERVE USE; OBSOLETE
M120	120	MORTAR	USSR	8700	13000	BN	REPLACING M1943 AT BATTALION LEVEL
M125	81	SP MORTAR	USA	4737			M 29 MORTAR IN M113
M160	160	MORTAR	USSR	8040		DIV	LIMITED DEPLOYMENT; MOUNTAIN DIVISION USE
M1943	120	MORTAR	USSR	5700		BN	BEING REPLACED BY M120 AND 2B9
M1944	100	FLD GUN	USSR	21000		AT BN/RGT	RESERVE; 3D WORLD USE
M1966	76	MT GUN	USSR	11500		RGT	MOUNTAIN UNITS; LIMITED DEPLOYMENT; 3D WORLD USE
M1974	152	SP GUN/HOW	NK	17400	20500		ATS-59 ARTILLERY TRACTOR, DAY AND NIGHT DIRECT FIRE SIGHTS
M1975	130	SP GUN	NK	27500			SP M46 ON AT-T CHASSIS
M1977	122	SP HOW	NK	15300	21900		SP D-30
M1978	170	SP GUN	NK	40000	53000		T-55 CHASSIS, SUPPORT REQUIRED BY SECONDARY VEHICLE TO TRANSPORT CREW AND AMMUNITION
M198	155	HOW	US/UK	18150	30000	CORPS/ DIV	IMPROVED 155mm ON LIGHT FRAME; USE IN BRITISH AND US LIGHT UNITS
M1981	122	SP GUN	NK	23900			D-74 MOUNTED ON AN ATS-59 ARTILLERY TRACTOR,
M1985	122	SP GUN	NK	20800			COPY OF THE RUSSIAN A-19 MOUNTED ON A MODIFIED ATS-59 ARTILLERY TRACTOR
M1985	122	MRL	NK	20500			30 TUBES WITH AN ONBOARD RELOAD
M1985	240	MRL	NK	43000			12 TUBES ON A 6X6 TRUCK, DEDICATED RESUPPLY VEHICLE
M1989	170	SP GUN	NK	40000			IMPROVED VERSION OF THE M1978
M1989	240	MRL	NK	43000			IMPROVED VERSION OF THE M1985, 22 TUBES ON A 6X6 TRUCK
M1991	122	SP HOW	NK	23900			IMPROVED VERSION OF THE M1981
M1993	120	SP COMBO GUN	NK	8800			COPY OF RUSSIAN 2S9
M240	240	MORTAR	USSR	9700	20000	THEATER	BREECH-LOADING
M30	122	HOW	USSR	11800		DIV	3D WORLD USE
M36	82	MORTAR	USSR	3100		BN	WIDE USE IN ASIA AND AFRICA

M37	82	MORTAR	USSR	3000		BN	CIS AND 3D WORLD USE; MAY BE FITTED WITH DOUBLE LOAD SAFETY
M38	107	MORTAR	USSR	6300		BN	MOUNTAIN UNIT USE; CIS RESERVE; MAN-PORTABLE
M41	82	MORTAR	USSR	2550		BN	3D WORLD USE
M42	45	AT GUN	USSR				
M44T	155	SP HOW	FR	24700	30000		
M46	130	FLD/GUN	USSR	27150			OBSOLETE
M46	130	GUN	USSR	27490		FRONT	HIGHLY ACCURATE; WIDE 3D WORLD USE AND EXPORT
M48	76	MT HOW	YUGOSLAV	8750			MAN/MULE TRANSPORTED IN EIGHT LOADS
M50	155	HOW	FR				
M52	85	AT GUN	CZECH	16160			
M53	100	AT GUN	CZECH	21000			IR SIGHTS
M56	105	HOW	YUGOSLAV	13000			
M56	105	PACK HOW	IT	10575			WIDE EXPORT AND USE
M59	155	GUN	US	22000			
M60	122	FIELD GUN	FINLAND	25000			
M63	262	MRL	YUGOSLAV	12800			32 RDS
M65	155	HOW	YUGOSLAV	14600			YUGOSLAV COPY OF M114
M68	155	HOW	IS				
M68	155	HOWITZER	FINLAND	23000			
M71	155	HOW	IS				
M74	120	MORTAR	YUGOSLAV				
M74	155	GUN-HOW	FINLAND	24000			
M75	120	MORTAR	YUGOSLAV	5400	9056		
M77		MRL	YUGOSLAV	20600			AUTORELOAD SYSTEM W/1 RELOAD; 32 RDS
M839P	155	HOW	IS		25000		
M84	152	GUN-HOWITZER	YUGOSLAV	24400			COPY OF SOVIET D-20
M85	128	MRL	YUGOSLAV	12500			MOUNTED ON TAM TRUCK; 32 RD LAUNCHER
M845P	155	HOW	IS		27500		
M87	262	MRL	YUGOSLAV	50000			12 RDS
MECAR FIELD	90	AT GUN	BE				
MK 61	105	SP HOW	FR	15000			
MK F3	155	SP HOW	FR	20047	25300		
ML20	152	GUN/HOW	USSR	17265		DIV	OBSOLETE; 3D WORLD USE
MT-12 T-12 A	100	AT GUN	USSR	21000		RGT	IR SIGHTS; AT-10 CAPABLE; INDIRECT FIRE CAPABLE
NODONG-1		SSM	NK	1000000			TRANSPORTED BY A COPY OF A RUSSIAN MAZ 543 TEL
TAEPO DONG-1		SSM	NK	2000000			TRANSPORTED ON MODIFIED SCUD TRANSPORTER
PRITHVI		SSM	INDIA	250000			WHEELED TRANSPORTER; ONLY IN INDIAN ARMY SERVICEZ
PZH2000	155	SP HOW	GE	30000	40000		
RPU-14	140	MRL	USSR	9810		ABN / RESERVE	16 RDS; TOWED LAUNCHER
S23	180	GUN	USSR	30400	43800	FRONT	3D WORLD USE; LIMITED CIS USE
SAJEEL 30	127	MRL	IRAQ	30000			IRAQI COPY OF ASTROS II

SAJEEL 40	180	MRL	IRAQ	35000			IRAQI COPY OF ASTROS II
SAJEEL 60	300	MRL	IRAQ	60000			IRAQI COPY OF ASTROS II
SAKR 80	210	FREE RKT	EGYPT	80000			AVAILABLE FOR EXPORT; WHEELED CARRIER
SLAMMER	155	SP GUN-HOW	IS		39000	DIV	AUTOLOADING (9 RDS/MINUTE); OFFERED FOR EXPORT
SS-1	"SCUD"	SSM	USSR	300000			WIDE 3D WORLD USE AND COPYING
SS-12	"SCALEBOARD"	SSM	USSR	900000			TO BE DESTROYED UNDER INF
SS-1C	"SCUDB"	SSM	USSR	300000		FRONT	WIDE 3D WORLD USE AND COPYING
SS-21	"SCARAB"	SSM	USSR	100000			LIMITED DEPLOYMENT
SS-23	"SPIDER"	SSM	USSR	500000			TO BE DESTROYED UNDER INF
T-63	107	MRL	NK	10000			SMALL, EASILY TRANSPORTABLE, HAS WHEELED AND TRACKED VERSIONSMOUNTED ON M1973 APCs, COPY OF CHINESE TYPE 63 MRL, ALSO MANPACKABLE
TERUEL	140	MRL	SPAIN	28000			40 RD LAUNCHER ON 6 X 6 TRUCK
TYPE 31 / TYPE 63	60	MORTAR	PRC	1530			
TYPE 53	82	MORTAR	PRC	3040			
TYPE 53	120	MORTAR	PRC	5700			
TYPE 54	122	HOWITZER	PRC	11800			CHINESE AND 3D WORLD USE
TYPE 54	152	HOWITZER	PRC	12400			CHINESE COPY OF D1
TYPE 54	76	AT GUN	PRC				
TYPE 54-1	122	SP HOWITZER	PRC	11800			SP COPY OF M-30
TYPE 54-1	122	HOWITZER	PRC	11800			CHINESE COPY OF M30
TYPE 55	57	AT GUN	PRC	8400			
TYPE 56	85	FIELD GUN	PRC	15650			CHINESE AND 3D WORLD USE
TYPE 59	100	FIELD GUN	PRC	20000			CHINESE COPY OF BS-3/M1944
TYPE 59-1	130	GUN	PRC	27490	38000		CHINESE COPY OF M46
TYPE 60	122	FIELD GUN	PRC	24000			CHINESE COPY OF D74
TYPE 63	130	MRL		15000			
TYPE 66	152	GUN-HOW	PRC	17230	21880		CHINESE COPY OF D20; WIDE 3D USE
TYPE 67	337	TWIN FREE ROCKET	JAPAN	28000			ONLY IN SERVICE WITH JSDF; RESEMBLES US ARMY LITTLE JOHN
TYPE 70	130	MRL		15000			
TYPE 74	105	HOWITZER	JAPAN	11270			
TYPE 74	284	MRL	PRC	1500			CHINESE MINECLEARING MRL; MAY USE A FUEL-AIR TYPE WARHEAD; 10 RD LAUNCHER
TYPE 75	130	MRL	JAPAN	15000			30 RD LAUNCHER ON TYPE 73 APC CHASSIS
TYPE 75	155	HOWITZER	JAPAN	15000			

TYPE 762	425	MRL	PRC	1000			CHINESE MINECLEARING MRL; MAY USE A FUEL-AIR TYPE WARHEAD; 2 RD LAUNCHER
TYPE 81	107	MRL	PRC	10000			JAMMER ROCKETS AVAILABLE
TYPE 81	122	MRL		20580			
TYPE 83	273	MRL	PRC	40000			10 RD LAUNCHER; SPECIALIZED MINELAYER MRL
TYPE 83	152	SP GUN-HOW	PRC	17230	39000		
TYPE 83	122	HOWITZER	PRC	18000			
TYPE 83	122	MRL		20580			
TYPE 83	152	GUN	PRC	30370	38000		
TYPE 85	122	SP HOWITZER	PRC				SP COPY OF D-30
TYPE 85	130	MRL		15000			
TYPE 86	100	AT GUN	PRC	13654			
UBM 52	120	MORTAR	YUGOSLAV	4760	6010		
VALKIRI	127	MRL	SA	22000			24 RD LAUNCHER ON 4 X 4 TRUCK
WA-021	155	GUN-HOW	PRC	30000			
WAC 21	155	GUN-HOW	PRC		39000		
WS-1	320	MRL	PRC	80000			
ZIS-2	57	AT GUN	USSR	8400			
ZIS-3	76	AT GUN	USSR	13290			
ZUZANA	155	SP GUN-HOW	SLOVAKIA		39600	DIV	8 X 8 ARMORED CARRIER; 30 RDS CAN BE FIRED IN 6 MINUTES (AUTOLOADING ASSIST); OFFERED FOR EXPORT

ASSAULT RIFLES AND LIGHT MACHINE GUNS

SYSTEM	WEAPON TYPE AND COUNTRY OF ORIGIN	MER**	TRACER COLOR
5.45X39.5mm	AK-74,RPK-74,AKSU-74 *UR*	400	GREEN
5.56X45.0mm	M-16,SAW,GALIL *US*	400	RED
7.62X39.0mm	AK47,AKM,SKS,RPD,RPK *UR*	400	GREEN
7.62X51.0mm	M-14,M-60,G-3,FN FAL *US*	900	RED
7.62X54.0mm	SVD(DRAGONOV),PKS,PKB, PKT,DP,DPM,RP46,SGM, SG34	900	GREEN

*Note: Above weapon listing is a sampling of major weapons chambered for each cartridge, not a complete listing of all produced and fielded. The table is designed to give you a good idea of weapons systems capability based on the type of system.
**MER - Max Effective Range (in meters)

ANTI-TANK ROCKETS

(Range in meters)

SYSTEM AND COUNTRY	MER	SYSTEM AND COUNTRY	MER
APILAS 122mm *FR*	330	M2 CARL GUSTAV 84mm *SW*	***
AT-4 84mm *SW*	300	M57 (RB57) *YO*	200
FT-5 100mm *SF*	600	RPG-2 *UR*	150
LAW, M72 66mm *US*	350	RPG-7 *UR*	500
LAW, RBR-M80 64mm *YO*	250	RPG-16 (IMPROVED RPG-7) *UR*	800
LAW-80 84mm *UK*	500	RPG-18 64mm *UR*	350

*** In service with U.S. Rangers Anti-Armor/Anti-Personnel Weapon Systems (RAAWS). Available rounds shown with range: HE (1100), HEAT (700), DP (HE/HEAT) (1000), SMOKE (1300), & ILLUM (2100).

ANTI-TANK GUIDED MISSLES (ATGM)

(Rarnge in nautical miles/kilometers)

SYSTEM & COUNTRY	MER	GUIDANCE
AT-T/SNAPPER *UR*	2.3/4.5	WIRE
AT-2/SWATTER *UR*	4.0/7.8	RADIO
AT-3/SAGGER *UR*	3.0/5.8	WIRE
AT-4/SPIGGOT *UR*	2.0/3.9	WIRE
AT-5/SPANDREL *UR*	4.0/7.8	WIRE
AT-6/SPIRAL *UR*	5.0/9.7	RADIO
COBRA *GM*	1.1/2.1	WIRE
DRAGON *US*	1.0/1.9	WIRE
HELLFIRE *US*	4.3/8.3	LASER
HOT *FR/GM*	4.0/7.8	WIRE
MAMBA *GM*	2.0/3.9	WIRE
MILAN *FR*	2.0/3.9	WIRE
TOW I *US*	3.0/5.8	WIRE
TOW II *US*	3.8/7.4	WIRE

RECOILLESS RIFLES

(Range in kilometers)

SYSTEM & COUNTRY	MER	MRPM
75mm TYPE 56 *CH*	6.6	10
82mm M-59A *CZ*	7.6	6
82mm T-21 *CZ*	2.6	6
106mm B-10 *UR*	4.4	6
106mm M40A1 *US*	6.9	5
107mm B-11 *UR*	6.7	6

OTHER SYSTEMS

SYTEM & COUNTRY	RANGE/CAPABILITY
MK-19 40mm Grenade Launcher	2500K
MICLIC	Engineer mine clearer 100M X 14M SPAN
ACE Engineer Dozer	Capable of digging to hasty positions per hour
Smoke Track	1-2 hour duration
AVLB	Capable of laying a bridge with 15m span

U.S. MILITARY INTELLIGENCE ASSETS

SYSTEM	# DIRECT SUPPORT TO BRIGADE	CAPABILITIES
GSQ-187 SYSTEM **"I-REMBASS"** **Improved Remotely Monitored Battlefield Sensor System**	1-3X Teams. Each Includes: 20X Rembass Sensors 1X Sensor Monitoring Kit 1X Portable Monitoring Sensor 1X Repeater 6X 96R	**Unattended ground sensor system that detects, classifies and determines direction of movement and target type(Veh or Pers)** Sensor Types: Infra-Red Passive(IP), Magnetic(MAG) Seismic/Acoustic(SA) **Detection Range:** **IP MAG SA** **TRACK** 3-50m 25m 350m **WHEEL** 3-50m 15m 250m **PERS** 3-20m 3m 50m **Repeater Range:** 15km
PPS-15A(V)1 **"GSR"** **Ground Surveillance Radar**	**1-3 x teams, each Includes:** 1X PPS-15A(v)1 1X HMMWV W MK-19 6X 96R (3X Radars for the Brigade)	**Man-potable or vehicle mounted system, limited to line of sight: uses radar to detect moving targets.** **Detection Range:** **Vehicles:** 50 – 3000m **Personnel:** 10 – 1500m (Line of Sight Dependent)
PRD-12 **"LLVI"** **Low Level Voice Intercept**	**2X teams, each includes:** 1X PRD-12 1X HMMWV 4X 98G(EW Opns)	**Man portable signals intercept system, provides search, collection and direction finding(DF) capabilities in the HF/VHF/UHF spectra.** **Detection Range:** Eff. Range 10km (Line of Sight Dependent)
TRQ-32(V)2 **"Turkey 32"**	1X Team attached to MICO 1X TRQ-32(HMMWV mount) 6X 98G(EW Opns) 1X PRD-12 backup	**HF/VHF/UHF intercept, VHF direction finding when "netted" with PRD-12s.** **Detection Range:**HF 50km/VHF 30km (Line of Sight Dependent)
TLQ-17	1X Team attached to MICO 1X TLQ-17 (HMMWV mount) 4X 98G(EW Opns)	**HF/VHF electronic attack(EA) jamming system. Produces up to 500 watts of signal strength per channel. Must be stationary to jam.** **Jamming Range:** Eff. Range 20km (Line of sight Dependent)
ALQ-151(V)1 **"Quick Fix"**	**0X systems with DS company.** 1X EH-60A 2X Pilots 2X 98G(EW Opns)	**Airborne HF/VHF electronic attack(EA); VHF direction finding, can net with TRQ-32 for direction finding. GS to division, available upon request.** **Detection Range:** DF HF to 500km, VHF to 75km, EA HF/VHF to 75km (Line of Sight Dependent)

AIR FORCE/NAVAL MUNITIONS

This section give descriptions and characteristics of various Air Force air-to-surface munitions. The focus is primarily on close air support and interdiction assets. Although there are numerous weapons in production, the following weapons are currently in the inventory and are still in popular use. This section will aid in choosing the right ordnance for the right job. A general knowledge of their capabilities will aid the battle staff when submitting ATO requests. If a specific ordnance is not requested, the ATO will most likely read " Best" under the ordnance category, meaning a standard package will be given and may not meet the requirements of the brigade. For further characteristics and more specific weapon-target analysis, refer to WINJMEM Air to Surface.

Guns

- **M61 Vulcan:** 20mm Gatling gun found on all primary fighters except the A-10; ROF: 6,000 rpm (rounds per minute) with six barrels.
- **GAU-8 Avenger**: 30mm gun on the A-10; ROF: 3,900 rpm with seven barrels; large ammunition capacity; round designed for armored vehicles.
- **GPU-5A:** This 30 mm four-barrel gun is sometimes mounted on the A-7, F-4, and F-16. The gun fires up to 2,400 rpm.
- **AC-130H**: Contains two 25mm, M-61 guns capable of firing 2,500 rpm per gun and can carry up to 3,000 rounds; one M2A1 BOFORS 40mm cannon firing 100 rpm and can carry up to 416 rounds; one 105mm M103 cannon which can fire 6-8 rpm and can carry up to 100 rounds; all HE with PD/DEL/TIME fuzes. All three weapons are located on the aft side of the aircraft.
- **AC-130U**: Latest version with an APG-7 pulse doppler fire control radar for all-weather employment. The U model contains the same 40mm and 105mm cannons as the H model, but has replaced the dual 20mm with a single 25mm GAU-12/U gun which has a ROF of 5,000 rpm and can carry up to 3,000 rounds.

General Purpose Bombs (GPB)

MARK-80 Series: The Mark-80 series is the cheapest and most versatile type of GP bomb. The MK 81 is a 250-lb. bomb, the MK 82 is a 500-lb. bomb, the MK 83 is a 1,000 lb. bomb, and the MK 84 is a 2,000-lb. bomb. The MK 83 is primarily used by the U.S. Navy. The most commonly used bombs – the MK 82 and MK 84 – are the ones the Air Force uses extensively during routine CAS missions. These bombs are often configured with a tail and a nose fuse which may be selected in the cockpit. Typical types are instantaneous (fragmentation) and delay (penetration). They can be fitted with steel nose plugs for greater penetration against hardened targets. One more GPB worthy of mention is the BLU-109, which is an improved 2,000-lb. bomb.

Precision Guided Munitions

- **Laser Guided Bombs:** The MK-80 series bombs may be fitted with laser guidance kits to allow greater standoff and can be ground or air guided precisely onto its target. The following is a conversion:

  MK-82 = GBU-12
  MK-84/BLU-190 = GBU-10
  MK-84/BLU-109 = GBU-24 (low level LGB)
  BLU-113B (4,500 LB.) = GBU-28

- **GBU-15:** Uses TV or IR seeker for guidance with a data link from the weapon to the aircraft. The TV version is good only in the day in good weather; the IR is good in the day or night in good weather.
- **AGM-130:** This is a rocket-assisted version of the GBU-15 with increased range and standoff attack capability.

