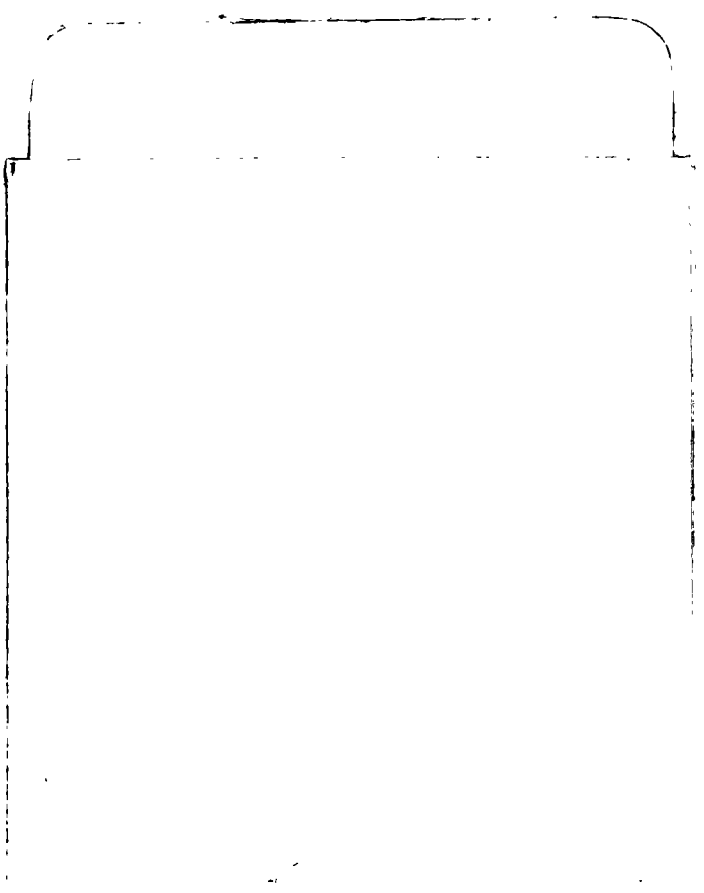
FM 6-121

FIELD ARTILLERY TARGET ACQUISITION

HEADQUARTERS, DEPARTMENT OF THE ARMY



FIELD MANUAL
No. 6-121

HEADQUARTERS
DEPARTMENT OF THE ARMY
Washington, DC, 1 May 1978

FIELD ARTILLERY TARGET ACQUISITION

To comply with guidance from the Assistant Secretary of Defense (Manpower and Reserve Affairs), this field manual has been reviewed for the use of neutral language. Where the third person singular is used in this publication, the word "he" will be understood to stand for both masculine and feminine genders.

Comments for improving this field manual should be sent to Commandant, US Army Field Artillery School, ATTN: ATSF-TD-TM, Fort Sill, Oklahoma 73503 (AV 639-4679/4902).

*This manual supersedes FM 6-121, 1 November 1967; TC 6-121-2, 19 March 1976; and TC 30-29, 19 August 1977. In addition, rescinds DA Form 2186-R, 1 November 1967.

FIELD ARTILLERY TARGET ACQUISITION

Table of Contents

Chapter 1
Introduction

WHY
Our capability to acquire targets is a product of the knowledge and understanding of those who participate in the effort.

WHAT
This chapter describes:
purpose
scope
target audience
changes or comments

1-1. Purpose

This manual describes the doctrine, tactics, organization, and procedures for the management of target acquisition (TA) equipment and systems. The doctrinal principles described herein should be used as guides in the management and employment of TA devices and systems. Local modifications of these principles should be considered in light of their impact on the total TA system.

1-2. Scope

The material presented is applicable to target acquisition for the field artillery. The term field artillery is used in its broadest context to mean that element responsible for coordinating all fire support against surface targets, not just cannon and missile fires. The concepts are applicable to both general and limited warfare. The organizations discussed are those associated with the armored, infantry, and mechanized divisions. Though the organizations presented do not fit the peculiar nature of airmobile or airborne operations, the principles of management and employment are the same.

1-3. Target Audience

This manual will assist all personnel involved in the target acquisition process to include field artillery commanders, fire support coordinators and their agencies at all levels, the corps and division G2 and all other personnel in all source intelligence channels,

and members of the division artillery tactical operations center and the target acquisition battery.