- **AGM-65 Maverick:** This is a 500-lb. class rocket-propelled munition. The A, B, and D models have a 125-lb. shaped-charge warhead, whereas the E, F, and G models have a 300-lb. fragmentation warhead. The A and B models (TV) are not effective at night. The D, F and G models (IIR) have good weather and day/night capability. The E model is used by the U.S. Navy and U.S. Marine Corps. This is laser-guided and requires a ground or air designator. The combination of self-contained guidance and boosting provides a standoff launch and leave capability.

Cluster Munitions

- **CBU-52, 58, 71:** The CBU-52 consists of 220 softball-size BLU-61 bomblets good for anti-personnel and material; the CBU-58 contains 650 baseball-size BLU-63 bomblets, also good for anti-personnel and material; both detonate upon impact. The CBU-71 contains 650 baseball-size BLU-86 bomblets that offer a random delayed detonation for area denial. All are excellent against area, soft-skinned targets.
- **CBU-75:** Is a 2,000-lb. class CBU. *It is considered an excellent weapon for suppression of strong enemy defenses.* It contains 54 SUU and 1800 BLU (80% BLU-63, 20% BLU-86).
- **Combined Effects Munitions (CEM) (CBU-87):** A cluster munition designed to eventually replace the rockeye and CBU-58. Called a combined effects munition because of its incendiary, fragmentary, and armor piercing capabilities.
- **MK-20 Rockeye:** This cluster munition is effective against armor as well as personnel. It consists of 247 bomblets in a MK-7 dispenser that has a primarily anti-armor function, but will produce some fragmentation.
- **CBU-89 Gator:** Similar to FASCAM, this munition consists of a combination of anti-armor and anti-personnel mines encased in a tactical munitions dispenser (TMD). The mines are armed upon their release from the dispenser and have a factory pre-set self-destruct timer.
- **Sensor Fuzed Weapon (SFW) (CBU-97):** The first smart submunition incorporated into a cluster weapon designed to defeat armor from above using IR sensors, delivered in a tactical munitions dispensor. The weapon contains 10 BLU-108/B submunitions, with 4 anti-armor warheads (skeets) each. Each submunition disperses its skeets sequentially in an X pattern, with its sensors spinning and scanning a large eliptical area above the engagement area. A single skeet covers a search area of 100 x 300 feet. The scan pattern of all 40 skeets from a single CBU-97 will describe a search pattern 1200 x 700 feet. The IR sensor in the skeet fires a highly explosive forged penetrator against the target's heat source or engine. If no target is found, it fires 8 seconds after release.

Anti-Radiation Missile

- **AGM-88 Harm:** This is an 807-lb. missile that is 13 feet 8 inches long. It has an HE warhead and a radar homing guidance system effective against enemy early warning radars and counter-mortar/battery radars. Better use in a linear battlefield as opposed to a low-intensity conflict (LIC) where friendly systems may be in the vicinity.
- **AGM SHRIKE:** This is a 400-lb. 10-foot-long missile with a high explosive/fragmentation warhead. It uses radar homing to strike ground emitting radars.

TARGET VULNERABILITY TABLE

TARGETS	WEAPONS
Armor	MK-20 Rockeye, AGM-65 Maverick, 30mm GAU-8, 40/105mm Gunship, CBU-89 Gator, CEM CBU-87/97
Area Denial and Canalization	CBU-87 Gator, CBU-71
Soft Targets (Personnel, trucks, parked aircraft)	All GP Bombs, CBU-52,58,71, 20/30mm, 25/40/105mm Gunship
Point targets	LGB's (GBU-10,12 14, 24,28, agm-65 Maverick, 20/25/30/40/105mm
Hardened Targets	GP Bombs with steel nose plugs, BLU-109, LGB's, AGM-65 Maverick, GBU-15/AGM-130, 105mm Gunship
SAM and AAA Radar Sites	AGM-88 HARM, AGM Shrike

J-FIRE RISK ESTIMATE DISTANCES

Risk estimate distances allow the ground forces commander or combat air commander to estimate the risk in terms of percent of friendly casualties that may result from a friendly air strike against an enemy threat along the forward line of own troops (FLOT). Risk estimate distances are based on the weapon fragmentation pattern.

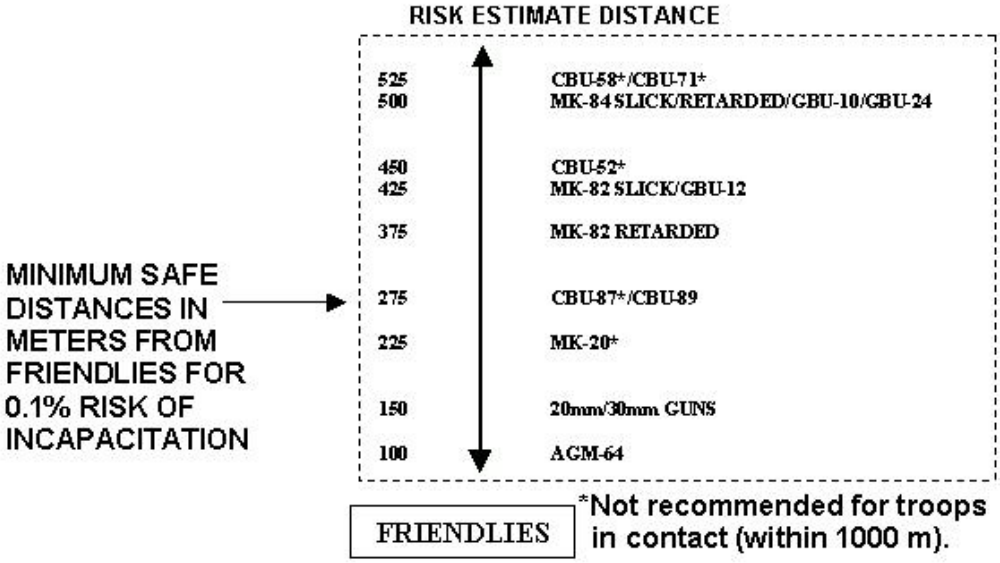
The casualty criterion is the 5-minute assault criterion for a prone soldier in winter clothing and helmet. The probability of incapacitation means a soldier is unable to perform the bodily function required in an assault within a 5-minute period after the attack. The 0.1% probability of incapacitation value can be interpreted as being less than or equal to 1 in 1,000.

The forward observer should treat targets within one kilometer of friendlies as a troops-in-contact situation and advise the ground commander accordingly. If a target is inside the 0.1% probability of incapacitation distance, the ground commander must be advised and accept responsibility for friendly risks.

The values shown for laser guided bombs (LGBs) assume the weapons do not guide and follow a ballistic trajectory similar to general purpose bombs. It is not recommended to use cluster bomb munitions near troops in contact.

Delivery parameters and considerations for specific weapons are in the ***Joint Munitions Effectiveness Manual,*** "Risk Estimate For Friendly Troops."

Risk estimate distances are for combat use and are not minimum safe peacetime or training distances.


RISK ESTIMATE DISTANCE
525
500
450
425
375
275
225
150
100
CBU-58*/CBU-71*
MK-84 SLICK/RETARDED/GBU-10/GBU-24
CBU-52*
MK-82 SLICK/GBU-12
MK-82 RETARDED
CBU-87*/CBU-89
MK-20*
20mm/30mm GUNS
AGM-64
MINIMUM SAFE DISTANCES IN METERS FROM FRIENDLIES FOR 0.1% RISK OF INCAPACITATION
FRIENDLIES
*Not recommended for troops in contact (within 1000 m).

RISK ESTIMATE DISTANCE EXTRACT (CONTINUED)			
		Distance in Meters	
ITEM	DESCRIPTION	10% PI (RADIUS IN METERS)	0.1% PI (RADIUS IN METERS)
MK 82 LD	500LB BOMB	250	425
MK 82 HD	500LB BOMB (RETARDED)	100	375
MK 82 LGB	500LB BOMB (GBU)	250*	425*
MK 83 HD	1000LB BOMB	275	475
MK 83 LD	1000LB BOMB	275	475
MK 83 LGB	1000LB BOMB (GBU-16)	275*	475*
MK 84 HD/LD	2000LB BOMB	325	500
MK 84 LGB	2000LB BOMB (GBU-10/24)	225*	500*
MK 20**	ROCKEYE	150	225
MK 77**	500LB NAPALM	100	150
CBU 55/77**	FUEL-AIR EXPLOSIVE	*	*
CBU 52 **	CBU (ALL TYPES)	275	450
CBU58/71 *****	CBU (ALL TYPES)	350	525
CBU 87 **	CBU (ALL TYPES)	175	275
CBU 89/78 **	CBU (ALL TYPES)	175	275
2.75" FFAR	ROCKET W/VARIOUS WARHEADS	160	200
SUU 11	7.62 MINIGUN	*	*
M 4,M 12, SUU 23, M 61	20mm GATTLING GUN	100	150
CAU 12	25mm GUN	100	100
GPU 5a, GAU 8	30mm GATTLING GUN	100	150
AGM 65 ****	MAVERICK (TV, IRR, LASER- GUIDED)	25	100
MK 1/MK 21	WALLEYE II (1000LB TV- GUIDED BOMB)	275	500
MK 5/MK 23	WALLEYE II (2400LB TV- GUIDED BOMB)	*	*
AC 130	105mm CANNON 40/25/20mm	80**** 35	200** 125

* Risk estimate distances are to be determined. For LGBs, the values shown are for weapons that do not guide and that follow a ballistic trajectory similar to GP bombs. This does not apply to GBU-24 bombs, because GBU-24s do not follow a ballistic trajectory.

** Not recommended for troops in contact.

*** CBU-71/CBU-84 bombs contain time-delay fuzes, which detonate at random times after impact. CBU-89 bombs are antitank and antipersonnel mines and are not recommended for use near troops in contact.

**** AC-130 estimates are based on worse case scenarios. The 105mm round described is the M-1 HE round with M-731 proximity fuze. Other fuzing would result in smaller distances. These figures are accurate throughout the firing orbit. The use of no-fire headings has no benefits for reducing risk-estimate distances and should not be used in contingency situations.

***** The data listed applies only AGM-65 A,B,C and D models. AGM-65 E and G models contain a larger warhead and risk-estimate distances are not currently available.

Chapter 6

Operational Terms and Symbols

MANEUVER OPERATIONS

Offensive Operations

Characteristics of Offensive Operations

- **Surprise.** Commanders achieve surprise by striking the enemy at a time or place or in a manner for which they are not physically or mentally ready. Surprise can be achieved by operating in a manner the enemy does not expect. The enemy may anticipate the attack, but they can be deceived as to its nature, its timing, and its force.
- **Concentration.** While surprise may contribute to offensive success, concentration is the ability to mass effects without massing large formations and is, therefore, essential for achieving and exploiting success. Commanders designate a point of main effort and focus resources to support it. They are ready to shift it rapidly without losing synchronization of effects as the attack unfolds. At the same time, commanders retain centralized control of sufficient assets to shift the main effort to a supporting attack if it appears more advantageous.
- **Tempo.** Tempo is the rate of speed of military action; controlling or altering the rate is essential for maintaining the initiative. Commanders seek a tempo that maintains relentless pressure on the enemy to prevent him from recovering from the shock and effects of the attack. An attack tempo puts sufficient pressure on the defender to ensure success; it promotes surprise, keeps the enemy off balance, contributes to the security of the attacking force, and denies the defender freedom of action.
- **Audacity** (*bold action in concert with calculation of risk*). A simple plan, boldly executed, requires audacious leaders to negate the disadvantages of numerical inferiority. Commanders should understand when and where they are taking risks, but must not become tentative in the execution of their plan.

Forms of the Offensive. The four forms of the tactical offense are *movement to contact, attack, exploitation,* and *pursuit.* While it is convenient to talk of them as different forms, in reality they flow readily from one to another. An attack may lead to exploitation, which leads to a pursuit. The ebb and flow of battle opens up many avenues for attack; victory goes to the bold.

- **Movement to contact** develops the situation and is used to gain or reestablish contact with the enemy. Variations to the movement to contact are: *approach march, search and attack, reconnaissance in force,* and *meeting engagement.*
  - **Approach march.** Commanders conduct an approach march when they are relatively certain of the enemy's location and are a considerable distance from the enemy. They decide where their forces can deploy into attack formations that facilitate the initial contact and still provide freedom of action for the bulk of their forces.
  - **Search and attack.** Conducted by smaller, light maneuver units and air cavalry or air assault units in large areas. The purpose of this operation is to destroy enemy forces, protect the force, deny area to the enemy, or collect information. It is used when the enemy is dispersed in close terrain, when there are no identified enemy weaknesses, or in an attempt to deny enemy movement in the area. It can be used in the rear areas to fight infiltrators or special operations forces (SOF).
  - **Reconnaissance in force.** A limited objective operation by considerable force to obtain information and locate and test enemy dispositions, strengths, and reactions. Commanders may conduct reconnaissance in force during mobile operations as a means of keeping pressure on the defender by seizing key terrain and uncovering weaknesses.

- **Meeting engagement.** The desired result of the movement to contact is to find the enemy. When this happens, commanders fight a meeting engagement. Sometimes in a race to an objective or occupation of key terrain, forces make contact while on the move. Moreover, meeting engagements can occur even when each opponent is aware of the other, but both sides decide to attack without delay. Once commanders establish contact, they implement the option that provides them the most advantage. Hasty attacks usually follow movement-to-contact operations, but other options are possible.

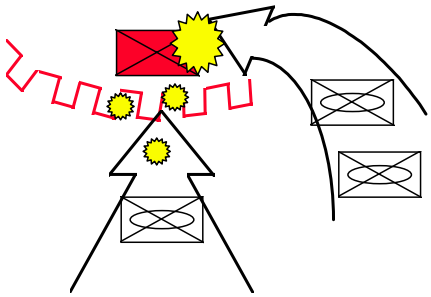
The movement-to-contact force is organized into a covering/security force, advance guard, main body, flank guards, and rear guards.

- **Attack.** The purpose of the attack is to defeat, destroy, or neutralize the enemy. The same fundamentals apply to each type of attack. The differences between types of attacks lie in the amount of planning, coordination, and preparation before execution. Whether hasty or deliberate, successful attack depends on the skillful massing of effects against the enemy force. The objective is to shatter the enemy's will, disrupt his synchronization, and destroy his units' cohesion and the willingness of his soldiers to fight. Successful attacks leave the defending units incapable of further resistance. The commander's intent drives the selection of available attack options – *hasty attack, deliberate attack, spoiling attack, counterattack, raid, feint, demonstration,* or any combination thereof.
  - **Hasty attack.** Most likely the result of a meeting engagement. Commanders launch the hasty attack with the forces at hand and with minimum preparation to destroy the enemy before he is able either to concentrate or to establish a defense. In the defense, commanders may quickly counterattack to recover lost ground and a shattered defense before the enemy can consolidate its gains. A hasty attack enhances agility at the risk of losing synchronization.
  - **Deliberate attack.** A fully synchronized operation that employs the effects of every available asset against an enemy defense. A deliberate attack requires more preparation, and this planning time must be weighed against urgency to prevent the enemy additional time to reinforce his position.
  - **Spoiling attack.** Commanders mount spoiling attacks from a defensive posture to disrupt an expected enemy attack.
  - **Counterattack.** Units counterattack after the enemy launches his attack, reveals his main effort, or creates an assailable flank. Although commanders conduct counterattacks much like other attacks, synchronizing them within the overall defensive effort requires careful timing. As in spoiling attacks, commanders prepare to seize the opportunity to exploit success by the entire force. However, counterattacks may be limited to movement to better terrain in order to bring fires on the enemy.
  - **Raid.** A limited-objective attack into enemy territory for a specific purpose other than gaining and holding ground. The raiding force withdraws from the objective area after completing its mission and, unless it is a stay-behind unit, recovers to friendly lines.
  - **Feint and demonstration.** Both are considered diversionary operations. A **feint** may divert the enemy's attention from the main effort. Brigades and smaller units conduct feints. Feints are shallow, limited-objective attacks conducted before or during the main attack. A **demonstration** is a show of force in an area where a decision is not sought. A demonstration threatens attack, but does not make contact.

- **Exploitation.** In an exploitation the attacker extends the destruction on the defending force by maintaining offensive pressure. The ultimate objective of the exploitation is the disintegration of the enemy to the point where he has no alternative but surrender or flight. Exploitation requires the physical and mental aggressiveness to combat the friction of night, bad weather, dangers of fratricide, and extended operations. As the enemy becomes demoralized and his formations begin to disintegrate, exploitation may develop into a pursuit.

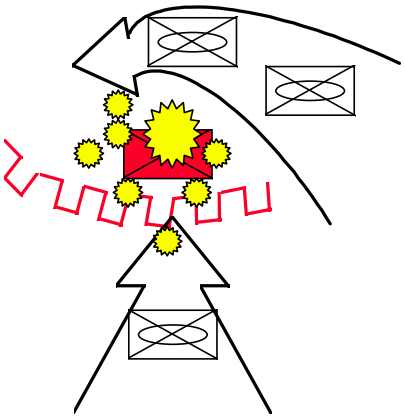
- **Pursuit.** A pursuit is an offensive operation against a retreating enemy force. It follows a successful attack. Exploitation is ordered when the enemy cannot conduct an organized defense and attempts to disengage. The object of the pursuit is the destruction of the opposing force. Exploitations and pursuits test the audacity and endurance of soldiers and leaders alike. Both of these operations risk disorganizing the attacker nearly as much as the defender.

Forms of Maneuver. The forms of maneuver are *envelopment, turning movement, infiltration, penetration,* and *frontal attack.* Commanders use these forms of maneuver to orient on the enemy, not terrain.



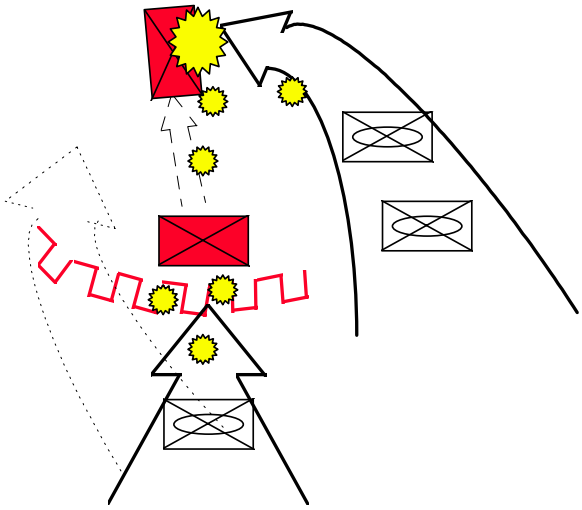
ENVELOPMENT

Envelopment. Uses maneuver and fire to put greater relative combat power against the defender and strip him of his advantages. To use this form of maneuver, commanders must find or create an assailable flank, pitting their strengths against the enemy's weakness. Envelopment avoids the enemy's strength by maneuvering around or over to secure objectives in the enemy's rear area. An encirclement is an extension of either a pursuit or an envelopment. Forces must be positioned to block or interdict the enemy's attempt to break through to the rear or break out at other points.



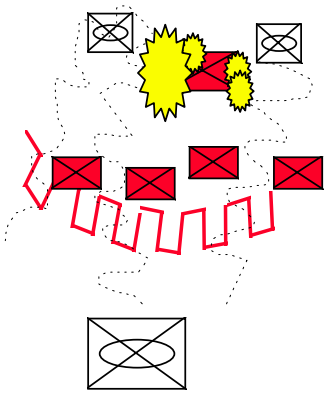
ENCIRCLEMENT

Encirclement is an extension of either a pursuit or an envelopment. Forces must be positioned to block or interdict the enemy's attempt to break through to the rear or break out at other points.

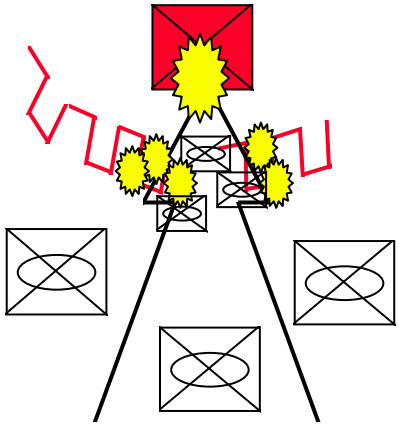


TURNING MOVEMENT

Turning Movement. The turning movement, like the envelopment, uses freedom of maneuver to create a decisive point where the enemy is unprepared. Maneuver by friendly units which force the enemy to abandon prepared positions and attack in an undesirable direction and at a time of his opponent's choice.