1-4. Changes or Comments

Users of this manual are encouraged to submit recommended changes or comments to improve the manual. Comments should be keyed to the specific page, paragraph, and line of the text in which the change is recommended. Justification should be provided for each comment to insure complete understanding and proper evaluation. Comments should be furnished directly to Commandant, US Army Field Artillery School, ATTN: ATSF-TD-TM, Ft Sill, OK 73503 (Autovon 639-4902).

Chapter 2
Producers of Target Information

WHY
A productive target information system consists of a variety of complementary activities.

WHAT
This chapter describes:
moving target locating radars
weapons locating radars
flash ranging
sound ranging
FIST
aerial observers
FA battalion OP's
maneuver units
military intelligence
USAF
crater analysis
national resources

Section I. Field Artillery Target Acquisition Assets

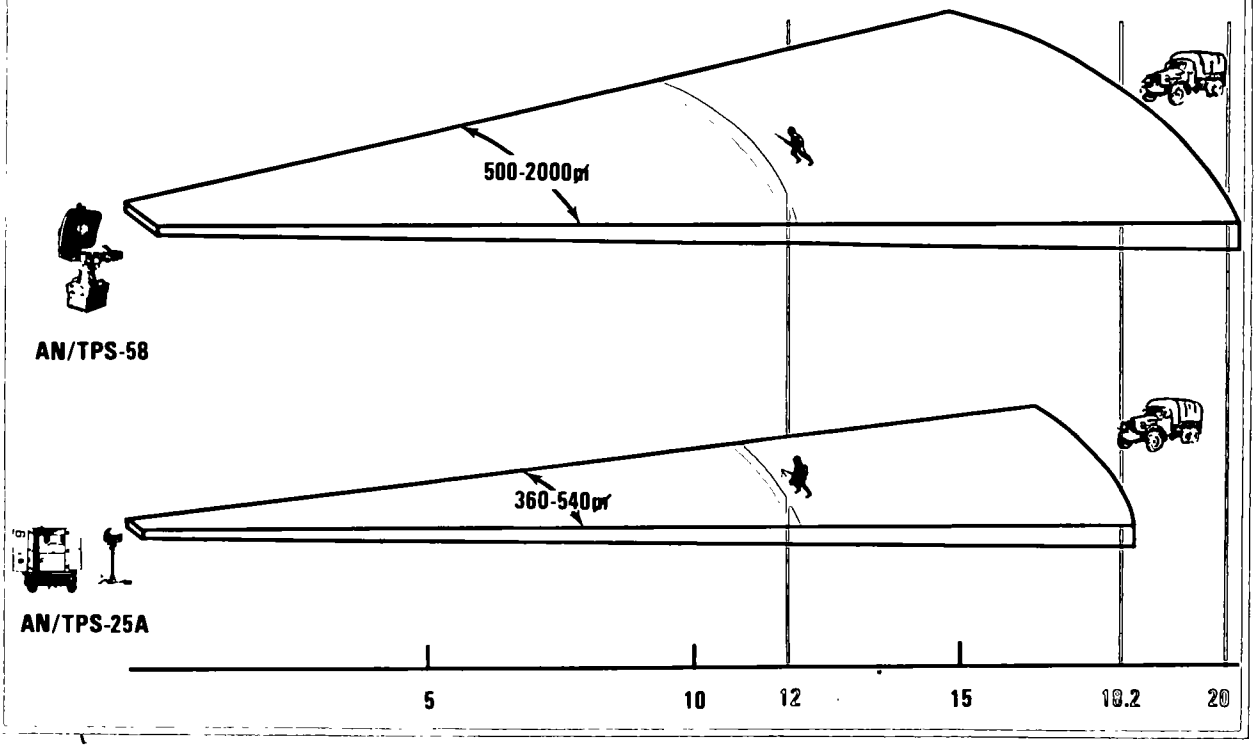
Once combat begins, most artillery targets will be located by the use of field artillery's organic target acquisition assets. These assets include:
Moving target locating radar section
Weapons locating radar sections
Sound/flash platoons
Fire support teams
Aerial observer teams
Battalion observation posts

2-1. Moving Target Locating Radar (MTLR) Section

Organization. One MTLR section is organic to each divisional TAB radar platoon and one MTLR section is organic to the TA platoon in the FA battalion of the separate brigade. The MTLR section is equipped with either an AN/TPS-25 radar or an AN/TPS-58 radar.