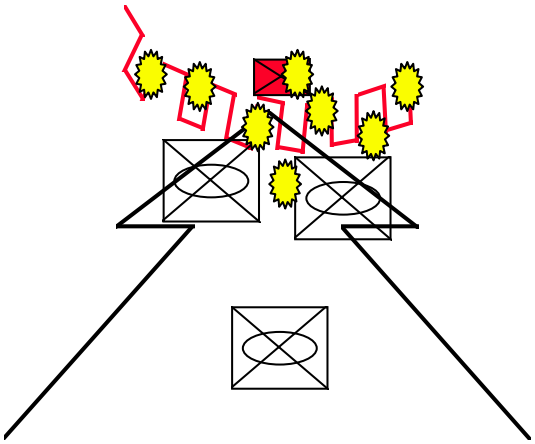


Infiltration. Infiltration is a covert movement of an attacking force through enemy lines to a favorable position in the enemy's rear area. Light infantry units are especially valuable for infiltration operations.



PENETRATION

Penetration. Commanders use penetration when enemy flanks are not assailable. They mass sufficient combat power at the point of penetration to overwhelm the enemy and gain the advantage. A penetration is sequential: First you must breakthrough the enemy defenses (usually on a narrow front), then hold open the shoulders of the "gap," then finally cripple enemy counterattacks. Penetrations are attacks into the strength of the enemy defense which means the attacker could incur high casualties.



FRONTAL ATTACK

Frontal Attack. The frontal attack strikes the enemy across a wide front and over the most direct approaches. It is normally used when commanders have overwhelming combat power and the enemy is at a clear disadvantage. It may be the most causality-intensive form of attack. It is often the best form of maneuver for a hasty attack or meeting engagement in which speed and simplicity are paramount to maintaining battle tempo and, ultimately, the initiative.

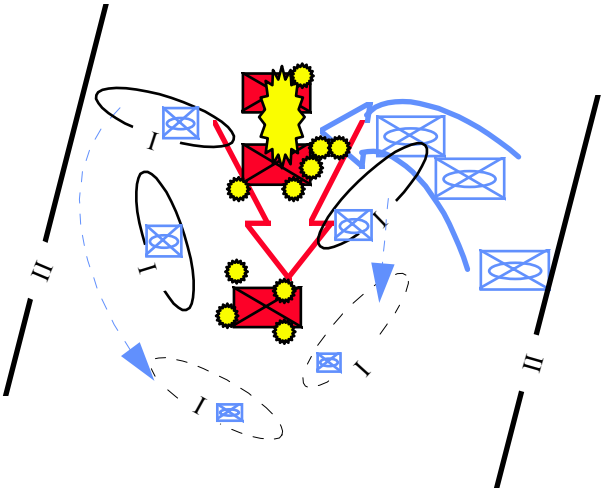
Defensive Operations

Characteristics of the Defense

- **Preparation.** The defender arrives in the battle area before the attacker, making the most thorough preparations that time allows. Preparation involves positioning forces in depth, improving terrain to favor the defender, war-gaming plans, organizing the force for movement and support, rehearsing, and taking measures to protect the force.
- **Security.** Since a force defends to conserve combat power for use elsewhere or at a later time, commanders must provide protection for their force. Normally, a security area is designated with a covering force. The purpose of these measures at all tactical echelons is to coordinate and synchronize the defense, provide early warning, and begin disrupting the integrity of the enemy attack early and continuously.
- **Disruption.** The defender disrupts the attacker's tempo and synchronization by countering his initiative and preventing him from massing overwhelming combat power. He deceives the enemy of his true dispositions and intentions, unravels the coordination of the enemy's supporting arms, and breaks the tempo of the offensive operations. The attacker is never allowed to get set. He is hit with spoiling attacks before he can focus his combat power and is counterattacked before he can consolidate any gains.
- **Mass and Concentration.** The defender seeks to mass the effects of overwhelming combat power where he chooses and shifts that mass repeatedly in accordance with his point of main effort. The defender may have to surrender some ground to gain the time necessary to concentrate his forces. The defender normally masses his weapons' effects and concentrates forces repeatedly during battle.
- **Flexibility.** Defensive operations epitomize flexible planning and agile execution. In exercising the initiative, the attacker initially decides where and when combat will take place. The defender who is agile enough to counter or evade the attacker's blow can then strike back effectively.

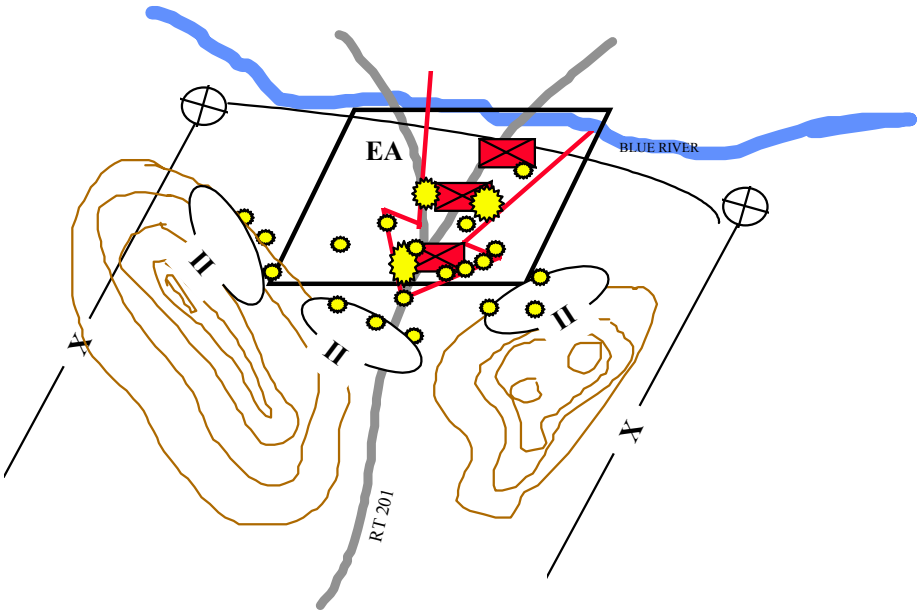
Purpose of Defensive Operations. Military forces defend only until they gain sufficient strength to attack. Though the outcome of decisive combat derives from offensive operations, it is often necessary, even advisable, to defend. Commanders choose to defend when they need to gain time, hold a piece of key terrain, facilitate other operations, preoccupy the enemy in one area so friendly forces can attack in another, or erode enemy resources at a rapid rate while reinforcing friendly operations.

Defensive Patterns



MOBILE DEFENSE

Mobile Defense. The mobile defense focuses on the destruction of the enemy by using a combination of fires, maneuver, offense, defense, and delay to defeat his attack. The minimum force possible is committed to pure defense; maximum combat power is placed in a striking force that catches the enemy as it attempts to overcome the element that is defending. A mobile defense requires the defender to have greater mobility than the attacker. Minimum forces are placed forward, allowing the formation of powerful forces to strike the enemy as he is the most vulnerable. Terrain is traded for maximum effect to divert the attention of the enemy from the defender's main force, overextend the attacker's resources, expose his flanks, and lead him into a posture and terrain that diminishes his ability to defend against the mobile reserve's counterattack.



AREA DEFENSE

Area Defense. Commanders conduct an area defense to deny the enemy *access to* designated terrain or facilities for a specified time. In an area defense, the bulk of defending forces deploys to retain ground, using a combination of defensive positions and small, mobile reserves. Commanders organize the defense around a static framework provided by defensive positions, seeking to destroy enemy forces with interlocking fires.

RetrogradeOperations

Purpose of Retrograde Operations. A retrograde operation is a maneuver to the rear or away from the enemy. It is part of a larger scheme of maneuver to regain the initiative and defeat the enemy. It improves the current situation or prevents a worse situation from occurring. Its objectives are to gain time, preserve forces, avoid combat under undesirable conditions, or maneuver the enemy into an unfavorable position. Commanders use retrograde operations to harass, exhaust, resist, delay, or damage an enemy. While retrograde operations are difficult, delays and withdrawals are particularly risky.

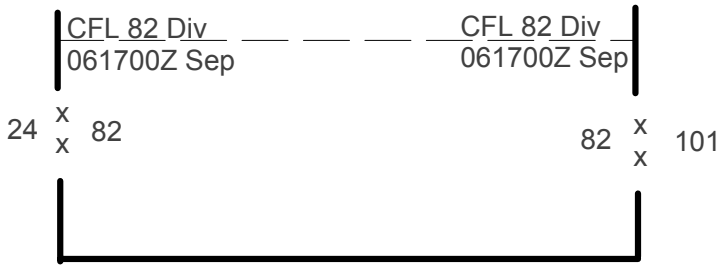
Types of Retrograde Operations. The types of retrograde operations are *delays, withdrawals,* and *retirements.* In each type of retrograde, a force not in contact with the enemy moves to the rear – normally by a tactical road march. In all retrograde operations, firm control of friendly maneuver elements is a prerequisite for success.

- **Delays** have units yield ground to gain time while retaining flexibility and freedom of action to inflict the maximum damage on the enemy.
- **Withdrawal** is a voluntarily disengagement from the enemy with or without assistance by other units. The disengagement preserves the force or releases it for a new mission. Withdrawal operations can take place when a unit is or is not in contact with the enemy.
- **Retirement** is a rearward movement conducted by units not in contact with the enemy. Security and speed are important considerations when conducting a retirement. Retiring units move at night when possible.

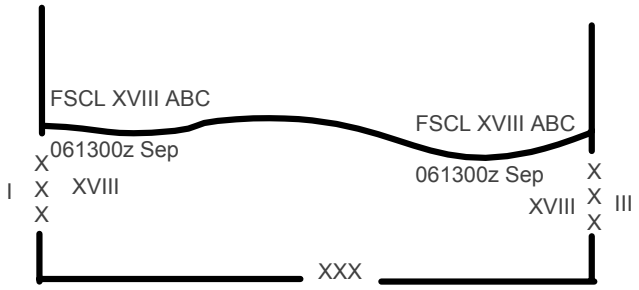
FIRE SUPPORT COORDINATION MEASURES

Unit Boundaries: Basic maneuver control measures used by commanders to designate the geographical area for which a particular unit is tactically responsible. No fire support means may deliver fires across a boundary unless those fires are coordinated with the force having responsibility for the area within that boundary (unless a permissive measure is in effect). (FM 6-20-50)

Coordinated Fire Line (CFL): A line beyond which conventional surface fire support means (mortars, field artillery, naval gunfire ships) may fire at any time within the zone of establishing headquarters without additional coordination. It is usually established by brigade or division, but may be established by a maneuver battalion. (FM 101-5-1)

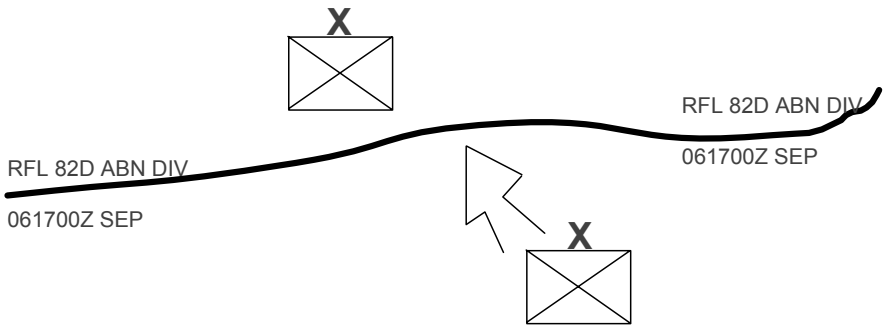


Fire Support Coordination Line (FSCL): A line established by the appropriate land or amphibious force commander to ensure coordination of fire not under the commander's control, but which may affect current tactical operations. The FSCL is used to coordinate fires of air, ground, or sea weapons systems using any type of ammunition against surface targets. The FSCL should follow well-defined terrain features. The establishment of the FSCL must be coordinated with the appropriate tactical air command and other supporting elements. Supporting elements may attack targets forward of the FSCL without prior coordination with the land or amphibious force commander provided the attack will not produce adverse surface effects on or to the rear of the line. Attacks against surface targets behind this line must be coordinated with the appropriate land or amphibious force commander. Forces attacking targets beyond the FSCL must inform all affected commanders to allow necessary coordination to avoid fratricide. (FM 101-5-1)



Free-Fire Area: An area into which any weapon system may fire without additional coordination with the establishing headquarters. Normally established on identifiable terrain by division or higher HQ. (FM 6-71)

Restrictive Fire Line (RFL): A line between converging friendly forces (one or both may be moving) that prohibits fires, or their effects, across that line without coordination with the affected forces. It is established on identifiable terrain by the common commander of the converging forces. (FM 6-71)



Restrictive Fire Area (RFA): An area with specific restrictions and in which fires that exceed those restrictions will not be delivered without coordination with the establishing headquarters. (FM 6-71)

No-Fire Area (NFA): An area into which no fires or their effects are allowed. Two exceptions:

a. When the establishing HQ allows fires on a mission-by-mission basis.

b. When a friendly force is engaged by an enemy located in a NFA and the commander returns fire to defend his forces. (FM 6-71)

Airspace Coordination Area (ACA): A three-dimensional block of airspace in the battle area in which friendly aircraft are reasonably safe from surface fires. Aircraft and indirect fires are separated by time, space, and altitude. Informal ACAs are most often used and are the preferred method. Established at TF or higher level. ACAs allow the simultaneous attack of targets near each other by multiple fire support teams, one of which is normally air. (FM 101-5-1)

Example of a Formal ACA

Chapter 7

Miscellaneous Tables

FIRE SUPPORT PRINCIPLES AND TASKS

13 FIRE SUPPORT PRINCIPLES
Plan early and continuously.
Exploit all available targeting assets.
Consider the use of all lethal/non-lethal attack means.
Use lowest echelon capable of furnishing effective support.
Use most effective means.
Furnish type of support requested.
Avoid unnecessary duplication.
Consider airspace coordination.
Provide adequate support.
Provide rapid and effective coordination.
Fire support coordination measures.
Provide for flexibility.
Provide for safeguarding and survivability of friendly units.
BASIC TASKS
Support forces in contact.
Support the force commander's plan.
Synchronize fire support.
Sustain fire support.

FM 6-20, ***Fire Support in the Airland Battle***

THE SEVEN INHERENT RESPONSIBILITIES OF FIELD ARTILLERY STANDARD TACTICAL MISSIONS

AN FA UNIT WITH A MISSION OF---	DIRECT SUPPORT	REINFORCING	GENERAL SUPPORT REINFORCING	GENERAL SUPPORT
Answers calls for fire in priority from--	1. Supported unit. 2. Own observers. 3. Force FA HQ.	1. Reinforced FA. 2. Own observers. 3. Force FA HQ.	1. Force FA HQ. 2 Reinforced unit. 3. Own observers.	1. Force FA HQ. 2. Own observers.
Has as its zone of fire--	Zone of action of supported unit.	Zone of fire of reinforced FA.	Zone of action of supported unit to include zone of fire of reinforced unit.	Zone of action of supported unit.
Furnishes fire support team (FIST) or fire support element (FSE)--	Provides temporary replacements for casualty losses as required.	No requirement.	No requirement.	No requirement.
Furnishes liaison officer	No requirement.	To reinforced FA unit HQ.	To reinforced FA unit HQ.	No requirement.
Establishes communication with--	Company FSOs, FSOs, and supported maneuver unit HQ.	Reinforced FA unit HQ.	Reinforced FA unit HQ.	No requirement.
Is positioned by--	DS FA unit commander or as ordered by force HQ.	Reinforced FA unit or as ordered by force FA HQ.	Force FA HQ or reinforced FA unit if approved by force FA HQ.	Force FA HQ.
Has its fires planned by--	Develops own plan.	Reinforced FA unit HQ.	Force FA HQ.	Force FA HQ.

METT-T CONSIDERATIONS

MISSION	ENEMY	TERRAIN & WEATHER	TROOPS	TIME AVAILABLE
Mission CMDR concept and scheme CMDR intent Operation objective Unit route Intermediate objectives Missions of near units Contingency missions	Capabilities Limitations FS assets Direct fire assets Vehicles Likely COs Locations Doctrine	Observation Cover/concealment Obstacles Key terrain Approach avenues Ambush positions Weather (mobility and visibility) Terrain (mobility and visibility)	Status of FIST and FS training FS assets available FS locations and capabilities Status of supported unit Status of observers	Time before OPs begin Time to fire plan (1/3,2/3) Time to coordinate fire plan Time OPs will last

OACOK

OBSERVATION AND FIELDS OF FIRE
- Will observer team be among the first to see the target(s)? - Are dead spaces and covered approaches in the CO/TM's direct fire plan targeted? - Does observer team have limited visibility plan? - Will changes in the weather affect planned smoke targets or other munitions?
AVENUES OF APPROACH
- Where along the approach (route/march, axis/attack) is the CO/TM most vulnerable? - Are the enemy avenues of approach covered by fires?
COVER AND CONCEALMENT
- How exposed are you and your team? - Where will you rally if engaged? - Are you ready to cover the CO/TM's assault or withdrawal with suppressive fires/smoke? - Have the commander and you discussed or war-gamed fire support actions on contact? - Do the observation posts have covered and concealed routes to and from positions, and are they visible from the engagement area?
OBSTACLES
- Will the CO/TM maneuver through restricted terrain or checkpoints? - Have the commander, engineer platoon leader, and you discussed or war-gamed the hasty/deliberate breach? - Did the commander, engineer platoon leader, and you review and confirm obstacles emplaced? - Are the obstacles targeted and covered? - Have you confirmed the locations of the obstacles and their targets and trigger points?
KEY TERRAIN
- Are intermediate, final, and contingency objectives sufficiently targeted? - Have you reconnoitered routes and assault positions for enemy OPs? - Did you participate in the leader's reconnaissance of the EA and battle position? - Are the potential enemy direct fire positions/OPs at the limits of the CO/TM's direct fire range targeted?

PRINCIPLES OF PLANNING

PRINCIPLES OF WAR	ELEMENTS OF COMBAT POWER	TENETS OF OPERATIONS	BATTLEFIELD ORGANIZATION	LEVELS OF WARFARE
Objective Offensive Mass Economy of force Maneuver Unity of command Security Surprise Simplicity	Maneuver Firepower Protection Leadership	Agility Initiative Depth Synchronization Versatility	Close Ops Deep Ops Rear Ops	Operational Strategic Tactical

TASK, PURPOSE, AND OPERATIONS KEYWORDS

TACTICAL TASKS		
ENEMY	**TERRAIN**	**FRIENDLY**
Assault Block Bypass Canalize Contain Demonstrate Destroy Exploit Feint Fix Interdict Neutralize Pursue Penetrate Suppress Attack by fire Reconnoiter Rupture	Clear Retain Secure Seize Reconnoiter	Follow and support Displace Guard Exfiltrate Infiltrate Occupy Overwatch Screen Breach Support by fire

PURPOSE (IN ORDER TO…)					
Prevent Enable Deny	Open Surprise Create	Draw Influence	Allow Deceive	Divert Cause	Envelope Support

TYPES OF OPERATIONS		
Attack Move to contact Countermobility Relief in place Exploitation	Counterattack Retrograde Survivability Raid Breakout	Defend Mobility River crossing Pursuit

DEFENSE

PLANNING CONSIDERATIONS		
FRAMEWORK	**CHARACTERISTICS**	**TYPES**
Deep Operations Close Operations Reserve Operations Rear Operations	Preparation Disruption Concentration Flexibility Security	Sector Battle Position Team Defense of BP Strongpoint (BN)
CONTROL MEASURES	**SEQUENCE**	**TECHNIQUES**
Coordinating Points Phase Lines BPs or Sectors Contact Points Passage Points Passage Lines Routes MSR Checkpoints Assembly Areas	Occupation Passage of Covering Force Defeat Enemy Recon, Infiltration, Prep Fires Approach of Enemy Main Attack Enemy Assault Counterattack Reorganize/Consolidate	Perimeter - All directions - Divided into sectors Reverse Slope - Against Fast Forces - OPs to the Front
BP OR SECTOR		
FACTOR	**BATTLE POSITION**	**SECTOR**
Avenue of Approach Terrain Area of Ops Mutual Support between companies Higher Command/Control	Well Defined Dominates AA Narrow Achievable Good	Multiple Not Dominating Wide Not Possible Degraded

RETROGRADE OPERATIONS

DELAY	WITHDRAWL	RETIREMENT
1. Friendly forces insufficient to attack or defend. 2. Gain time. 3. Slow or break enemy momentum. 4. Maneuvering enemy into position to counterattack.	1. Extract subordinate units from combat. 2. Adjust defensive positions. 3. Relocate entire force. 4. Normally free from enemy pressure.	1. Rearward movement by units not in contact. 2. Pre-arrange rear guards. 3. Security and speed are important.