Radar Type. The AN/TPS-25 radar uses noncoherent doppler radar to detect, locate, and—to some extent—identify moving targets. It is particularly useful for surveillance of a critical area such as an avenue of approach during periods of low visibility when passive surveillance means are not available or effective. The AN/TPS-58 radar uses coherent doppler radar to detect, locate, track, and—to some extent—identify moving targets. The AN/TPS-58 is used in the same manner as the AN/TPS-25.

FIGURE 2-1. CAPABILITIES OF MOVING-TARGET LOCATING RADARS



Capabilities. The AN/TPS-25 radar can locate moving targets to within 100 meters, at a maximum range up to 18,280 meters for vehicles the size of a ¼-ton truck or larger, or up to 12,000 meters for personnel. The AN/TPS-25 can scan a sector from 360 to 540 mils located anywhere within its total azimuth limits of 6,750 mils. The azimuth limits are 3,375 mils left or right of center giving an overlap of 350 mils. Elevation limits are 265 mils above or below the horizontal. Minimum range is 450 meters. The AN/TPS-58 radar can locate targets to within 50 meters at ranges up to 12,000 meters for personnel and 20,000 meters for vehicles. Several seconds are required for the radar to sweep from minimum to maximum range. The sector scan is from 500 to 2,000 mils. Operation is automatic. This radar can be used to register and adjust artillery and mortars and to track targets and predict target locations.

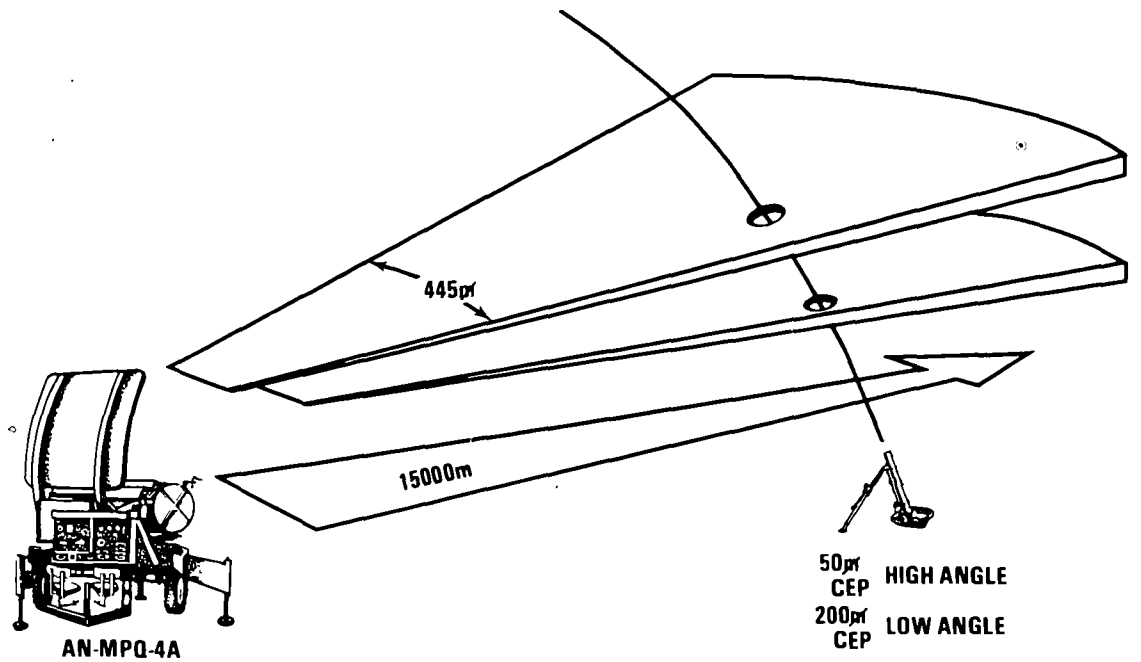
Positioning. Both the AN/TPS-25 and AN/TPS-58 radars must be positioned to achieve electronic line-of-sight into the area to be observed. This makes it extremely vulnerable to enemy electronic countermeasures including jamming and direction finding (and subsequent attack).

Employment. For tactical employment of the AN/TPS-25 and the AN/TPS-58 radars, see FM 6-161.