OFFENSE

PLANNING CONSIDERATIONS			
CHARACTERISTICS	**TYPES**	**FORMS OF MANEUVER**	**TF MOVEMENT FORMATIONS**
Surprise Concentration Speed Flexibility Audacity	Movement to Contact Attack Exploitation Pursuit	Envelopment Turning Movement Penetration Frontal Attack Infiltration	Column Wedge Vee Echelon Line Box/Diamond
TM MOVEMENT FORMATIONS	**MOVEMENT TECHNIQUES**	**BREACHING OPERATIONS**	**BREACHING ORGANIZATION**
Combat Column Echelon Wedge Vee Line	Traveling - Contact not likely, 10m between men, 20m between squads Traveling Overwatch - Contact possible, 20m between men, 50m between squads Bounding Overwatch - Contact expected, 20m between men, length of bound depends on terrain	Suppress Secure Reduce Obscure	Support Force Breach Force Assault Force
CONTROL MEASURES	**OBSTACLE REDUCTION**	**TASK ORGANIZATION**	**ACTIONS ON CONTACT**
Objective Zone of Action Axis of Advance Direction of Attack Line of Departure Checkpoints Infiltration Lane Attack Positions Assault Positions Final Coord Line Phase Line Overwatch Position Limit of Advance Attack-by-fire Pos. Support-by-fire Pos.	Mounted Explosive - MICLIC Mounted Mechanical - Track Width Mine Plow - Track Width Roller - Mine Rake Manual Reduction	Security Force Advance Guard - Initial Main Effort Main Body Flank and Rear Guards	Task Force - Bypass - Hasty Ambush - Hasty Attack - Defense Team - Return Fire - Deploy - Report - Develop Situation - Choose Course of Action

STABILITY AND SECURITY OPERATIONS

PRINCIPLES	OPERATIONS		
Objective Unity of Effort Legitimacy Perseverance Restraint Security	Noncombatant Evacuation Arms Control Support Domestic Civil Auth. Humanitarian Assistance/ Disaster Relief Security Assistance	Nation Assistance Support Counter Drug Ops Combating Terrorism Peacekeeping Ops Peace Enforcement Show of Force	Support Insurgents/ Counterinsurgents Attacks and Raids

COMPANY FS BRIEF

SITUATION	MISSION	EXECUTION	SERVICE SUPPORT	COMMAND & SIGNAL
• Orient Commander • Give FS documents • Enemy known and suspected locations • Enemy most likely and most dangerous COAs • How enemy FS will inhibit operations • Friendly units in area (front, left, right, rear) and brief maneuver description	Restate mission from OPORD verbatim	CO guidance for fires FS assets - Type - DS/R - # Tubes - Other POF Priority TGTs FPFs Special munitions - FA/Mortar smoke (min) - FA/Mortar illum (min) - # Copperhead - FASCAM req. Scheme of fires - BN FS reg. - POF, Pri TGT, FPF to include changeover criteria - FSCMs Mortars - Concept of support - Displacement/position plan Each TGT - Description - Location - Shell/fuse - CMDR intent - Engagement criteria - Pri and alt executor - Trigger points	Mortars - Load/resupply plan - Drop-off/ consolidation plan FS Equipment Status - Vehicle - Commo - Weapons	FS task organization - FIST - FOs - FCTs - FACs Clearance of fires - FO control option (digital/voice) FISTV - Employment option - Movement plan Location - FSO - FISTV - Actions upon FSO loss Call signs Frequencies

FPF PLANNING

MORTARS				
SIZE (mm)	**TYPE**	**NUMBER OF MORTARS/GUNS**	**APPROXIMATE WIDTH (M)**	**APPROXIMATE DEPTH (M)**
120	M285	6 Platoon	350	60
120	M285	3 Section	180	60
81	M29A1	4 Platoon	140	40
81	M29A1	3 Section	100	40
81	M252	4 Platoon	150	50
60	M224	2 Section	60	30
ARTILLERY				
155	Howitzer	3 Guns	150	50
155	Howitzer	6 Guns	300	50
105	Howitzer	3 Guns	105	35
105	Howitzer	6 Guns	210	35

TARGETS

TYPE	DESCRIPTION	ILLUSTRATION
Linear	More than 200 but less than 600 meters. Designated by two grids or center grid and length on the TGT list.	KL2312
Rectangular	Wider and longer than 200 meters. Designated by four grids on the TGT list.	KL2313
Circular	Designated by center grid and radius on the TGT list	KL2314
Final Protective Fire (FPF)	Symbol includes FPF unit to fire	KL2315 FPF C/1-9 FA
Target Reference Point	Used for standard TGTs or direct fire TRPs	TRP KL2319

MOVING TARGETS

TRIGGER POINT CALCULATION MATRIX										
Km/hr →	5	10	15	20	25	30	35	40	45	50
m/min →	83	167	250	333	417	500	583	667	750	833
m/sec →	1.4	2.8	4.2	5.5	7	8.3	9.7	11.1	12.5	13.9

TRIGGER POINT PLANNING	
In choosing a trigger point, the observer must consider the intended path of the target, target speed, time of flight, and CFF transmission time. In a Copperhead mission, also consider the size and shape of the footprint.	
1.	Determine the distance from the planned target location or intercept point to the trigger point. This is done by adding the transmission time to the time of flight and multiplying this sum by the speed of the target. EXAMPLE: TOF = 20 sec, tgt speed = 5m/sec DISTANCE TO TRIGGER POINT = (transmission time + TOF) X (tgt speed), or in numbers (5 sec + 20 sec) X 5 m/sec = 125m
2.	The trigger point is then plotted by measuring the distance determined above from the planned target location or intercept point along the expected path toward the moving target.
If the target passes the trigger point before the battery reports READY, make a bold shift to a new target location by using the same trigger point and intercept distances.	

ELEMENTS OF THE CALL FOR FIRE

INITIAL CALL FOR FIRE		
	ELEMENT	**EXAMPLE**
1	Observer ID	Battleking November this is China Bravo
	Warning Order - Method of fire - Size of element to fire - Method of TGT location	 Adjust fire Battalion Polar
2	Target Location - Grid - Shift from known point - Polar	 Grid 123456 Direction 1230, L100, +300, U40 Direction 5670, Distance 1800, U50
3	Target Description	2 BMPs
	Method of engagement - Type of adjustment - Danger close - Mark - Trajectory - Ammunition = Projectile = Fuze = Volume - Distribution = Sheaf	 Destruction Danger close Mark High angle ICM (omit for HE) Time (omit for quick) 3 rounds Converged
	Method of fire and control - Method of fire - Method of control	 Platoon right AMC

SUBSEQUENT CORRECTIONS	
1. OT direction	9. Deviation correction
2. Danger close	10. Range correction
3. Trajectory	11. Height of burst correction
4. Method of fire	12. Target description
5. Distribution	13. Mission type and/or method of control
6. Projectile	14. Splash
7. Fuze	15. Repeat
8. Volume	

CALL FOR FIRE FORMAT

FIRE MISSION (GRID)	
1	"___ this is ___, Adjust Fire *or* Fire For Effect, over."
2	Grid _____ over.
3	(Target description) "_____ (Method of engagement: destruction; danger close; mark; projo+fuze; number of rounds) _____ (Method of fire and control: Plt right *or* left; AMC; cannot observe; TOT minutes from...now over *or* TOT (*desired time)* over; continuous illum; coordinated illum) _____ over"
4	"Direction _____over"
FIRE MISSION (POLAR)	
1	"___ this is ___ , AF/FFE polar *or* laser polar, over"
2	"Direction_____, distance _____, up *or* down___, vertical angle +/-_____ (if required) over.
3	(Tgt description)"_____, (method of engagement)_____, (method of fire and control)_____over"
FIRE MISSION (SHIFT FROM A KNOWN POINT)	
1	"____ this is ____ AF/FFE shift known point ___ over" (Laser data sent to the nearest 1 mil and 10 meters)
2	"Direction (OT)_____, right *or* left (known point's shift factor X angle in mils to the OT line)_____, add *or* drop (nearest 100m)_____, up *or* down (only if vertical distance between known point and tgt is >30m, to the nearest 5m) over"
3	(Tgt description)" _____ (method of engagement) _____ (method of fire and control) _____ over"

REGISTRATIONS

PRECISION REGISTRATION (IMPACT, MORTAR, TIME, ABBREVIATED)	
ON KNOWN POINT	**POINT SELECTED BY OBSERVER**
FDC: H18 de H44, Register on KP1, Q & Ti, k FO: DIR 6400, k FDC: SHOT, k	FDC: H18 de H44 select RP vic grid NK6138, Q & Ti, k FO: GRID NK612345678, DIR 6310, k FDC: SHOT, k

Objective: Get spottings of four rounds (two overs and two shorts) along the OT line from rounds fired with the same data or data 25 meters apart (50 meters apart when PE_R is greater than 25 meters). A target hit or a round spotted as range correct provides spottings of both over and short.

IMPACT REG	FDC or FO initiates mission as shown above. FO spots rounds for deviation to the nearest 1 mil and brings the rounds onto the OT line before splitting the 200m bracket. Once the rounds are on the OT line, the FO measures and records deviations but does not make corrections. If a doubtful about a range spotting, correct for deviation only. **If a deviation correction is made after a 200m bracket is established, the last round fired and all previous rounds cannot be considered as usable rounds for determining range and deviation refinement data.** When 50m bracket is established, 2 rounds are fired with data 25m in the direction opposite that of the last range spotting. Example: FO spots last round as on line and 20m short. He calls: "2 rds, add 25, k". These rounds are spotted on line and 10m over. He calls: "1 rd, drop 25, k". When the requirement of 2 overs and 2 shorts with same data or data fired 25m apart has been met, the impact registration is ended with refinement to deviation and /or range to the nearest 10m. To determine refinement data for range, observe where the last round(s) landed in relation to the reg pt. If the last round(s) landed nearer the reg pt than the previous rds, then **no range refinement is necessary.** If the reg pt is equidistant between the two sets of rds (overs and shorts), then range refinement is **ADD 10** or **DROP 10** from the last data fired. If the reg pt is nearer the pair of rds at the opposite end of the bracket (last rd(s) landed further from the reg pt than the first ones) then refinement is **ADD 20** or **DROP 20.** Deviation refinement is a math problem. Make sure you record the deviation spottings of the over and short rds, which may be 2, 3, or 4 spottings. This total is then divided by the number of rds (2, 3, or 4) you used to get the "2 over, 2 short" spottings to get the average deviation, which you then express to the nearest mil. The average deviation multiplied by the OT factor equals the correction, which is expressed to the nearest 10m. End the impact phase of the registration. Example: **LEFT 10, DROP 20, RECORD AS REGISTRATION POINT, k.**
TIME REG **(MORTARS DO NOT CONDUCT TIME REG)**	If a time registration is required after the impact registration is complete, the FO determines and announces refinement data and commands the time registration to be fired; example: **LEFT 10, DROP 20, RECORD AS REGISTRATION POINT, TIME, REPEAT, k.** The objective of the time portion is to correct the mean HOB of 4 rds fired with the same data to 20m above the reg pt. If the 1st round is a graze burst, a correction of **UP 40** is sent. Once a measurable airburst is fired, the FO commands **3 ROUNDS REPEAT k**. When 4 rds have been fired with the same data, the registration is ended with the appropriate correction to achieve a 20m HOB. When 4 airbursts are spotted, the HOB is corrected to 20m. The mean HOB is determined by adding the 4 spottings (in mils), dividing by 4, expressing the product to the nearest mil, and then multiplying by the OT factor. This product is then expressed to the nearest 5m, and the appropriate correction is determined to achieve the 20m HOB. When 3 airbursts and 1 graze burst are spotted, the HOB is correct; **no correction** is sent. With 2 airbursts and 1 graze burst, HOB correction is **UP 10**. With 1 airburst and 2 graze bursts, HOB correction is **UP 20**. If a round bursts extremely high, a DOWN correction may be sent.
ABBREVIATED REGISTRATION	Some situations may prohibit a full-scale precision registration. Although not as accurate, an abbr reg can provide adequate corrections for the effects of nonstandard conditions. The decision to conduct an abbr reg rests with the FDO. Normal adjust fire procedures are followed until a 100m bracket is split. The correction then sent is **ADD** or **DROP 50**. The burst which is a result of this correction is spotted, and corrections for both deviation and range are sent to the FDC in the following format: - For an impact only reg: **RIGHT 30, ADD 10, RECORD AS REG PT, EOM, k.** - For an impact and time reg: **RIGHT 30, ADD 10, REC AS REG PT, TIME, RPT, k.** Normal adjust fire, time adjustment procedures are followed in the time portion: - An airburst is obtained and then corrected to a 20m HOB. - Instead of firing additional rounds, refinement is sent to the FDC: **UP 10, REC AS TIME REG PT, EOM, k**,

REFINEMENTS

Range:	Deviation:	HOB:
Last Rd Closer to KP - NONE Last Rd Equidistant to KP - -10 Last Rd Farther from KP - -20	Add all deviation spottings Divide by number of rds used Express to nearest 1 mil, X OT Factor = Correction to nearest 10 mils	4 Air Burst: Correct to 20 m 3 Air Burst: HOB correct 2 Air Burst: UP 10 1 Air Burst: UP 20

HB / MPI REGISTRATION

1. Always report direction
2. May report VA
3. Requires 2 surveyed OP's
4. All 6 rounds fired with the same data

LASER REGISTRATION

1. Lase the target
2. Lase the burst

MORTAR REGISTRATION

Observer needs to know how many pieces are firing and which piece is base piece.
1. Adjust until observer breaks a 100 meter bracket
2. Range corrections to nearest 25 meters.

Example: *if observer selects registration point*
China Thunder this is China Bravo prepare to register, registration point 01, grid 12345678, over
Direction 1234, over
Shot, out
Splash, out
Adjust round onto OT line and get one round over and one round short. Send refinement.
Left 10, Drop 10, Record as Registration Point 01, over
Prepare to adjust the sheaf, section left, over
Shot, out
Splash, out
Adjust guns 6,5,4,2,&1 if 3 is base piece
Gun 6, Left 20, Add 60, over
Gun 5, Left 30, Add 100, over
Gun 4, Left 10, Add 50, over
Gun 2, Left 30, Drop 40, over
Gun 1, Right 60, Drop 100, over
Guns are fired and adjusted
Gun 6, shot out
Left 20, Add 20, Gun 6 is adjusted repeat 5, over
Keep adjusting tubes until all tubes are hitting a correct sheaf
Final transmission:
Gun 1 is adjusted, the sheaf is adjusted, over

NAVAL SURFACE FIRE SUPPORT

CHARACTERISTICS				
WEAPON/ CALIBER	**MIN/MAX RANGE**	**MAX EFF RANGE**	**MAX REDUCE CHARGE RNG**	**BURSTING DIAMETER**
5"/38	910/15,700		8,000	40m
5"/54	910/22,999		12,000	40m
16"/50	910/35,909		23,000	200m

FIRE SUPPORT ORGANIZATION		
UNIT	**TASK**	**COMPOSITION**
Division ANGLICO	Division support	3 BDE ANGLICO PLT's
Brigade air and naval gunfire liaison platoon	BDE level plan, request, coordinate, control NGF and Naval Air	1 BDE support team, 2 Supporting Arms Liaison Teams
SALT	Maneuver Bn Support, advise FSCOORD on NGF	2 officers, 6 enlisted Marines
FCT	Maneuver Co. request, observe, adjust NGF	3 enlisted Marines

NAVAL GUNFIRE CALL FOR FIRE

Sent in two transmissions of six elements: (1) Spotter ID, warning order and target number.
(2) Target location, target description, method
of engagement, and method of fire and
control.
This is followed by the Prefiring Report from the ship, which includes the gun-target line direction, line of fire (for illumination rounds), summit, first salvo aiming point, any changes to the observer's request, ready and time of flight.

Spotter ID: Who is calling. Call signs are omitted after first transmission.

Warning Order: Tells ship that a CFF is being transmitted. For NGF, say FIRE MISSION.

Target Number: Used to track a mission; the FIST uses the next tgt no. from their assigned block and gives it to the ship.

Target Location: Same as for artillery. Grid, Polar, or Shift from Known Point.

Target Description: Type of tgt, activity, size, and degree of protection.

Method of Engagement: (a) DANGER CLOSE followed by a cardinal direction and distance from the tgt to the nearest friendly position. (b) Trajectory. Can be changed to high angle by announcing REDUCED CHARGE. (c) Ammunition. HE/Q is standard, observer must specify if he desires different. (d) Armament. Observer must specify MAIN or SECONDARY armament if ship has more than one caliber gun. (e) Number of Guns. No. guns in effect; one is standard. (f) Number of Salvos. Sent when entering FFE, it is the number of rounds to be fired by each gun. (g) Special Instructions. INTERVAL (seconds) causes FFE rounds to be fired with specified time interval between salvos. SUSTAINED FIRE causes FFE to be spread over a specified period of time. TIME ON TARGET causes initial FFE to impact at a specified time. COORDINATED ILLUMINATION causes the illuminating rounds to illuminate the tgt only at the time required for spotting and adjusting the HE fires. CONTINUOUS ILLUMINATION will give the observer constant light on the tgt, for a specified period of time if desired.

Method of Fire and Control: (a) SPOTTER ADJUST; is standard but can be reverted to any time during a mission. (b) SHIP ADJUST is used when the observer believes the ship has a better view of the tgt than he does. (c) FIRE FOR EFFECT is announced when the observer believes the salvo will have effect on the tgt; is preceded by number of salvos (and guns if different from number used in adjustment). (d) CANNOT OBSERVE is used when neither ship nor observer can see the tgt. (e) AT MY COMMAND is announced by the observer when he desires to control the firing of each round.

EXAMPLE	
OBSERVER	SHIP
A1T this is China B, Fire Mission, Target KL3215, over.	China B this is A1T, Fire Mission, Target KL3215, out.
Grid MR123456, Altitude 020, Direction 0250, 4 tanks refueling in open, Reduced Charge, Shell WP in effect, At My Command, over.	Grid MR123456, Altitude 020, Direction 0250, 4 tanks refueling in open, Reduced Charge, Cannot comply with Shell WP, HE in effect, At My Command, out.
	GT line 6200, Ready 20, over.
GT line 6200, Ready 20, Break...Fire, over.	Fire, out. Shot, over.
Shot, out.	Splash, over.
Splash, out.	
Right 200, Add 200, 2 guns, 5 salvos, Interval 10, Cancel At My Command, Fire For Effect, over.	Right 200, Add 200, 2 guns, 5 salvos, Interval 10, Cancel At My Command, Fire For Effect, out.
	Shot, over.
Shot, out.	Splash, over.
Splash, out.	Rounds complete, over
Rounds Complete, out.	
End of Mission, 1 Fuel truck and 4 tanks burning, over.	End of Mission, 1 Fuel truck and 4 tanks burning, out.

DANGER CLOSE DISTANCES FOR NAVAL GUNFIRE		
CALIBER OF GUN	**ORDNANCE**	**DANGER CLOSE DISTANCE**
Less than 6-inch	All	750 meters
6-inch or larger (including 16-inch)	HE/Q or time	1,000 meters
16-inch	ICM or HE/CVT (controlled variable time)	2,000 meters

CLOSE AIR SUPPORT

FORMAT

a. OBSERVER IDENTIFICATION: Use call signs from SOI.
b. WARNING ORDER/type of mission: "Close Air Support"
c. TARGET LOCATION/grid: Two character, six-digit grid.
d. TARGET DESCRIPTION: The number and type, concealment, and movement direction of tgts.
e. RESULTS DESIRED (METHOD OF ENGAGEMENT): One of the three types of damage criteria- Destroy, Neutralize, or Harass.
f. TIME ON TARGET (METHOD OF FIRE AND CONTROL): Specified as "ASAP", NET/NLT a specified time, or as a time block. Indicate time as LOCAL or ZULU!
g. REMARKS: Include any enemy ADA weapons system by number/type and location.