2-2. Weapons Locating Radar (AN/MPQ-4A) Sections

Organization. Weapons locating radar sections are equipped with AN/MPQ-4A radars. Five of these sections form part of the radar platoon organic to the target acquisition battery of the division. Additionally, each separate brigade has one section or-

FIGURE 2-2. CAPABILITIES OF WEAPONS LOCATING RADARS



ganic to its direct support field artillery battalion.

Function. The AN/MPQ4A locates mortars, cannons, and rockets by detecting the position of the inflight projectile at two points in space. The data obtained from these two points are inserted into a computer, which extrapolates the trajectory of the projectile to its origin and displays the two dimensional coordinates of the hostile weapon.

Capabilities. The AN/MPQ-4A radar has a first round detection capability. It has a 6,400 mil capability with a 445-mil sector of scan at any one time. The radar has a range of 15,000 meters and can locate weapons firing high angle trajectories to within 50 meters. Weapons firing low angle trajectories can be located to less than 200 meters radial error.

Vulnerabilities. The radar is vulnerable to enemy electronic countermeasures including jamming and direction finding. Heavy rain and snow reduce its capabilities. The radar is also vulnerable to saturation. The level of training and experience of the operator has a direct impact on the speed and accuracy with which he can detect and locate targets.

Employment. For tactical employment of the AN/MPQ-4A radar, see FM 6-161.

2-3. Sound/Flash Platoons

Each of the two sound/flash platoons have both a flash ranging and a sound ranging capability.

Flash Ranging. Four flash observation sections are organic to each of the two sound/flash platoons of the divisional target acquisition battery (see chapter 9).

The primary function of flash OP's is to locate counterfire targets (artillery, rockets,

TABLE 2-1. SOUND/FLASH

		Signature	Method of target location	Max range	Add'l functions
Flash	4 OP's w/BC scope	Flash of arty, rockets, mortars firing	Intersection of rays from OP's to targets	15km	● cue sound base ● nuc HOB ● supplement ground observers
Sound	6 microphones/ Sound base	Sound of Weapon firing	Convert sound wave arrival time to ray, intersect rays at sound source	2 times base width not to exceed 20km	Adjust friendly artillery

and mortars) by observing their flash signature. Two or more OP's measure the direction to the flash (or other target) and the sound/flash central (or control center) computes or plots the intersection of the directional rays, resulting in a grid location. A major secondary function of the flash OP is to assist in the locating of counterfire targets by cuing the sound system. Specified OP's activate the sound ranging system when they see a flash or hear the sound of enemy artillery, mortars, or rockets firing. The flash OP's also locate many other targets through direct observation of the battlefield. Enemy activity within direct line-of-sight of a flash OP can be targeted. In this function they supplement the coverage of the battlefield provided by ground observers (FIST's) working with the maneuver units.

In many cases—particularly in the attack—the flash OP from its location on dominant terrain near the FEBA will be able to provide better coverage than the FIST, which will be with the maneuver unit. Flash OP's can locate targets up to the maximum limits of visibility (usually considered to be 15km). An accurate direction can be determined even though the firing weapon is in defilade if the flash is high enough to appear over the crest.

Sound Ranging. Each divisional target acquisition battery has two sound/flash platoons. Each sound/flash platoon is capable of installing and operating two microphone bases, but normally operates just one. The second base is to provide additional sound coverage for limited periods of time or to eliminate nonoperational time when displacement is necessary.

One sound base can locate counterfire targets in an area the width of the base (about 10 km) and to a depth of twice the base width but not exceeding 20 km. By measuring the relative time of arrival of the sound wave at each microphone, a direction (ray) to the source can be determined from a point midway between each pair of microphones. The intersection of these rays is the target. In a fast-moving situation when survey teams cannot meet the requirement of surveying each microphone, the sound base is still extremely useful. Without the surveyed location of the microphones, the sound central can still direct a sound-on-sound adjustment. This is accomplished by matching the sound of our exploding rounds with the sounds from the target. The sound/flash central determines the location of the sound source (target) and the location of the sounds from our first volley. Corrections are then provided to the

FDC personnel to bring the two sounds into coincidence.

High winds, particularly gusting winds, can cause false sensings and erroneous locations. Sound ranging is susceptible to deception (sound simulators). The sound system can be saturated by large volumes of fire but only for very short periods (more than 10 sounds per second). The ammunition required to saturate sound for any significant length of time would be prohibitive. Sound events separated by 0.1 second or more can be located.

For tactical employment, see FM 6-122.

2-4. Fire Support Teams (FIST) (TC 6-20-10)

Fire support teams are organic to divisional field artillery battalions. One FIST works directly with each maneuver company/troop. FIST's are a lucrative source for close-in target locations and battlefield information. The FIST is under the general supervision of the maneuver battalion/squadron fire support officer (FSO). The FIST chief, who positions himself near the maneuver commander, must keep the FSO and FA battalion FDC informed of his location. The FIST passes targets and battlefield information to the FSO with the maneuver battalion/squadron and the supporting field artillery battalion FDC.

THE FIRE SUPPORT TEAM

- **ATTACHED TO COMPANIES/TROOPS**
- **SOURCE OF CLOSE-IN TARGETS AND BATTLEFIELD INFORMATION**

2-5. Aerial Observers (TC 6-40-6)

Aerial observers are organic to the div arty HHB and the FA brigade HHB. These observers are allocated by the div arty aviation officer to those units needing additional observer support. These allocations are closely coordinated with the S3. Due to their high mobility, aerial observers can cover much more area than ground observers. The additional height achieved through use of aircraft can extend the limits of their vision significantly. Targets and battlefield information are reported to the maneuver brigade/battalion/squadron FSO, the div arty TOC, or the FDC of the direct support battalion responsible for that brigade zone.

2-6. Field Artillery Battalion Observation Posts (OP) (FM 6-40)

FA battalions do not have dedicated personnel to continuously man a battalion OP; however, the survey parties of the direct support battalion are equipped to perform this function as a secondary mission. Since all survey requirements will seldom be completed, particularly in a mobile situation, the availability of survey personnel to perform this mission will be limited. When all survey requirements have been accomplished, the battalion recon and survey officer should report to the battalion S2 who will select site(s) for the battalion OP after considering the tactical situation, terrain, and the visibility diagrams from other ground observers and TA devices. The OP will report targets and battlefield information as directed by the battalion S3, usually to a battery FDC or directly to the battalion FDC.

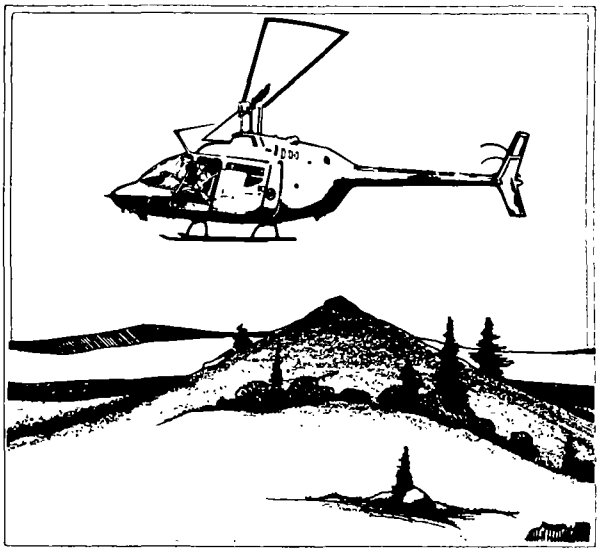
Although they are not specifically equipped to perform the additional duty, survey parties from div arty HHB, the TAB, and general support battalions should be used when available. If employed, they must coordinate with the DS FA battalion in the zone to insure optimum coverage.

Section II. Sources not Organic to the Field Artillery

The field artillery's organic TA capability will provide a significant number of targets and target information; however, the field artillery is not presently able to detect and locate counterfire targets until they have begun to fire. It is important to locate these targets before they are able to inflict severe damage. Sources, agencies, and organizations not organic to field artillery will provide a portion of targets and target information. These include maneuver units, military intelligence, Air Force, and national sources.

2-7. Maneuver Units

The maneuver units, those closest to the action, are good sources of targets and battlefield information. Their combat outposts, reconnaissance patrols, and even listening posts keep close watch over enemy activities. PW interrogation is usually done at maneuver brigade level, and higher; however, it may be initiated as low as company/troop level if the company/troop has the capability, and if information of immediate tactical importance may be revealed (FM's 30-5,30-15, and 19-40). Maneuver brigades have an organic aviation section. All pilots, crew, and passengers should rapidly report battlefield information that may be of importance regardless of their immediate mission. Pilot debriefing can also provide valuable information. Aircraft may be provided for a TA role. In this case information gathered will flow through the brigade S2 to the brigade FSE.