MARKING METHODS

White Phosphorus - Very good marker, timing of round is critical. Bracket the target with two rounds if possible.
Laser - Laser-tgt line should be within 30 degrees of aircraft attack heading when using Laser Guided Bombs, but aircraft should not fly directly over the designator.
Terminology-
a. "10 seconds" - The pilot will want the laser on in about 10 seconds.
b. "Laser on" - Designate the tgt immediately.
c. "Spot" - The pilot has acquired the laser spot.
d. "Terminate" - Turn the laser designator off.
e. "Shift" - Continue to lase while moving the spot from an offset point to the target.
f. Turn the laser off when: "TERMINATE" is broadcast; when the weapon hits the target after 20 seconds.
Illumination rounds - On the ground, excellent for day or night. At night, bracket the tgt with 2 illum rounds.
Beacons - Provide accurate ground reference point for all-weather bombing by specially equipped aircraft.
Visual references - Transmit a verbal target description by reference to distinctive ground features near the target.

CAS CALL-FOR-FIRE

1. IDENTIFICATION: " (BN FSO) this is (CO FSO) "
2. WARNING ORDER: "Close air support"
3. TARGET LOCATION: " (2 letter, 6 digit grid) "
4. TARGET DESCRIPTION: "(What it is and what it is doing)"
5. RESULTS DESIRED: "(destroy, neutralize, or harass)"
6. DESIRED TOT: "(ASAP, NET, NLT, etc.)"
7. REMARKS: "(enemy ADA situation)"

PREPARING THE J-FIRE "9-LINE" CAS BRIEFING

Line 1 - IP; can be given as a pre-designated code, a common geographical name, 6 digit grids, or Lat/Long,
Line 2 - Heading (from IP to target); must be in degrees magnetic. May be offset.
Line 3 - Distance (from IP to target); must be in nautical miles to the nearest tenth (km X .54).
Line 4 - Target elevation; in feet above mean sea level (feet = meters X 3.3)
Line 5 - Target description; what the target is, movement, general target position relative to significant terrain features.
Line 6 - Target location; 6 digit grid, lat/long, or detailed visual description.
Line 7 - Type mark; WP, illum, laser, beacon. For laser or beacon, include code. If laser, include laser to tgt line in degrees magnetic.
Line 8 - Location of friendlies; relative to tgt in meters and cardinal direction (do not give grids).
Line 9 - Egress; safest cardinal direction for fighters to depart the target area.
REMARKS -
1. Threats: type, distance & cardinal direction from tgt.
2. Hazards: weather, high terrain, power lines, etc.
3. Restrictions: assume "none". If aircraft will be flying above friendly artillery fire, establish a minimum altitude for CAS operations (1000ft higher than the max ord anticipated).
4. Abort Code (verification): Obtained from fighter aircraft as part of line-up information.
5. Attack Clearance: Establish a TOT, a time-to-target (TTT), or advise fighters "cleared to depart IP. Call departing."

J-FIRE "9-LINE" CAS BRIEFING, CO FSO TO PILOT

"ARE YOU READY FOR THE 9-LINE?" (wait for reply)
1. INITIAL POINT (IP): "(code, name, grid or lat/long)"
2. HEADING: "(IP to TGT, magnetic)" "OFFSET (left or right)"
3. DISTANCE: "(IP to TGT, nautical miles)"
4. TARGET ELEVATION: "(in feet above MSL)"
5. TARGET DESCRIPTION: "(what it is, relative position, movement)"
6. TARGET LOCATION: "(grid, lat/long, visual description)"
7. TYPE MARK: "(WP, laser, beacon), CODE_____, LASER-TGT LINE ___DEGREES"
8. LOCATION OF FRIENDLIES: "(Distance & direction from target, no grids)"
9. EGRESS: "EGRESS (cardinal direction or "TO IP")"
REMARKS: " (Threats, hazards, restrictions, abort code, attack clearance)"
"HOW COPY?" (wait for reply)

COPPERHEAD

COPPERHEAD (M712)			
PLANNED TARGET		**TARGET OF OPPORTUNITY**	
CFF Battleking N de China B Fire TGT AB3025, k 4 Tanks, 4 Rounds BRAMC, k	MTO 1/A, 4 rd, BRAMC Confirm G/VLLD Code 241, k TOF 25, k *Angle T announced if over 800*	CFF Battleking N de China B, FFE, Polar, k DIR 1835, DIS 3450, VA +5, k 4 Tanks, CPH, 4 Rounds, BRAMC, k	MTO 1/A,4 rd, BRAMC Confirm G/VLLD Code 241, k TOF 25, TGT KL2306, k

SNO-CONE OPERATIONS	
OT DISTANCE GREATER THAN 5K	**OT DISTANCE LESS THAN 5K**
1. PLACE TEMPLATE OVER OP. ROTATE UNTIL DELIVERY UNIT IS UNDER CENTER RANGE LINE. 2. READ DISTANCE FROM OBSERVER TO FA UNIT. THIS BECOMES ENTRY DISTANCE. 3. MARK ENTRY DISTANCE AT APPRO-PRIATE POINT ON EACH SIDE OF 5K SEMI-CIRCLE. TRACE ARC. 4. SELECT MIDDLE ARC THAT IS NEXT LOWEST TO ENTRY DISTANCE. POSITION SO ENDS OF ARC ARE ON END OF 5K ARC AND OP LOCATION. TRACE SELECTED ARC. 5. TRACE 3K ARC.	1. DRAW 5K AND 3K ARCS AROUND OP LOCATION. 2. POSITION TEMPLATE SO ONE SIDE INTERSECTS THE OP AND THE OTHER INTERSECTS THE FA UNIT. DO THIS WITH THE VERTEX AT DIFFERENT POINTS, MARKING THE VERTEX EACH TIME. 3. CONNECT THESE POINTS AND ERASE EXCESS 5K AND 3K ARCS.

TEMPLATE TYPE			
WEAPONS	**CLOUD HEIGHT**	**GT RANGE**	**TEMPLATE**
VISIBILITY 1.0 (MORE THAN 7500 METERS)			
ALL	150M OR LESS	ALL	A
M198, M109A2/A3/A6	MORE THAN 150M	LESS THAN 8.8km	B
		8.8km TO 11km	C
		11km TO 16km	D
M109A1	MORE THAN 150M	LESS THAN 8.8km	B
		8.8km TO 11km	J
		11km TO 16km	D
VISIBILITY 0.5 (4000 TO 7499 METERS)			
M198, M109A2/A3/A6	ALL CLOUD HEIGHTS	LESS THAN 8.8km	E
		8.8km TO 11km	F
		11km TO 16km	G
M109A1	MORE THAN 150M	LESS THAN 8.8K	E
		8.8km TO 11km	K
		11km TO 16km	G
VISIBILITY 0.3 (2000 TO 3999 METERS)			
ALL	ALL CLOUD HEIGHTS	LESS THAN 7.7K	H
		MORE THAN 7.7K	I
HIGH ANGLE BALLISTIC			
ALL	ALL CLOUD HEIGHTS	ALL RANGES	L

GENERAL INFORMATION
Must DESIGNATE for the final 13 seconds / Use ICE CREAM CONE in accordance with rules delineated in FM 6-20-40 to determine observer location / Use footprints based on range and cloud height to ensure 80% chance of hitting target/ Max range 16000m

ILLUMINATION

WEAPON	PROJECTILE	HOB (m)	DISTANCE BETWEEN BURSTS (m)	BURN TIME (sec)	ROUNDS / MINUTE	DESCENT RATE (mps)
ARTILLERY						
155mm	M118	750	800	60	2	10
155mm	M485A2	600	1000	120	1	5
155mm	M335	700	500	60	2	10
105mm	M314A2	750	800	60	2	10
105mm	M314A3	750	800	70-75	2	10
MORTARS						
120mm	M91	600	1000	60	16	5
81mm	M301A1	400	500	60	2	6
81mm	M301A2	400	500	60	2	6
81mm	M301A3	600	500	60	2	6
60mm	M721	400	500	25	30	10
60mm	M83A3	400	300	25	30	10

FASCAM

FASCAM	
TYPES	
Remote Anti-Armor Mine System (RAAMS)	9 Anti-armor Mines / Long Duration-48 hrs (M718) / Short Duration-4 hrs (M741) / Magnetically Armed / Self Destruct Mode / Anti-disturbance feature
Area Denial Artillery Munition (ADAM)	36 Anti-personnel Mines / Long Duration-48 hrs (M731) / Short Duration-4 hrs (M692) / 7 Trip Wires deploy 20 Feet from the Mine / Ball munition explodes 2-8 feet in the air / 600 1.5 grain fragments / Self Destruct Feature
GENERAL INFORMATION	
Interdiction or Area Denial / Employment as an Obstacle / Employment to Augment an Obstacle / Minefields employed against targets of opportunity / Takes BN 27 minutes to lay 400X400 M high density minefield / Display in green on the map	
FASCAM / OBSTACLE COMPARISON	
Low Density	Disrupting
Medium Density	Fixing
High Density	Blocking
High Density (2XADAM)	Turning

MINEFIELD DENSITIES			
TYPE	LOW	MEDIUM	HIGH
RAAMS	0.001 Mines/ Square M	0.002 Mines/ Square M	0.004 Mines/ Square M
ADAM	0.0005 Mines/ Square M	0.001 Mines/ Square M	0.002 Mines/ Square M
FASCAM PLANNING			
SIZE	HIGH DENSITY	MEDIUM DENSITY	LOW DENSITY
200 X 200 (Lo Angle)	24 RAAMS, 12 ADAM	12 RAAMS, 6 ADAM	6 RAAMS, 3 ADAM
400 X 400 (Hi Angle)	96 RAAMS, 12 ADAM	48 RAAMS, 12 ADAM	24 RAAMS, 3 ADAM

CALL FOR FIRE	
FIRE FOR EFFECT	**ADJUST FIRE**
Z57 de Z42, FFE, k Grid 18045132, k Inf Co. i/o, ADAM, k	Z57 de Z42, AF, k Grid 185367, k 5 T-72 Tanks i/o, RAAMS i/e, k
Do not use if within 700 m	No deviation corrections < 50, range corrections < 100, No HOB corrections = 0 on FFE, 50<HOB<100 on repeat

SMOKE

PLANNING DATA FOR SMOKE (1000m smoke screen)			
SYSTEM	**ROUND**	**TIME TO BUILD (Min)**	**BURNING TIME (Min)**
155mm	WP M110AL HC M116A1	0.5 1-1.5	1-1.5 4
155mm	WP M825	0.5	5-10
105mm	WP M84 HC M60	0.5 1-1.5	1-1.5 3
120mm	WP M68 WP M929	0.5	1
60mm 2 Mortars	WP M302A1 WP 722	0.5	1

PLANNED SMOKE (1000m SCREEN)	
2 batteries will build the screen and 1 will sustain.	Build volley: 2 batteries x 6 rds = 12 rds Sustain volley: 1 battery x 6 rds = 6rds Interval between sustain volleys: 5 minutes
EVENT	ARTILLERY RESPONSE
Initial CFF	2 batteries fire 1 round per gun to build.
Adjust the screen	2 batteries adjust tubes and fire 1 rd/gun.
Build screen	1 battery standing by to fire sustaining volley.
Sustain screen	1 battery fires 1 volley; 5 min. interval between volleys.

QUICK SMOKE													
WEAPON/SHELL	DURATION REQUESTED												
155mm / Shell Smoke	4	5	6	7	8	9	10	11	12	13	14	15	
	ROUNDS PER TUBE												
	3	4	6	7	9	10	12	13	15	16	18	19	
155mm/ Shell WP	DURATION REQUESTED												
	2	3	4	5	6	7	8	9	10	11	12	13	14	15
	ROUNDS PER TUBE												
	6	9	12	15	18	21	24	27	30	33	36	39	42	45
105mm / Shell Smoke	DURATION REQUESTED												
	3	4	5	6	7	8	9	10	11	12	13	14	15
	ROUNDS PER TUBE												
	4	7	10	13	16	19	22	25	28	31	34	37	40
105mm / Shell WP	DURATION REQUESTED												
	3	4	5	6	7	8	9	10	11	12	13	14	15
	ROUNDS PER TUBE												
	16	22	28	34	40	46	52	58	64	70	76	82	88

WIND SCALE (1 KNOT = 1.15 MPH)	
KNOTS	**OBSERVATION**
1	Dust rises vertically / No leaf movement.
1-3	Direction of wind slightly shown by smoke, vapor from breath, or dust. Slight intermittent movement of leaves.
4-6*	Wind slightly felt on face. Leaves rustle.
7-10*	Leaves and small twigs in constant motion.
11-16*	Wind raises dust from ground. Loose paper and small branches move.
17-21	Small trees with leaves sway. Coastal wavelets form on inland waters.
22-27	Large branches on trees in motion. Whistle heard in telephone or fence wires.
28-33	Whole trees in motion. Inconvenience walking against wind.

*** Best for production of smoke screens**

HEAVY BATTLEFIELD CALCULUS

120 MM MORTARS

AMMO	MIN RG	MAX RG	ROF
M57	200	7,200	15 rds per min for 1 min, then 4 rds per min, sustained, all types.
M68	200	7,200	
M91	200	7,100	
M993	200	7,200	
M934	200	7,200	

PROPELLANTS

PROP	UBL DESERT/MTN	% DESERT/MTN	RANGE	BN 3 ROUNDS DESERT/MTN
GB M3A1	296/296	5/5	9 km	3
WB M4A2	2152/2152	39/39	14.5 km	30
RB M119A1	2120/2008	38/35	18.1 km	29
RB M203	992/1224	16/22	30.1 km	13

SHIFT TIMES

TGT Of Opportunity	3 Minutes
Priority TGT	3 Minutes

PROJECTILE BASIC LOAD

PROJ	UBL DESERT/MTN	% DSRT/MTN	BN 3 RDS DESERT/MTN	
DPICM	2218/1406	40.01/25.36	41.07/26.04	
RAP	1134/1032	20.45/18.61	21.00/19.11	
HE	756/1,812	13.64/32.68	14.00/33.56	
M825 WP	180/180	3.25/3.25	NA/NA	
DPICM-BB	954/704	17.21/12.70	17.67/13.04	
ILLUM	104	1.88/1.88	NA/NA	
CPHD	90/90	NA/NA	NA/NA	
ADAMS	12/24	0.22/0.43	NA/NA	
RAAMS	96/192	1.73/3.46	NA/NA	

KILLER MISSIONS

1. BN 3 rounds = 54 rounds
2. DPICM: Total # Rounds/54=Killer Missions (DPICM) 54 rounds to kill 1 tank
3. HE: Total # Rounds/54=Killer Missions (HE) 108 rounds to kill 1 tank
4. RAP: Total # Rounds/54=Killer Missions (RAP)

SMOKE M825

Modules of Smoke:
- 2 x BTRY 1 rd M825 at 12 aim points to build
- BTRY 1 rd every 5 minutes to sustain

SMOKE M110

- Time from sunrise to one hour later
- 1000X50X30 Minutes
- 12 rds to build
- 6 rds every 5 minutes after for sustain
- Total of 48 rounds

FASCAM (400X400)

RD	ANGLE	LOW	MED	HIGH
RAAMS	HIGH	24	48	96
RAAMS	LOW	6	12	24
ADAMS	HIGH/LOW	3	6	12

MINUTES OF ILLUMINATION

- 1 Gun Illumination = 1 rd = 1 minute illumination
- # rds in UBL = minutes of Illumination

SMOKE HC

- Time from sunrise to one hour later
- 1000mX50mX30 minutes
- 12 rounds to build
- 6 rounds every 5 minutes to sustain
- Total of 48 rds

NTC ARTILLERY CASUALTY TABLE

HE CASUALTIES FOR 155mm																		
TYPE TGT	**CASUALTY ASSESSMENT**																	
NO. ROUNDS	6	12	18	24	30	36	42	48	54	60	66	72	78	84	90	96	102	108
TROOPS I/O (PLT)	2	4	6	7	8	9	10	11	11	12	12	12	13	13	13	13	13	14
TROOPS I/O (CO)	6	12	18	21	24	27	30	33	33	34	35	36	37	38	39	40	41	42
TRPS DUG-IN NO OVERHEAD (PLT)	-	1	2	3	3	3	4	4	4	4	5	5	5	6	6	6	7	7
TRPS DUG-IN NO OVERHEAD (CO)	1	3	6	7	8	9	10	11	12	13	13	14	15	16	17	18	19	20
TROOPS DUGIN W/ OVERHEAD (PLT)	-	-	-	1	1	1	1	2	2	2	2	2	3	3	3	3	4	4
TROOPS DUG-IN W/OVERHEAD(CO)	-	1	2	3	3	3	4	4	4	5	5	6	6	7	7	8	8	8
WHEELED VEH.	-	1	1	1	1	2	2	2	3	3	3	3	3	4	4	4	5	5
ARTILLERY	-	-	-	-	-	-	-	-	1	1	1	1	1	1	1	1	1	2
APCs	-	-	-	-	-	-	-	-	1	1	1	1	1	1	1	1	1	2
TANKs	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
DPICM CASUALTIES FOR 155mm																		
TROOPS I/O (PLT)	3	6	9	11	12	13	14	14	15	15	15	16	16	16	16	17	17	17
TROOPS I/O (CO)	9	18	27	32	36	39	41	43	45	46	47	48	49	50	51	52	53	54
TRPS DUG-IN NO OVERHEAD (PLT)	1	2	3	4	4	5	5	5	6	6	6	7	7	7	8	8	8	9
TRPS DUG-IN NO OVERHEAD (CO)	3	6	9	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
TROOPS DUGIN W/ OVERHEAD (PLT)	-	-	-	-	-	-	1	1	1	1	2	2	2	2	2	2	3	3
TROOPS DUG-IN W/OVERHEAD(CO)	-	1	1	2	2	2	3	3	4	4	5	5	6	6	6	7	7	7
WHEELED VEH.	1	2	2	2	3	3	3	4	4	4	4	5	5	5	6	6	6	7
ARTILLERY	-	-	1	1	1	1	1	1	2	2	2	2	3	3	3	3	4	4
APCs	-	-	1	1	1	1	1	1	2	2	2	2	3	3	3	3	4	4
TANKs	-	-	-	-	-	-	-	-	1	1	1	1	1	1	1	1	2	2

PLT = 20 personnel, CO = 80 personnel

PROJECTILE / PROPELLANT RANGES

PALADIN HOWITZER PROJECTILE / PROPELLANT MAX RANGES					
PROPELLANT PROJECTILE	M3A1 (5GB)	M4A2 (7WB)	M119A1 (8WB)	M119A2 (7RB)	M203A1/A2 (8RB/8S)
HEA FAMILY HEA HEC HEB HED HEE ILA GSB GSC GSD GSX SMA SMB	9.8 km	14.8 km	18.1 km	18.1 km	SEE BELOW
HEF FAMILY AML AMS APL APS HEF HEL HEM* SAD SMC SMD	9.2 km	14.4 km	17.5 km	17.5 km	27.7 km - HEM 22.0 km - GSC HEL SAD SMC SMD only
HER**	-	19.5 km	PROHIBITED	PROHIBITED	30.1 km
CPH	6.7 km	9.9 km	16.0 km	16.0 km	-

* The only authorized propellant for HEM in the M284 cannon is M203 A1/A2. Plan 5000m safety zone short of the target due to possibility of base burner non-ignition.

** Plan 6000m safety zone short of target due to possibility of rocket motor failure.

RADAR

RULES FOR DEVELOPMENT OF ZONES
1. Maximum of 9 zones may be entered per radar; all one type or any combination. 2. Zone has a minimum of 3 plots and a maximum of 6. 3. Zones cannot intersect or touch each other. 4. No more than 2 zones may be along the same azimuth, excluding a CFZ around the radar location. 5. Grid coordinates must be entered sequentially (i.e., clockwise.) 6. Points of a zone must lie under radar search fence except for a CFZ. 7. An azimuth from the radar should not intersect the same zone more than once. 8. CFZ around radar position must be the last one entered.