The divisional armored cavalry squadron (FM 17-36) and the corps armored cavalry regiment (FM 17-95) perform surveillance, reconnaissance, security, and economy of force missions. The success of all these missions relies very heavily upon timely and accurate reporting of battlefield information. This aspect of military operations is emphasized in the organization, equipping, and training of armored cavalry units (including their associated air cavalry). The armored cavalry is therefore a more prolific source of information than other maneuver units. The division intelligence nets are the principal channels whereby target information is passed from the cavalry to the artillery.

The primary means of surveillance used is visual. The many eyes of the unit are highly rated as efficient target acquirers. Additionally, most air cavalry pilots are routinely trained to adjust artillery fires. At night, the eyes are assisted by light intensification devices and IR equipment. Aerial photography can be performed using organic aircraft, and in many instances ground surveillance radars will be attached to ground elements. Because of its long range and mobility, the air cavalry troop, organic to both the divisional armored cavalry squadron and the corps ACR, is particularly good at acquiring targets. The air cavalry can perform the same missions as its ground counterparts either operating independently or supporting ground forces. An air cavalry troop can be employed as a unit or broken into platoons or sections. No matter what mission it is performing or how it is employed, reporting battlefield information is one of its inherent duties.

The separate brigade has the same capability as divisional brigades to gather battlefield information from patrols and outposts.

2-8. Military Intelligence

The extensive and diverse activities of military intelligence assets are in appendix F.

2-9. Air Force

The Air Force has an extensive capability to support target acquisition efforts and is particularly good at locating enemy air defense weapon sites. Its long range makes it a good source of target information for field artillery missiles.

FIGURE 2-3. AIR FORCE TARGET ACQUISITION CAPABILITIES

Pilot reports (particularly reconnaissance pilots).
Photo imagery.
Infrared imagery (IR).
Side looking airborne radar (SLAR).
Low light level television.
Advanced location strike system (ALSS).
Airborne warning and control system (AWACS).
Remotely piloted vehicles (RPV) with a variety of sensors.
Remote sensors (REMS); acoustic, magnetic, seismic,etc.

2-10. Crater Analysis

The details of crater analysis and SHELREP's are included at appendix D.

2-11. National Resources

Highly classified national resources can also be expected to provide valuable assistance, particularly in locating targets deep in the enemy's rear areas. Although these resources cannot be discussed in detail in this manual, their integration into the targeting process is outlined in chapter 6.

Chapter 3
Obtaining Target Information

WHY
Target acquisition requires thorough planning and coordination at each echelon from corps to battery level.

WHAT
This chapter describes:
general aspects
target processing

3-1. General

Full exploitation of the firepower available to the commander depends upon the effective use of all target information collection assets. The primary means of insuring the best use of all collection assets is through continuous planning and systematic coordination of the collection effort. To effectively use the sources and agencies for the collection of target information, their availability, capabilities, and limitations must be known to the direct support field artillery battalion S2, the division artillery assistant S3 for plans, and the division and the corps TA staff officer and FA assistant intelligence officers.

3-2. Planning

Planning the collection effort begins with the determination of requirements and establishment of priorities. A continuously updated target acquisition plan keyed to the mission of the supported unit, the enemy situation, and available target acquisition assets must be developed. Based on this plan, orders and requests for the collection of specific information and area or zone target acquisition coverage are sent to selected units and organizations (sources and agencies).