FIREFINDER ZONES

ZONE	DESCRIPTION
Critical Friendly Zone (CFZ)	Area that commander deems critical to the mission
Call For Fire Zone (CFFZ)	Enemy territory, Priority 2 CFF around enemy artillery locations
Artillery Target Intelligence Zone (ATIZ)	Commander wishes to monitor closely
Censor Zone (CZ)	Commander wishes to ignore all target detection

EMPLOYMENT CONSIDERATIONS

Mobility / Communications / Concealment / Cover / Routes of Approach / Security / Survey / Slope of Ground / Area in front of Antennae / Electronic line of Sight / Aspect Angle / Track Volume / Radar Capability / Other sets in the Area

SYSTEMS

SYSTEM	RANGE (m)	SECTOR (mils)	EMPLACEMENT TIME (min)	MARCH ORDER TIME (min)	SCREENING CREST (mils)
AN-TPQ 36	750-24,000	230-1600	20	10	15-30
AN-TPQ 37	3000-50,000	300-1600	30	15	5-15

FO/FISTV OPTIONS

CONTROL OPTIONS	
FO Option 1 **Decentralized**	FOs call for fire Least positive control
FO Option 2 **Pre-designated**	Assign each FO a fire support asset and give him that net
FO Option 3 **Centralized**	FO always contacts FIST HQ
FISV EMPLOYMENT OPTIONS	
FSV Option 1	FSO in FSV
FSV Option 2	FSV positioned by terrain FSO in CO's vehicle
FSV Option 3	FSV used as COLT within TF FSO takes 2 radios and FS SPC and operates from CO's vehicle

SELECTION OF OP

MAP RECON
- Prominent Terrain - Prominent Landmarks = Avoid the obvious (churches, bridges) = Use cover and concealment - Tentative Routes = Entry to OP without being seen = Exits from OP - Proposed Position = Ensure visibility of targets = Try to use elevated points: forward or reverse slope
GROUND RECON
- Physically check proposed sites to ensure they provide: = Cover and concealment = Surveillance of entire area = Room for commo equipment (OE-254)

SLOCTOP

PHASE	DESCRIPTION
Security	Ensure FISV is not silhouetted / Ensure communication / RATELO and FSNCO dismount 50-100 meters for security sweep / FSO provide overwatch with M60 / Visual and mounted sweeps are also possible / FSNCO guides FIST-V into optimum overwatch position with the least exposure to the enemy / Only one targeting head should be visible / TC and DRV observe for ground and air threat / may coordinate for dismounts through company.
Location	FSO determine 8 digit map spot / Pass to FSNCO and RATELO / Identify assigned targets and orient the driver / Orient map with OF fan / Terrain sketch / Driver monitor the area / FSNCO update SITMAP.
Communication	Tell CO 'in position' / RTO sends location to BN FSO / RATELO sends location to direct support and the mortars / Move or use OE-154 or AT-984 as necessary / Turn on systems / Monitor QF with 254, CO CMD, FD1 or FD2 and TF Fire Support.
Targeting	Stow M60 / Driver close hatch / Raise head / Move if necessary / Verify map spot with resection / Update location as necessary / DVR observes for ground and air threat.
Observation	Scan area with 3X sight / FSNCO scan with periscope / Verify target location/ Update terrain sketch with 8 digit grids from the G/VLLD.
Position Improvement	Erect OE-254 or AT-984 / Erect camouflage nets / Rotate through positions / Dig two foxholes per track (5-7m in front) at 45 de angle / Machine gun range card / Coordinate engineer support / Survey support / Boresight 2X per day (twilight and dusk) / Defensive plan/ PMCS on all equipment to -10 standard.

FORWARD SLOPE OP

CHARACTERISTICS	
ADVANTAGES	**DISADVANTAGES**
- View of front/flanks better - Fires on crest won't neutralize FIST effectiveness - Hillside provides background	- Day occupation difficult - Commo difficult - No direct fire cover

REVERSE SLOPE OP

CHARACTERISTICS	
ADVANTAGES	**DISADVANTAGES**
- Day occupation easy - Freedom of movement - Commo easy - Protection from direct fire	- Poor field of view - Fire on crest may neutralize effectiveness

READINESS CONDITIONS

CONDITION	DESCRIPTION
REDCON 1	Personnel alert, vehicles loaded, secured, weapons manned, engines running.
REDCON 2	Equipment stowed, vehicles and weapons manned, PCI complete, OPs employed, status reports and green 3 submitted, ready to move in 15 minutes.
REDCON 3	50% of each crew down, ready to move within 30 minutes.
REDCON 4	75% of crew down, OPs manned, ready to move within 1 hour.

INITIALIZING THE TSCD

SYSTEM TURN ON PROCEDURE	
STEP	**DESCRIPTION**
1	Set EQPT BAT and VEH BAT switches to ON, set communication station electrical transient suppressor and targeting station electrical transient suppressor to ON.
2	Set TSCD and TURRET CIRCUIT BRKR switches to ON (base of cupola).
3	
4	Set the NSG switch to ON (pull out then up). Align while in the stowed position. - NSG lamp lit, NSG ALIGN lamp is flashing.
5	Enter EASTING, NORTHING, ALTITUDE. - Enter UTM easting, 6 digits. - Enter UTM northing, 7 digits. - Enter vehicle altitude. - Display should show "KEYBOARD READY", NSG light should not be blinking.
6	Allow up to 10 minutes for NSG to align. - NSG RDY lamp will be lit when it is aligned.
ENTER G/VLLD PRF CODE	
1	Press GLLD CODE.
2	Enter the three-digit code, no zeros or nines.
3	Press ENTER.
CALCULATE TARGET GRID	
1	Lase the target.
2	Press CALC twice.
3	Press ENTER.
NSG REALIGNMENT	
1	NSG ALIGN after 60 min. of operation. - Press VEH GRID to check location accuracy. - If accurate, press NSG ALIGN, then ENTER.
NSG REINITIALIZE	
1	Reinitialize every four hours. Check your location by pressing VEH GRID.
2	Press CLEAR.
3	Press NSG ALIGN twice. - Display should show NSG RE-INIT.
4	Press ENTER. - Display should show KEYBOARD READY.

BORESIGHT USING COLLIMATOR

STEP	DESCRIPTION
1	Open top access door to nightsight and front access door to G/VLLD.
2	Ensure nightsight is on.
3	Remove lens cover from nightsight.
4	Set select switch to night on control handle.
5	Set nightsight switch to on.
6	Pull field of view control out.
7	Check focus in narrow field of view and push handle back in.
8	Install battery on boresight collimator at guide pins, push in to mate with battery connector
9	Pull out G/VLLD cover control. Place locking handles of boresight collimators in up position and position boresight collimator over locating pins and pads on the front of nightsight. Secure collimator to nightsight by pushing in on the locking handles and turning them all the way down.
10	Set sight select switch to 13X. look through sight picture for sight picture.
11	Adjust boresight collimator EL and AZ knobs to bring reticle into alignment with LDR reticle sight picture. If unable to align reticles loosen nightsight latching handle, place course adjustment on nightsight to position 2 and repeat alignment steps.
12	Set sight select switch to night. Look through eyepiece for collimator reticle, adjust to obtain best display of reticle.
13	Unlock EL and AZ knobs on the nightsight.
14	Adjust nightsight AZ and EL boresight adjustment knobs to bring reticles into alignment.
15	Relock AZ and EL knobs on the nightsight. Recheck the sight picture.
16	Set sight select to 13X and recheck LDR for reticle alignment.
17	Hold collimator firmly and unlock securing latches and remove collimator from nightsight. Remove battery and store in case.
18	Close all covers.

BORESIGHT WITH DAP

STEP	DESCRIPTION
1	Erect head and open nightsight door.
2	Remove lens cap from nightsight.
3	Pull out G/VLLD cover.
4	Locate a target at 1500-3000 M with distinct edges.
5	Set sight select 10 3X and locate TGT in eyepiece.
6	Set sight select to 13X and adjust reticle to TGT with control handles. Align reticle to TGT.
7	Set sight select to night.
8	Turn on nightsight.
9	Pull out FOV handle for narrow field of view.
10	Unlock AZ and EL knobs on nightsight.
11	Adjust AZ and EL knobs to bring reticle pattern to the TGT with same view as 13X.
12	Relock AZ and EL knobs on nightsight.
13	Recheck sight pictures.

INITIALIZING THE FED

REFERENCE	ACTION
POWER SWITCH	Turn on, press NEXT to silence alarm.
FED USAGE/MODE MENU	Press ENTER to select device type, select A for FO/FIST, then specify A for FO or FIST.
SET-UP MENU	Press J for FED status and A to enter set-up menu.
TIME SET	Enter current time, press S to start, enter all sub-fields by hitting ENTER.
LOP TEST: 000MIN	Ensure 000 is entered.
OB: 00	Observer number from subscriber table.
LOCAL ADDRESS	Internal address to TF FSE.
ROUTING ADDRESS	Listed in subscriber tables.
LOGC CHAN NUMBER	Only used with EPLRS.
PRINTER	N/A
KBD BELL VOL: 0	Desired volume (0-7).
MSG BELL VOL: 0	Desired volume (0-7).
DSPL DELAY: 0.4	Set to 0.0.
NF TIMER MOD	Time that digital DESIGNATE gets to FED, set to 05 seconds.
GVLLD CODE	G/VLLD code, CLOUD HEIGHT in tens of meters, VISIBILTY in meters.
SETUP MENU	Press PREV to go back to set-up menu.
NET STATUS	Press B to get net status and ENTER to input data.
CONNECTION	Select ENC FSK RADIO, auth codes only required on wire or unencrypted.
BLOCK	Set to A for single block.
PREAMBLE	Enter 1.4
RATE	Press B for 1200 BPS.
DELAY	Set to OFF.
SQUELCH	ON for radio, OFF for wire.
FED STATUS	Press PREV for FED status.
SELF LOCATION	Enter current location.
TGT NUMBER	Press E to enter auto TGT numbers.
MODE MENU	PREV to return to MODE menu.
MEMBER DATA	E to observe member data summary, start entry by pushing address letter.
TYPE	FSE is MVR FSO, FDC is BN FDC.
UNIT	Logical name of subscriber.
LOCATION	Location of subscriber.
DEVICE TYPE	FSE is TF/DMD, BN FDC is TF/BN.
OB NUMBER	If appropriate.
MODE MENU	PREV to return to MODE.
MEMBER MONITOR	F to enable subscribers.
MONITOR PAIR	A to access ADR1 and ADR2, if no specific pair, enter in ADR1 and / to indicate all members.
MESSAGE TYPES	Move cursor to ALL MESSAGES and hit B for NO, fill in choices accordingly.
MEMBER MONITOR	PREV to return to member monitor menu, enter other members.
MODE MENU	PREV to return to mode menu.
LOCAL FILES	G to select local files.
MSG TYPES	Number corresponding to file and C select specific message type.
CREATED FILE	PREV twice to observe file created.
MSN's FROM LOCAL FILES	Transmit from 1 or 2, cannot move missions without MTO with the TGT number.

FED FOCC APPLICATION SOFTWARE TRANSFER

STEP	HOST FED	TARGET FED
1	POWER ON	POWER ON
2	MODE MENU: N	MAIN MENU
3	SETUP	SETUP
4	PERIPHERAL DEVICE INTERFACE	PERIPHERAL DEVICE INTERFACE
5	DATA RATE: 115200, 8 bit no parity	DATA RATE: 115200, 8 bit no parity
6	NO. OF STOP BITS: 2	NO. OF STOP BITS: 2
7	Press F6 to save	Press F6 to save
8	DATE CHANGE, check it, F6 to save	DATE CHANGE, check it, F6 to save
9	TIME CHANGE, check	TIME CHANGE, check
10	DISK VOLUME: 010x64 KBYTES	DISK VOLUME: 010x64 KBYTES
11	MAIN MENU: SETUP	MAIN MENU: SETUP
12	PROTECTED VDISK VOLUME: 012x64 KBYTES, F6	PROTECTED VDISK VOLUME: 012x64 KBYTES, F6
13	MAIN MENU: UPLOAD/DOWNLOAD UTILITY: **SEND FILE**	MAIN MENU: UPLOAD/DOWNLOAD UTILITY: **GET FILE**
14	C:/HTUAPP	C:/HTUAPP
15	FOCC.EXE	FOCC.EXE
16	F6	F6
17	**SEND FILES LIST**	**GET FILE**
18	**C:/**	Arrow up: **C:/**
19	FOCC.TLF	FOCC.TLF
20	F6	F6
21	Hit any key	ENTER
22	MAIN MENU: APPLICATIONS	Power off
23	ENTER: ENTER	Power on

ARMORED FIGHTING VEHICLES AND PERSONNEL CARRIERS

VEHICLE	WEAPONS	MAX/MAX EFF WPN RANGE (m)	VEHICLE MAX SPEED (km/h)	CREW/PAX
SOVIET				
BRDM-2 (wheeled)	14.5mm coaxial MG 7.62mm coaxial MG	7000/2000 4000/1000	100	4/NA
BTR-60/70/80 (wheeled)	14.5mm coaxial MG 7.62mm coaxial MG	7000/2000 4000/1000	80	3/8
BMP-1	73mm smoothbore gun 7.62mm coaxial MG AT-5	2200/1000 4000/1000 6000/5000	65	3/8
BMP-2	30mm auto cannon 7.62mm coaxial MG AT-5	4000/2000 4000/1000 6000/5000	65	
MT-LB	7.62mm MG M2	4000/1000	60	3/10
AMERICAN				
M2 IFV	TOW -2B min rg 200m 25mm automatic gun 7.62mm coaxial MG M240C	3750/3750 AP: 17,000/ 1800 HE: 3000/3000 3725/900	66	3/6
M3 CFV	TOW -2B min rg 200m 25mm automatic gun 7.62mm coaxial MG M240C	3750/3750 AP: 17,000/ 1800 HE: 3000/3000 3725/900	66	3/2
M113 APC	.50 cal MG M2	/1800	64	2/8

LASERS

SYSTEMS	
SYSTEM	**CAPABILITIES**
AN/GVS 5	One per FO team / Rangefinder to 9990m
MELIOS AN/PVS-6	One per FO team / Rangefinder to 9990m
G/VLLD AN/TVQ-2	Direction (1mil) / Distance (10m) out to 9990m / VA (1mil) / Designates 3000m for moving tgts, 5000m for stationary tgts / Range 1 - Soft tgts / Range 2 - Hard tgts
MULE AN/PAQ-3	Designates 3.5 km for stationary tgts, 2 km for moving tgts

SAFETY		
NOHD - Nominal Ocular Hazard Distance		
SYSTEM	**NON MAGNIFIED NOHD**	**MAGNIFIED NOHD**
AN/CVS 5	1100m	8500m
AN/TVQ-2 (Designator) AN/TVQ-2 (Rangefinder)	25,000m 8000m	80,000m 40,000m
AN/PAQ-3 (Designator) AN/PAQ-3 (Rangefinder)	20,000m 6500m	79,000m 35,000m

ATTACK AIRCRAFT

TYPE	ARMAMENT	COMBAT RG (km)	MAX SPEED
SOVIET			
MiG-17 FRESCO	Various	500-700	1.1 mach
MiG-19 Farmer	Various	2855	1.4 mach
Mig-21 Fishbed	23/30mm Cannon Bombs/Rockets	465-925	2.2 mach
Mig-23 Flogger	23/30mm Cannon Bombs/Rockets	1300	
MiG-27 Flogger	23/30mm Cannon Bombs/Rockets	1200	1.8 mach
Su-7B	Two 30mm Cannon Bombs/Rockets	320-485	1.9 mach
Su-17 Fitter	Two 30mm Cannon Bombs/Rockets	360-700	2.2 mach
Su-24 Fencer	23mm Gatling gun, Bombs/Rockets	400-1800	2.3 mach
Su-25 Frogfoot	30mm Cannon Bombs/Rockets	556	0.8 mach
OTHER			
Mirage F1 (FR)	30mm Cannon Bombs/Rockets	425-600	
AMERICAN			
A-10 Warthog	30mm Gun 2-8 Guided Missile 2 Heat Seekers	800 miles	420 mph (0.56 mach)
F-16	30mm Gun 2-6 Guided Missiles Heat Seekers	200+ miles	Mach 2.0
F-15E	8-12 Guided Missiles 20mm Gun 4 Heat Seekers 4 Radar Missiles	3,450 miles	Mach 2.5+
F-117	2, 2000 lb laser guided bombs	Unlimited with air refueling	Mach 0.9
E-3 Sentry (AWACS)	None	NA	460 knots
B-52	51, 750 lb bombs 12 Cruise missiles 8 Harpoon missiles	Unlimited with air refuel	650 mph
B-1	30 CBU-87/89/97 bomb 8 Cruise missiles 84, 500 lb bombs	Intercontinental	900+ mph
B-2	Conventional and nuclear	Intercontinental	High Subsonic
AC-130H	2-20mm Cannons 1-40mm Cannon 1-105mm Howitzer	Unlimited with air refuel	300 mph

WEAPON SYSTEMS	
TARGET	**WEAPONS**
Armor	MK-87, AGM-65, CBU-87, CBU-89, 30mm
Soft Targets	GP Bombs, CBU-52/58/71, CBU-87, Guns
Point Targets	CBU-15/AGM-130, LGB's, AGM-65, Guns
Hardened Targets	AGM-65, LGB's, GP Bombs w/steel noses, BLU-109
SAM and AAA Sights	CBU, LGB's, GP Bombs, AGM-65, AGM-88

ATTACK HELICOPTERS

SOVIET				
TYPE	**ARMAMENT**	**CRUISE SPEED (KPH)**	**COMBAT RADIUS (KM)**	**CREW/PAX**
Mi-2 Hoplite	23mm Cannon 7.62/12.7 MG Rockets AT-3	190	170	1/6-8
Mi-8 Hip	23mm Cannon 12.7 MG Rockets AT-2/3	225	200	2-3/24
Mi-24 Hind	30mm Cannon 12.7 MG Rockets AT-2/6	310	160	3/8-10
Mi-28 Havoc	30mm Cannon Rockets AT-2/6	280	240	2/0
Ka-36 Hokum	23/30mm Gun AAM	350	250	2/0

OTHER	
TYPE	**ARMAMENT**
BO-105 (FR/GE)	7.62 MG / Rockets / ATGM / HOT
Gazelle (FR)	20mm Gun / 7.62 MG / ATGM / HOT
Alouette (FR)	20mm Gun / 7.62 MG / ATGM / HOT

AMERICAN				
TYPE	**CRUISE SPEED (MPH)**	**ARMAMENT**	**MAX EFF RANGE (m)**	**MAX LOAD**
AH-1 Cobra	141	2.75" FFAR 7.62mm MG 40mm Grenade 20mm Cannon TOW	9300 1100 2000 1500 3750	76 4000 300 750 8
AH-64 Apache	182	2.75" FFAR 30mm Cannon (AP/HE) Hellfire	9300 2500 5500	76 1200 16
OH-58D Kiowa Warrior	136	ATAS Hellfire 0.50 cal MG 70 mm Rocket	4000 5500 1000 9300	4 4 500 14

UTILITY HELICOPTERS

HELICOPTER	SPEED	CAPACITY	RANGE
UH-1 Huey	Cruise 90 Knots Maximum 124 Knots	8 Personnel 2,300 Pounds	2 Hours 20 Minutes
UH-60 Blackhawk	Cruise 120 Knots Maximum 193 Knots	11 With Seats 21 Without Seats 8,000 Pounds	2 Hours 20 Minutes
CH-47 Chinook	Cruise 100 Knots Maximum 170 Knots	33 Personnel 24 Litter Capacity 26,000 Pounds	2 Hours 30 Minutes

AIR DEFENSE

AIR DEFENSE WARNINGS				
STATUS	**DESCRIPTION**			
Red	Hostile aircraft or missiles imminent or in progress			
Yellow	Hostile aircraft or missiles probable			
White	Hostile aircraft or missiles improbable			
WEAPON CONTROL STATUS				
STATUS	**DESCRIPTION**			
Weapons Free	Fire at aircraft not identified as friendly			
Weapons Tight	Fire at aircraft identified as hostile			
Weapons Hold	Do not fire unless in self defense			
ANTI-AIRCRAFT GUNS				
SOVIET				
TYPE	**CALIBER (mm)**	**TUBES**	**MAX EFF RG (m)**	**MOBILITY**
S-60	57	1	6000	Towed
ZSU-23-4	23	4	2500	SP
2S6	30	2	4000	SP
M1939	85	1	3000	Towed
ZU-23	23	2	2500	Towed
M-53/59	30	2	3500	Truck
ZSU-57-2	57	2	6000	SP
SA-7	NA	NA	5500	Manpack BTR/BMP
SA-14/16	NA	NA	6000	Manpack BTR/BMP
AMERICAN				
AVENGER	M2 MG + 4 STINGERS		1800m (MG) 5000+	HMMWV
STINGER	NA	1	5000+	Manpack, vehicle
MISSILE SYSTEMS				
SOVIET				
TYPE	**NAME**	**PODS X SAMS**	**MAX EFF RG (m)**	**MOBILITY**
SA-6	Gainful	3 X 1	24,000	SP
SA-8	Gecko	2 X 2	12,000	3X3 Wheeled
SA-9	Gasky	2 X 2	6000	BRDM
SA-11	Gadfly	4 X 1	30,000	SP
SA-13	Gopher	2 X 2	6000	SP
AMERICAN				
TYPE	**NAME**	**CALIBER**	**WARHEAD**	**MOBILITY**
MIM 704	Patriot	410mm	HE Shaped	Vehicle

CAVALRY

MISSION	DESCRIPTION
RECONNAISSANCE	
Route Reconnaissance	Specific route and all adjacent terrain.
Zone Reconnaissance	Dominant terrain within specific boundaries.
Area Reconnaissance	Commander needs information about specific area.
SECURITY	
Screening Force	Provide surveillance and early warning to main body.
Guard Force	Prevent enemy ground observation.
Covering Force	Accomplishes the tasks of screening and guard forces.
OTHER	
Attack	Offensive action by violent assault or fires.
Defend	Destroy enemy force or force him to withdraw.
Delay	Trade space for time without losing freedom to maneuver.