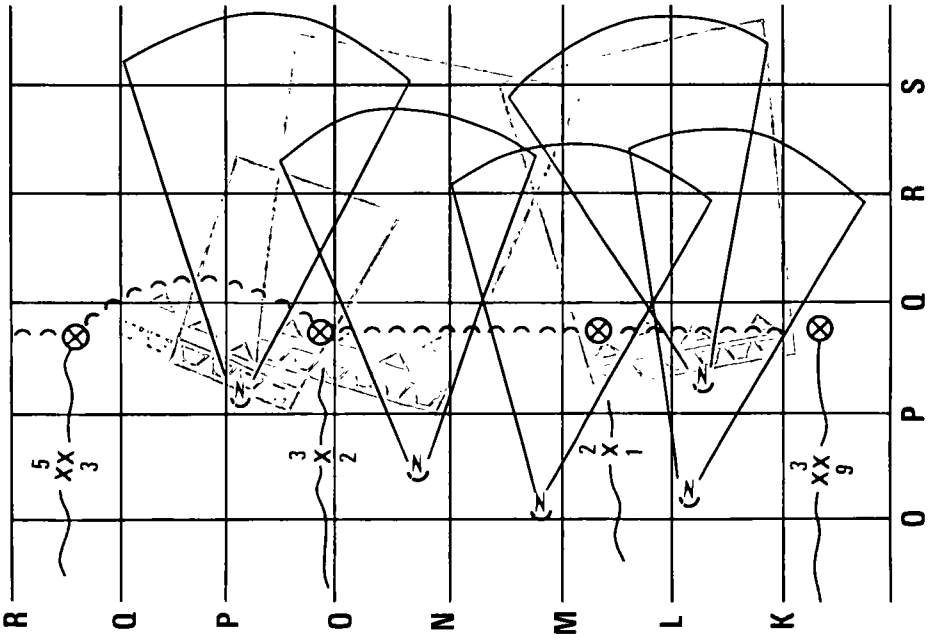
In the initial stages of target acquisition planning, some portions of the plan may be based on assumptions concerning our own forces and the capabilities of the enemy. As additional information becomes available,

changes are made to meet the actual situation. These changes will precipitate corresponding changes in the plan as it is being evolved. The required flexibility must be assured by simplicity of procedures for disseminating information and by coordination among all staff sections engaged in the planning. The final plan must be sufficiently flexible to accommodate changes in the friendly or enemy situations as they develop. Higher echelons are responsible for providing information and instructions to subordinate echelons at the earliest possible time. This is usually done through briefings, orders, and/or directives. At successively higher echelons, the plan is expanded to include the details required for that particular echelon and to assure complete coverage. Coordination between senior and subordinate echelons insures that problems are not overlooked and that solutions are promptly found.

Target acquisition capabilities overlays (app C) are submitted by all target acquisition agencies. Without these overlays, planning for the collection effort is handicapped because gaps in the target acquisition coverage of the corps, division, or brigade areas may not be detected.

The officer responsible for target acquisition studies all available information, evaluates the target areas, and establishes priority for observation. He uses the visibility diagrams from assigned and subordinate target acquisition agencies to prepare a consolidated capabilities chart. Analysis of this chart, consideration of priorities for observation, and subordinate units' requests for assistance (requirements vs capabilities) indicate any necessity for reallocating or repositioning target acquisition assets or for requesting assistance from higher echelons. The collection effort is then directed toward securing information to verify, identify, locate accurately, or disprove the presence of suspected targets. This is accomplished by assigning suitable tasks to the collection agencies. Expanded frontages and depths will require more intensive planning and maximum use of available target acquisition agencies.

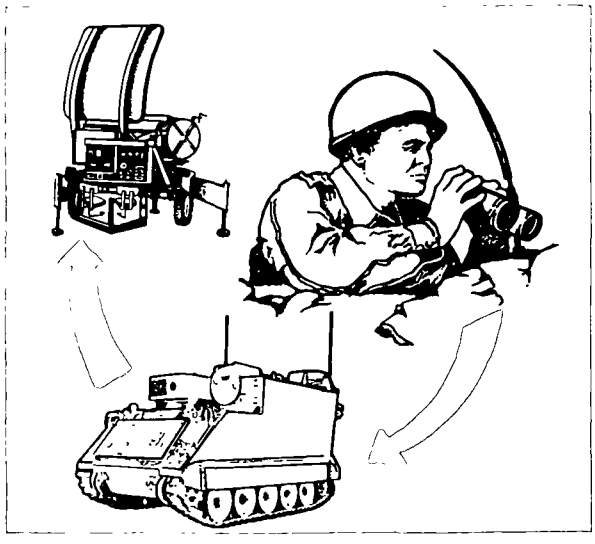
FIGURE 3-1. TARGET ACQUISITION CAPABILITIES OVERLAY



3-3. Coordination

Instructions for the TA effort may be issued orally or in written form. The most common written instructions are the TA annex to the FA support plan and the TA support appendix to annex J (Surveillance and TA) to force OPORD. Examples of these two TA plans are at appendix C. The following discussion relates some of the considerations in effecting good TA within a div arty.