ENGINEERS

PRIMARY MISSIONS	
Mobility	**Breaching, improving routes, crossing water obstacles.**
Countermobility	**Impedes movement of enemy forces (obstacles).**
Survivability	**Constructing fighting positions.**
General Engineering	**Repair and maintain communication and logistical lines.**
Topographic Engineering	**Support in area of terrain analysis.**

TYPES OF OBSTACLES	
TYPE	**DESCRIPTION**
Turning	Deflect a threat formation; allows engagement of enemy flank.
Blocking	Limit penetration, obstacles in depth, minefields.
Fixing	Slow down and disrupt the enemy; sited at optimum ranges.
Disrupting	Disrupt the enemy timetable, depth, not necessarily in range of direct fire.

ENGINEERING EQUIPMENT	
AVLB	**Armored vehicle launched bridge - 2 in PLT, MLC 60, 17 M Gap / MLC 70, 15 M Gap**
MICLIC	**Mine clearing line charges- Close in mine clearing, provides lane 8 M wide by 100 M long, 5 lb. of C4 per foot.**
ACE	**M9 armored combat earthmover- 30 mph on road, swim 3 mph**
SEE	**Small emplacement excavator- All wheel drive vehicle capable of rapidly digging combat positions; travels 40 mph on road.**

GENERAL INFORMATION
1. Natural and reinforcing obstacles 2. Obstacles support commander's plan, integrate with observed fires, integrated with existing obstacles, deployed in depth, employed for surprise.

THREAT DEFENSIVE DOCTRINE

GLOBAL THREAT		
TYPES	**CONDUCT**	**BATTLEFIELD ORGANIZATION**
Prepared Defense - Minefields - Strongpoints **Hasty Defense** - Predominantly **Direct Fire**	Recon Patrols Counterprep Fire Canalize Enemy Fixed Wing Battlefield Interdiction 1st Echelon Engages 2nd Echelon or AT Counterattack	Enemy Security Echelon (20-30 km) Main Defensive Area (15-20 km) Fire Sacks (Engagement Area) Minefields and Obstacles Reserves
REGIONAL THREAT		
PRINCIPLES	**MIDDLE EAST**	**NORTH KOREA**
Defeat or Repulse Attack Hold Important Terrain Defense in Depth Transition to Offense	Types - Deliberate - Mobile - Hasty - Withdrawal	Types - Position - Moving
UNIT SIZE	**FRONTAGE (KM)**	**DEPTH (KM)**
MRD	20-30	15-20
MRR	10-15	7-10
MRB	3-5	Up to 2
MRC	0.5-1	Up to 0.5
MRP	0.8	N/A

THREAT OFFENSIVE DOCTRINE

GLOBAL THREAT		
TYPES	**CONDUCT**	**BATTLEFIELD ORGANIZATION**
Attack against a DEF enemy -MRD -MRR -MRB	 3 MRR in line 1 TR in back 2 MRB on line followed by RAG element, then 1 MRB and MRB follow 1 TK CO in front followed by 3 MR CO on line then Mortar BTRY then ARTY BN	MRD/TD 15-25 KM MRR/TR 3-8 KM MRB/TB 1-2 KM MRC/TC 500-800M MRP/TP 100-200M
REGIONAL THREAT		
PRINCIPLES	**MIDDLE EAST**	**NORTH KOREA**
Intelligence Maneuver Establishment of Reserves Surprise and Momentum Logistics and Admin Concentration Morale Cooperation Objective	Advanced Operations: -Movement to Contact -Pursuit -Meeting Engagement Offensive Operations: -Hasty -Deliberate -Breakthrough	Meeting engagements Attack against prepared defensive positions Attack against hastily occupied defensive positions

THREAT MARCH TIMES

MARCH COLUMN ASSEMBLY TIMES	UNIT	MINUTES
	MRC	5
	MRB	10-15
	Artillery BN	15-20
	Artillery RGT	40-50
	MRR	60-120
AVG. MARCH RATES FOR MIXED COLUMNS	**CONDITION**	**SPEED (KM/HR)**
	Day, On Roads	20-30
	Night, On Roads	15-20
	Cross Country	5-15
UNIT DISPERSION INTERVALS	**UNIT**	**INTERVAL (M)**
	Vehicles in Company	25-50
	Companies in BN	25-50
	Battalions on a Route	3000-5000
	Regiments on a Route	5000-10,000
	RGT Rear Service and Main Force	3000-5000
	DIV Rear Service and Main Force	15,000-20,000
AVERAGE SPEED OF VEHICLES	**CONDITION**	**SPEED (KM/HR)**
	Paved Road	
	- No Damage	40-50
	- 10% Damage	20-35
	- More than 10% Damage	10-20
	Gravel and Rubble	
	- No Damage	40-45
	- 10% Damage	20-30
	- More than 10% Damage	10-20
	Dirt	
	- No Damage	15-25
	- 10% Damage	8-15
	- More than 10% Damage	5-10

OPFOR FORMATION CONFIGURATION

OFFENSE		DEFENSE	
FORMATION	**CONFIGURATION**	**FORMATION**	**CONFIGURATION**
DIV RECON	3T80 - 4BMP - 4BRDM - 1GSR - 6DRT	DIV RECON	3T80 - 4BMP - 4BRDM - 1GSR - 6DRT
REGT RECON	4BMP - 4BRDM - 1GSR - 3CHEM BRDM - 1ENG BRDM	REGT RECON	4BMP - 4BRDM - 1GSR - 3 CHEM BRDM - 1ENG BRDM
CRP	3BMP	CSOP	1-3BMP
FP	1-3BMP - OR 1-3 T80	AMBUSH	1-3BMP OR 2-3T80
FSE 10K BEH CRP	3T80 - 10BMP - 3AT-5 - 6 2S1 - 2ENG BRDM	MRR	68BMP - 20T80 - 242S1 - 6BRDM W/AT-5
AGMB 5-10K BEH FSE	27BMP - 9T80 - 18 2S1 - 3BRDM W/AT-5	CAR	3T80
MRR 20-30K BEH AGMB	68BMP - 20T80 - 18 2S1 - 6BRDM W/AT-5	AT RESERVE	3BRDM W/AT-5 - 2 MT12
CAR	10BMP - 3T80	FWD DET	MRC 10BMP - 3T80/MRB 30BMP - 10T80
AT RESERVE	6-9BRDM W/AT-5 - 4-6MT12	TF ANGEL	100 DISMOUNTS W/3 AT4 AND VIPERS
FWD DET	MRC 10BMP - 3T80/MRB 30BMP - 10T80	PERS CHEM	2X1300M
TF ANGEL	100 DISMOUNTS W/3 AT4 AND VIPERS	HIND'S	2
TF DESTROYER	100 DISMOUNTS W/3 AT4 AND VIPERS	ENG RESERVE	2 113 W/1.5 TON TRAILER
TF RAMPAGE	100 DISMOUNTS W/10BMP		
PERS CHEM	2X1300M		
HINDS	2		
MSD (Movement Support Detachment)	1AVLB - 2ACE - 1CEV - 1MICLIC - 1-2GMZ		
MOD (Mobile Obstacle Detachment)	2 113 W/ 1.5 TON TRAILER		

ENEMY PHASES OF FIRE

OFFENSIVE
PHASE 1 - FIRES TO SUPPORT FORWARD MOVEMENT OF TROOPS Fired by the DAG/AAG (2S1, BM-21), From movement from SP to LD, Lasts for 1 hour, TGTs - Artillery/MLRS/Airstrips/FDC/COLT/Radar/Scouts, AMMO-FASCAM/Chemical (Persistent/Nonpersistent)/MLRS. **Supports maneuver of troops from AA to LD**.
PHASE 2 - PREP FIRES Fired by DAG. Begins when MRR hits the LD, and/or 20-30 min. prior to the 1st MRB making contact with BLUFOR lead company teams. Lasts until the MRR is 1 km from the BLUFOR BP's. TGT- TOCs, scouts, EW assets, FDCs, COLTs, artillery, radar, co-tm hide sites, BPs. Extensive smoke and nonpersistent chem. **Used to suppress and destroy**.
PHASE 3 - FIRE SUPPORT OF THE ATTACK Fired by RAG & DAG in support. Rolling barrage against a defense where individual vehicle positions are not known. Fired when tanks are 100m-200m from lead co-tms. Continues until BLUFOR is overrun. TGTs - tanks and inf, FDCs, artillery, aviation, TOCs. **Used to destroy defending forces**.
PHASE 4 - FIRE ACCOMPANIMENT Fired by RAG & DAG in depth. Deep fires to support MRR through the depth of battlefield. Starts with penetration of BLUFOR BP's. TGTs - reserve, aviation, TOCs, FDCs, ALOs. **Used to exploit successes in the rear area**.
DEFENSIVE
PHASE 1 - COUNTERPREP Fired by DAG to neutralize BLUFOR AAs and Fire Support. Starts prior to BLUFOR prep. TGTs - FDC, COLT, TOC, artillery, radar, scouts, retrans sites. **Used to neutralize BLUFOR combat power prior to attack**.
PHASE 1 - INTERDICTING FIRES Fired by DAG then RAG. Starts when BLUFOR leaves AA, deploys into BN column, continues until BLUFOR LDs. TGTs - formations >20 vehicles, FDC, COLT, TOC, radar, artillery. **Disrupts formations**.
PHASE 2 - FIRES TO REPEL ENEMY ATTACK Fired by DAG, RAG, & mortars. Starts when BLUFOR LDs, ends when OPFOR BP's penetrated. TGTs - main effort, engineers, TACs, artillery, C^2. **Used to destroy attacking forces**.
PHASE 3 - FIRE SUPPORT OF DEFENDING TROOPS Fired by all available assets. FPF and direct artillery fire danger close against penetrating BLUFOR; stops when MRB reserve is committed. **Used to stop penetration of OPFOR BPs**.
PHASE 4 - DESTRUCTION OF BLUFOR DURING COUNTERATTACK Fired by DAG & RAG in direct fire. Starts with counterattack, ends when BPs are recaptured. TGTs - all BLUFOR in range. **Used to support counterattacking forces**.

SINCGARS PROGRAMMING

SINCGAR PROCEDURES				
LOADING SC FREQUENCIES	**OFFSET FREQUENCIES**	**SCAN**	**LOAD COMSEC**	**LOAD HOPSET**
Channel – selected channel Mode – SC FCTN – LD COMSEC – PT Press: FREQ CLEAR Enter Frequency Press: STO	Channel – Offset Channel Mode – SC FCTN – LD COMSEC – PT Press: ERF OFST CHG FREQ or STO	Channel – Cue Mode – FH FCTN – SQ ON COMSEC – PT or CT Press: STO 8 – Scan All 1-7 – Priority Clear: Press Channel Number and CLR Retrieve: Press Channel Number	Channel – MAN Mode – SC FCTN – LD COMSEC – CT Key Handset 2X Connect KYK-13 Turn KYK-13 on Put in Position 1 Press: LOAD H TEK Displayed Press: STO 1-5	Channel – MAN Mode – FH FCTN – LD COMSEC – CT Connect ECCM Turn on ECCM Press: LOAD HF 3—Displayed Press: STO LOAD
RECEIVE ERF	**COPY/MOVE HOPSET**	**CHANGE NET ID**	**SEND ERF**	**PASSIVE ENTRY**
Channel – MAN Mode – FH FCTN – LD COMSEC – CT HF 3—Displayed Press: STO and Channel to Store FCTN – SQ ON CHAN – ERF Channel	Channel – MAN or 1 Mode – FH FCTN – LD COMSEC – CT Press: LOAD HLD- Displayed Press: 1 HF 3—Displayed Press: STO 2	Channel – NET ID Mode – FH/M FCTN – LD COMSEC – CT Press: FREQ CLR F3—Displayed Enter new Net ID Press: STO	Channel – MAN Mode – FH/M FCTN – LD COMSEC – CT Establish Commo Stand by for ERF Press: LOAD Net ID ERF OFST	Channel – MAN Mode – FH/M FCTN – LD COMSEC – CT Push TIME Enter last 2 digits of Julian Date, Enter Hours, Enter Minutes, Press Time at 00 seconds. Press FREQ Press TIME and SYNC

SOI PROCEDURES

TRIAD NUMERAL CIPHER/AUTHENTICATION SYSTEM

1. Cipher Numbers
   a. To determine the Line Indicator, locate the line indicated by the first letter of the Random Set Indicator. Read right on that line and locate the second letter of the Random Set Indicator, identify the letter to the right of that second letter and move to that line. On this new line, read right and locate the third letter of the Random Set Indicator; identify the letter to it's right. This letter is the Line Indicator that identifies the Encipher/Decipher Line, the line used to encipher and decipher text.
   b. On the Encipher Line, read right and find the numbered column that corresponds to the first digit of the number to be enciphered. Substitute ONE of the letters in that column for the plaintext number. Stay on this line and repeat this process for each digit to be enciphered.
   c. When sending enciphered text, say "I SET _ _ _" to indicate that the next three letters will be the Random Set Indicator.
2. Encipher Grid Zone Letters (GZL)
   Using the Encipher Line and the nearest darker printed guide alphabet line located above the plaintext numbers, read right on the Encipher Line until you are in line with the first GZL to the enciphered. Substitute the plaintext GZL letter with the letter located on the Encipher Line.
3. Decipher Numbers
   After receiving the enciphered message, identify the Random Set Indicator. This will be the first three letters of the ciphertext following the words "I SET". Determine the appropriate Decipher line in the same manner as you determine the Encipher Line. Using this line, read right on the line until you locate the first letter of the ciphertext. Determine which number appears at the top of that column. Substitute that column number for the ciphertext letter. This number is the first digit of the plaintext message. Stay on that line and repeat this process for each letter of the ciphertext.
4. Decipher GZL
   Never assume that a GZL has been transmitted! After determining the Decipher Line, read right on that line until you locate the ciphertext letter. Substitute the ciphertext letter with the plaintext letter located directly above it on the darker printed guide alphabet located above the column numbers. Repeat for each GZL.
5. Challenge and Reply authentication & Transmission authentication
   a. Challenge and Reply will be used whenever a nonsecure radio net is opened or when the called party wants to validate the authenticity of the calling station. This prevents an enemy operator from entering a radio net. The called party will always make the first challenge. The party making the call may counter-challenge the called party using a different challenge.
   b. Transmission authentication is used to validate the authenticity of the message when it is impossible or impractical to use Challenge and Reply.
   c. TRIAD Challenge and Reply is either ground-to-ground or ground-to-air. Ground-to-ground: select three letters at random. Ground-to-air: Select three letters, ensuring the first letter is A, B, or C.
   d. TRIAD reply: Using the three letters in the challenge, take the first letter and go to the line indicated by that letter. Move to the right on that line until you reach the second letter of the challenge. Take the letter directly below the second letter of the challenge and go to the line indicated by that letter. Move to the right on that line until you reach the third letter of the challenge. The letter immediately below that third letter of the challenge is the correct reply. Remember: DOWN-RIGHT-DOWN-NEW LINE-RIGHT-DOWN
6. TRIAD Airborne Matrix Challenge and Reply.
   a. Challenge: Ensuring the first letter is A, B, or C, select two additional letters.
   b. Reply: Proceed to the appropriate matrix table indicated by the first letter of the challenge. Take the second letter of the challenge and go to the line indicated by that letter. Move right on that line until you reach the third letter of the challenge. The letter immediately below that letter is the correct reply.
7. Transmission Authentication
   Use the TRANSMISSION AUTHENTICATION TABLE. Authenticators from the columns should be used only once. The SOI assigns each unit a column of the table, for example "column 3". Authenticate by reading off the first unused two-letter code in the column and then cross it off to preclude reuse.

RETRANSMIT OPERATION

RETRANS STATION	
1. Ensure the forward station puts the retrans frequency (RTS in the SOI) on his radio. 2. The Retrans station puts the RTS frequency on the top radio, the net frequency on the bottom radio. 3. Ensure both radios have power amps and OE-254's. COLTs will have non-power amp with the vehicle whip on top radio, power amp and OE-254 on the bottom radio. 4. At the retrans station both radios must be plain text. 5. Hook up the retrans cable to each radio's left side. 6. Switch both radios to the RXMT position.	
PARAMETERS	
SINGLE CHANNEL	**FREQUENCY HOP**
1. OPERATE IN THE GREEN 2. FREQS DO NOT MATTER 3. ANY ANTENNAES	1. RED 2. FREQS MUST BE 10000 APART 3. ANTENNAES AT LEAST 60 FT APART
SINCGAR CONFIGURATION	
89A L/S - 25K AND 15K	92A L/L - 25K AND 25K

REMOTE COMSEC FILL

NCS	MEMBER
1. Tell members to set function to LD and COMSEC to CT, then set COMSEC to CT.	1. Set function to LD and COMSEC to CT.
2. Set function to LD, contact net members using secure communications and tell them to set comsec to RV and stand by.	2. Set comsec to RV and stand by.
3. Set comsec to RV and then connect KYX-15 to radio AUD/FILL connector.	3. NA
4. Set KYX-15 toggle switch to position containing KEK of members to ON, set all other toggle switches to OFF, then set KYX-15 MODE to LD.	4. NA
5. Press radio LOAD, two beeps will be heard and KYX-15 indicator light will flash.	5. NA
6. Tell members to scroll to comsec key position to be filled.	6. Press CMSC then CHG until position to be filled is displayed, inform NCS when ready.
7. Tell members to wait for burst of noise and beep, then to wait 2 seconds and set comsec switch to CT.	7. Stand by.
8. Operate KYX-15 for MK, refer to KYX-15 operator's manual.	8. When burst of noise and beeps heard, set COMSEC to CT.
9. Press STO to store COMSEC	9. NA
10. Set radio comsec switch to CT then confirm commo with members.	10. Confirm commo with NCS.

ANTENNAE INFORMATION

ANTENNAE RANGES	
ANTENNAE	**RANGE**
Manpack	8 Kilometers
Vehicle Whip	12-15 Kilometers
OE-254	20-35 Kilometers
FIELD EXPEDIENT ANTENNAES	
ANTENNAE	**DESCRIPTION**
Replacement Whip Antennae	One end connected to radio to an insulator over a branch and wrapped around a tree.
Center Fed Doublet	Both ends connected to trees with an insulator in the middle leading to the radio.
Wire Antennae with Resistor	Put resistor toward the distant station.
RC-292	One end grounded to tree over a branch to insulator then leading to another insulator that splits into the triangle with insulators on each leg. The legs of the triangle act as the ground plane elements.

WIRE COMMUNICATION

HOOK UP THE DNVT
1. Tie wire to D ring - Green to XMIT, brown to RCVE 2. Connect wire to J1077 - Green to odd, brown to even 3. Power check for tone and green light 4. Request service - 8R 118 + SDN 5. Disaffiliate service - 8C 118 + SDN 6. Disconnect - J1077 first and then DNVT
MSRT
1. Move COMSEC to center position. 2. Turn remote power switch to on. 3. Turn blackout switch on (alarm goes out). 4. Connect storage device (KYCK 13). 5. Push up COMSEC 4 times with storage device on. 6. Turn storage device off and disconnect. 7. Connect ESD to field connector of the telephone. 8. On telephone, turn COMSEC to ZERO and function to DISABLE. 9. Place COMSEC to center. 10. Function to LDU. 11. Load from position 1 to LDU. - Turn on ESD. - Push COMSEC to right and release. - Load from position 2 to LDX. - RING/BUSY and NSW lights should be on. 12. Turn switch to OP (lights go out). 13. Clear old FLP (8CFR). 14. (8F03) load plan, then load frequencies. 15. Dial R after last group of numbers (LOAD FREQ light stays on). 16. Affiliate (8R 118 SDN) and hang up. 17. Disaffiliate (8C 118 SDN). 18. Clear directory (8R SDN). 19. Clear frequency load plan (8CFR). 20. Function to DISBL and COMSEC to ZERO. 21. Zero COMSEC on RT 1539. 22. Blackout to OFF. 23. Power to OFF.
TA-312
1. Insert batteries - 1 up and 1 down. 2. Cut wire and connect.

NBC

MOPP LEVELS					
EQUIPMENT	**MOPP 0**	**MOPP 1**	**MOPP 2**	**MOPP 3**	**MOPP 4**
Mask	Carried	Carried	Carried	Worn	Worn
Overgarment	Available	Worn	Worn	Worn	Worn
Undergarment	Carried	Worn	Worn	Worn	Worn
Overboot	Available	Available	Worn	Worn	Worn
Gloves	Available	Carried	Carried	Carried	Worn

NUCLEAR ATTACK			
BEFORE ATTACK	**DURING ATTACK**	**AFTER ATTACK**	**RADIATION SIGNS**
Choose Shelter Cover Exposed Skin Cover Equipment	Drop face down Close eyes Cover Exposed Skin	Decontaminate (Brush, scrape, flush) Monitor (174 Radiometer, T236 Dosimeter)	Untalkative, stunned, helpless, depressed, tense, preoccupied

BIOLOGICAL ATTACK			
BEFORE ATTACK	**DURING ATTACK**	**AFTER ATTACK**	**ATTACK SIGNS**
Hygiene Sanitation Training Physical Conditioning	Don mask and cover skin MOPP 4 Take shelter Best to do this prior to the attack.	Monitor with M34, M256 or CBASK	Dizziness, blurred vision, rashes, blisters, numbness, paralysis, coughing, fever, muscle ache, nausea, diarrhea, internal bleeding, shock

CHEMICAL ATTACKS		
TYPE	**SIGNS**	**TREATMENT**
Nerve	Pinpoint pupils, sweating, drooling, twitching, involuntary urination	Pre-treatment tablets, Mark I and II injections, convulsant antidote.
Blood	Lips and skin red, gasping for air, short shallow breathing	Mask and evacuate to medical assistance
Blister	Redness, blistering, burning eyes, diarrhea, immediate pain, black and brown skin.	MOPP 4, M258A1 kit, wash and wrap affected area, evacuate.
Note: Use M9 M8A1 or M256 to identify type of chemical attack.		

NBC 1 (OBSERVER'S REPORT)

TYPE OF REPORT: NBC 1 CHEM, NBC 1 NUC, or NBC 1 BIO
Line
A. Strike serial number (not usually used for NBC 1).
B. Observer's position.
C. Direction of attack from observer (grid or magnetic; degrees or mils).
D. DTG of attack.
E. Duration of illumination (nuclear). Date-time attack ended (chemical or biological).
F. Location of attack.
G. Means of delivery or kind of attack.
H. Type of burst (air, surface, unknown, height if known).
I. Number of munitions or aircraft (chemical or biological).
J. Flash-to-bang time.
K. Cloud width at H+5.
L. Cloud angle at H+10 (top or bottom) (nuclear); Enemy action before and after attack (chemical or biological).
NOTE: Line items B, D, and H and either C or F should always be reported; other line items may be used if the information is known.

MASK REMOVAL

WITH M256A1/A2 KITS (15 MINUTES)	WITHOUT M256A1/A2 KITS (35 MINUTES)
1. After checking with kit, results are negative. 2. Senior person selects 1 or 2 soldiers, they-- - Move to shady place. - Unmask for 5 minutes. - Clear and reseal masks. 3. Observe them for 10 minutes. 4. If no symptoms appear, give all clear. 5. Watch for delayed symptoms. 6. Have first aid available.	1. Senior person selects 1 or 2 soldiers. 2. Move to shady place. 3. Have soldiers-- - Take deep breath, hold, break seal. - Keep eyes open for 15 seconds. - Clear and reseal masks. 4. Observe them for 10 minutes, if no symptoms-- - Break seal on masks, take 2 or 3 breaths. - Reseal and clear their masks. 5. Observe them for 10 minutes. 6. If no symptoms, unmask for 5 minutes and re-mask. 7. If no symptoms after 10 minutes, give all clear. 8. Watch for delayed symptoms.

MOPP ANALYSIS/EXCHANGE

ANALYSIS	BUDDY EXCHANGE
Mission Weather Work Rate Possibility of Heat Stress Duration of Work Amount of Degradation Unit Targeted Warning Time Additional Protection Available Training and Physical Levels Day or Night	1. Decon Individual Gear. 2. Decon Hood and Roll it Up. 3. Remove Overgarments. 4. Remove Overboots and Gloves. 5. Put on Overgarments. 6. Put on Overboots and Gloves. 7. Secure Hood. 8. Repeat Steps 2-7 for Buddy. 9. Secure Individual Gear. WITHIN 6 HOURS (HASTY DECON)

ADMINISTER NERVE ANTIDOTE (SELF)

SEQUENCE	DETAILED INSTRUCTIONS
1. Recognize mild symptoms of nerve agent poisoning.	1. Unexplained runny nose. 2. Unexplained sudden headache. 3. Excessive flow of saliva. 4. Tightness of chest causing difficulty breathing. 5. Difficulty seeing. 6. Muscular twitching of exposed skin. 7. Stomach cramps. 8. Nausea.
2. React to chemical hazard.	1. Put on protective mask. 2. Give alarm.
3. Prepare to administer one atropine injection.	1. Check to avoid buttons and other materials in pockets. 2. Take small injector.
4. Administer the atropine injection.	1. Inject and hold for 10 seconds. 2. Remove and hold onto.
5. Prepare to administer one 2PAM CI injection.	1. Take the large injector.
6. Administer the 2PAM CI injection.	1. Inject and hold for 10 seconds.
7. Secure the used injectors.	1. Put the needle of both injectors through an outer pocket flap. 2. Decontaminate the skin. 3. Seek buddy aid.

ADMINISTER NERVE ANTIDOTE (BUDDY)

SEQUENCE	INSTRUCTION
1. Recognizes severe symptoms of nerve agent poisoning.	1. Strange and confused behavior. 2. Gurgling sounds when breathing. 3. Severely pinpointed pupils. 4. Red eyes with tearing. 5. Vomiting. 6. Severe muscular twitching. 7. Loss of bladder/bowel control. 8. Convulsions. 9. Unconsciousness or stoppage of breathing.
2. Take immediate steps to protect self and warn others.	1. Put on mask. 2. Give alarm. 3. Give antidote to self if necessary. 4. Decontaminate skin if necessary. 5. Put on remaining protective clothing.
3. Leave casualty in positions found unless moving is necessary.	
4. Masks the casualty if necessary.	1. Ensure the casualty is on their back.
5. Administer atropine injection.	1. See 'SELF AID'.
6. Administer the 2PAM CI injection.	1. Administer up to three sets of injections. 2. Secure the injectors.
7. Decontaminate skin and seek medical aid.	1. Do not kneel at any time.

CHEMICAL PROTECTION

AGENT →	BLISTER	NERVE	UNKNOWN POWDER	UNKNOWN LIQUID
Protection	**MOPP 4/As advised**	**MOPP 4/As advised**	**MOPP 4/As advised**	**MOPP 4/As advised**
Persistency	Normally Persistent	G - Normally Nonpersistent V - Normally Persistent	NOT IMMEDIATELY DETERMINABLE	NOT IMMEDIATELY DETERMINABLE
Detection	M8 Chemical Detector Paper; M256A1/A2 Kit, CAM in H mode; M9 Paper	CAM in G Mode, M8 Paper; M256A1/A2 Kits; M9 Paper; M8A1 Alarm	M256A2 Kit	M256A2 Kit
Rate of Action	HD, HT, HN, Delayed. HL, L PD, ED, MD, CX, Immediate Irritation	G - Very Rapid V - Moderately Rapid	Delayed	Delayed and Rapid
Exposure Symptoms	Irritates Eyes and Skin. Produces Same Damage as Heat Burn. Blisters Skin	Running Nose, Tightness in Chest, Dimness of vision, Pinpointing of Pupils, Difficulty Breathing, Excessive Sweating, Nausea, Jerking and Twitching, Cessation of Breathing	May vary	May vary
CAM Bar Reading	H Mode 0 Bar - No Vapor 0-3 Bars - Low Vapor 4-6 Bars - High Vapor 7-8 Bars - Very High	G Mode 0 Bar - No Vapor 0-3 Bars - Low Vapor 4-6 Bars - High Vapor 7-8 Bars - Very High	N/A	N/A
Personnel Decon	Eyes: Flush with water Skin: M258A1 or M291 Kit	Eyes; Flush with cold water Skin; Soap and water or M258A1 or M291 Kit	M258A1 Kit, M291 Kit for Skin	M258A1 Kit, M291 Kit for Skin
First Aid	Seek Medical Aid. Keep Affected Area Clean	Mark I Kit, Artificial Respiration as Required Seek Medical Aid. Keep Affected Area Clean	Seek Medical Aid	Seek Medical Aid

NBC MARKERS

SIGN	INFORMATION	ILLUSTRATION
Chemical Yellow Background Red Lettering	Name if Agent (If Known) Date and Time of Detection	
Biological Blue Background Red Lettering	Name if Agent (If Known) Date and Time of Detection	
Radiological White Background Black Lettering	Dose Rate Date and Time of Reading Date and Time of Burst (If Known)	
Chemical Minefield Red Background Yellow Lettering and Stripe	Chemical Agent in Mine Date and Time of Emplacement	

MEDEVAC PROCEDURES

LINE	INFORMATION
Line 1	Location (at least 6 digit grid coordinate)
Line 2	Radio frequency, call sign, suffix
Line 3	Precedence: a. Urgent - Emergency, needs immediate evacuation to save life, limb, eyesight. b. Priority - Patient should be evacuated within 4 hrs. or his medical condition will deteriorate to Urgent status. c. Routine - Requires evacuation, but condition is not expected to deteriorate seriously within 24 hrs. d. Immediate - Condition not Urgent but needs to be evacuated ASAP so as to not endanger unit's mission.
Line 4	Special Equipment Required (neck/back brace, jungle penetrator)
Line 5	Number of patients: a. Litter b. Ambulatory (walking)
Line 6	Security at pickup site.
Line 7	Method of marking pickup site.
Line 8	Patient's nationality and status.
Line 9	NBC contamination level.
NOTE: PRIMARY FREQ = 48.50 ALTERNATE FREQ = 46.10 CALL SIGN = "RANGE CONTROL"	TELEPHONE at FT XXXXXX: XXX-XXXX

SALUTE REPORT

SIZE: The size of the enemy force observed.
ACTIVITY: What the enemy was doing.
LOCATION: Where the enemy was located.
UNIT: The unit to which the enemy belongs.
TIME: When the enemy was observed.
EQUIPMENT: What the enemy wore, carried or used.

SHELLING REPORT

Unit or origin (encode).
Position of observer (encode).
Azimuth of flash, sound, or groove.
Time from.
Time to.
Area affected (encode).
Number and nature of guns.
Nature of fire.
Number, type, and caliber.
Flash-to-bang time.
Damage (encode).
NOTE: Elapsed time between impact and sound x 350 meters per second = distance (in meters).

CLASSES OF SUPPLY

CLASS	DESCRIPTION
I	Subsistence
II	Clothing, individual equipment, tentage, organizational tool sets
III	POL
IV	Construction
V	Ammunition
VI	Personal demand
VII	Major end items
VIII	Medical material
IX	Repair parts
X	Material to support nonmilitary programs

TEMPERATURE CONVERSION TABLE

C	F	C	F	C	F	C	F
-62.2	-80	-12.2	10	23.9	75	60	140
-56.7	-70	-9.4	15	26.7	80	62.8	145
-51.1	-60	-6.7	20	29.4	85	65.6	150
-45.6	-50	-3.9	25	32.2	90	68.3	155
-40.0	-40	-1.1	30	35.0	95	71.1	160
-34.4	-30	1.7	35	37.8	100	73.9	165
-31.7	-25	4.4	40	40.6	105	76.7	170
-28.9	-20	7.2	45	43.3	110	79.4	175
-26.1	-15	10.0	50	46.1	115	82.2	180
-23.3	-10	12.8	55	48.9	120	85	185
-20.6	-5	15.6	60	51.7	125	87.8	190
-17.8	0	18.3	65	54.4	130	90.6	195
-15.0	5	21.1	70	57.2	135	93.3	200

STANDARD ILLUMINATION CONDITIONS

BMNT: "Beginning Morning Nautical Twilight". Classified as the period before sunrise, when the sun is 12 degrees below the horizon. Illumination is poor, only vague outlines distinguishable.

BMCT: "Beginning Morning Civil Twilight". Before sunrise, when the sun is 6 degrees below the horizon. On a clear day, outdoor "visible" activity is possible during this period.

SUNRISE: When the sun breaks the crest of the horizon.

SUNSET: When the sun recedes across the crest of the horizon.

EECT: "Ending Evening Civil Twilight". After sunset, when the sun is six degrees below the horizon. On a clear day, outdoor "visible" activity can take place.

EENT: "Ending Evening Nautical Twilight". After sunset, when the sun is 12 degrees below the horizon. Illumination is poor, only vague outlines distinguishable.

CONVERTING VELOCITY MEASUREMENTS

METRIC TO US UNITS

(1) **Centimeters divided by seconds x 0.033** = feet divided by seconds
(2) **Meters divided by seconds x 3.281** = feet divided by seconds
(3) **Meters divided by seconds x 196.85** = feet divided by minutes
(4) **Kilometers divided by hours x 0.621** = miles divided by hours

US UNITS TO METRIC

(1) **Feet divided by seconds x 30.48** = centimeters divided by seconds
(2) **Feet divided by seconds x 0.305** = meters divided by seconds
(3) **Feet divided by minutes x 0.0051** = meters divided by seconds
(4) **Miles divided by hours x 1.609** = kilometers divided by hours

DETERMINING AND CONVERTING SPEEDS

Converting knots to mach:
3,960,000 divided by (knots x 6076) = equivalent mach speed

Converting mach to knots:
(Mach x 3,960,000) divided by 6076 = equivalent knots.

SPEED OF SOUND:
1100 ft divided by seconds at sea level.
*(*Flash to bang time = 340 meters divided by seconds*)*

DISTANCE CONVERSION CHART

STATUTE MILES = 5280 FEET

NAUTICAL MILES = 6076 FEET

STATUTE MILES X 0.87 = NAUTICAL MILES

NAUTICAL MILES X 1.15 = STATUTE MILES

Chapter 8

Target Synchronization Matrix

(See pages 150-151)

TARGET SYNCHRONIZATION MATRIX (PHASE/EVENT: IIIa-AASSLT/ABN ASSLT) AS OF: 080600(C) TO 090600(C)OCT99

DECIDE				DETECT				DELIVER				ASSESS		
PRI	CAT	HPT	LOCATION	NAI	AGENCY	ASSETS	DETECTION WINDOW	AGENCY	ASSETS	WHEN	EFFECTS	AGENCY	ASSETS	REMARKS
1	ADA	DShK	WQ02404210	1a	DIV	LRS	D-2	DIV	NGF/CAS	P/A	S/D (CAS)	DIV B/222	LRS QFIX	LRS OFF @ P-HOUR
					B/222 MI	QFIX	P-2	2-318	105mm	A	S			
			WQ039431	1b	DIV	LRS	D-2	DIV	NGF/CAS	P/A	S/D (CAS)	DIV B/222	LRS QFIX	LRS OFF @ P-HOUR
					B/222 MI	QFIX	P-2	2-318	105mm	A	S			
		SA-18	WQ00654372	5a	DIV	LRS	D-2	DIV	NGF/CAS/ J-SEAD	P/A	S/EW	B/222	QFIX	SPOT JAM C2 NET FOR ADA TRAFFIC ONLY FROM P-HOUR TO P+__
					B/222 MI	QFIX	P-2	2-318	105/155mm	A	S			
			WQ02204380	5b	DIV	LRS	D-2	DIV	NGF/CAS/ J-SEAD	P/A	S/EW			
					B/222 MI	QFIX	P-2	2-318	105/155mm	A	S			
			WQ05823913	5c	DIV	LRS	D-2	DIV	NGF/CAS/ J-SEAD	P/A	S/EW			
					B/222 MI	QFIX	P-2	2-318	105/155mm	A	S			
			WQ06704185	5d	DIV	LRS	D-2	DIV	NGF/CAS/ J-SEAD	P/A	S/EW			
					B/222 MI	QFIX	P-2	2-318	105/155mm	A	S			
2	FS	81mm	WQ01654015	4a	2-318	Q36	P+2.5	DIV	NGF/CAS/ J-SEAD	P/A	N/EW	B/222 2/318	UAV P-BDA	SPOT JAM FS NET FROM P-HOUR TO P+__
								2-318	105mm	I	D			
					B/222 MI	QFIX	P-2	TF 1-83	OH-58D	I	D			
								TF 3-326	ORG	I	D			
			WQ042447	4c	2-318	Q36	P+2.5	DIV	NGF/CAS	P/A	N	B/222 2/318	UAV P-BDA	SPOT JAM FS NET FROM P-HOUR TO P+__
								2-318	105mm	I	D			
					B/222 MI	QFIX	P-2	TF 1-83	OH-58D	I	D			
								TF 2-326	ORG	A	D			
			WQ05604105	4b	B/222	QFIX	P-2	DIV	NGF/CAS	P/A	N	B/222 2/318	UAV P-BDA	SPOT JAM FS NET FROM P-HOUR TO P+__
								2-318	105mm	I	D			
					2-318	Q-36	O/O	TF 1-83	OH-58D	I	D			
								TF 3-326	ORG	A	D			
3	MAN	SQD(+) HLZs	WQ04543870	2a	CA	TPT	D-2	BDE FSE	NGF	P/A	N	B-222	ORG	
			WQ05954020	2b	CA	TPT	D-2	2-318	105mm	A	N	TF 1-83	ORG	
								TF 1-83	OH-58D	A	D	BDE FSE	CAS	
								BDE FSE	CAS	A	D			
4	CIV	CARNIS	WQ02354455	7a	CA	TPT	D-2	DNE-INFO OPS				CA	TPTTM	DNE=DO NOT ENGAGE
			WQ02654400	6a										

TARGET SYNCHRONIZATION MATRIX (PHASE/EVENT: | AS OF:

DECIDE				DETECT				DELIVER				ASSESS		
PRI	CAT	HPT	LOCATION	NAI	AGENCY	ASSETS	DETECTION WINDOW	AGENCY	ASSETS	WHEN	EFFECTS	AGENCY	ASSETS	REMARKS