After receiving information on the enemy and directions or guidance from the division artillery assistant S3 for plans, the artillery battalion commander whose unit has operational control or attachment of a radar selects the general position area in which the attached weapons locating radar(s) will be be employed. The radar technician should select the actual position after considering how to achieve both maximum system performance and survivability. The battalion commander (or his S2) will insure that the sector of search is in accordance with the instructions received from the div arty TOC and the target acquisition plan. The sector of search will usually fall within the zone of the supported unit. The radar is vulnerable to direction finding if it transmits for extended periods; therefore, it is best to establish a cuing technique to activate the radar only when there is firing. The method may vary, but the establishment of a direct communication link between the radar and forward observers is a good system. The fire support team (FIST) can notify the radar via fire direction channels when hostile mortars and artillery are firing and can usually give a general direction to them. Prior to occupying an OP or joining his maneuver company, the FIST chief receives any special instructions that the S2 may have, such as particular areas to keep under surveillance and what is expected to be in these areas. FIST observers select their OP locations where they can best support the maneuver company, and in the zone designated by the maneuver battalion fire support officer. This is done to insure coordinated observation within the zone of the supported unit. The FIST prepares visibility diagrams for its OP's and submits these to the FSO for forwarding to the S2. This may be impractical in all except static tactical situations.



Upon receiving the visibility diagrams from the FIST and battalion OP's and the location and site evaluation charts from the radar(s), the battalion S2 prepares a target acquisition capabilities chart consisting of consolidated OP visibility diagrams and radar(s) visibility diagrams. One copy is forwarded to the division artillery assistant S3 for plans for integration into or modification of the TA plan. Other FA battalions in the division zone intending to establish battalion OP's will also provide visibility diagrams.

The division artillery assistant S3 for plans reviews the capabilities charts from subordinate battalions and then determines if any changes to the employment of division TAB assets are necessary. He then issues proper instructions and, if necessary, coordinates with the battalion S2's to change the location of their assets. If TA assets are not sufficient, he will request assistance from the division G2.

In addition to the radar visibility diagrams, the two sound/flash platoons prepare visibility diagrams for their sound bases and visibility charts for their flash OP's. These

are provided to the assistant S3 for plans for inclusion in, or revision to, the TA plan.

3-4. Event-Triggered Reporting

Specific types of high priority targets can sometimes be located by division EW assets with sufficient accuracy to justify attack. The procedures for processing this type of target location can be streamlined. The FAIO at division level who works in the electronic warfare intelligence operation center (EWIOC) can coordinate with the G2 to have these targets routed directly from the EWIOC or combat electronic warfare and intelligence (CEWI) agency to the fire control element at the div arty TOC or in some cases directly to a firing unit. This eliminates the delay associated with processing at G2, FSE, and div arty.

Chapter 4
Exploiting Target Information

WHY
Timely target information is fundamental to effective fire support.

WHAT
This chapter describes:
the steps involved in target processing
evaluation ratings
integration of target information
dissemination of target information

4-1. General

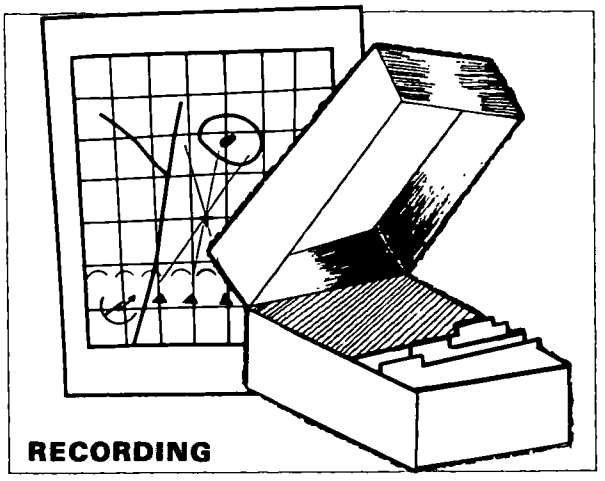
Two steps in the target acquisition cycle are discussed in this chapter, processing and dissemination of targets and target information. These two steps are inextricably linked. Useful targets can be produced from the collation of target information from many sources only if that information reaches the processing section in usable form before the potential target has the opportunity to move or harden itself so as to be less vulnerable or invulnerable to attack. In a similar manner, targets are useful only if the locations and descriptions are forwarded to the attacking agency in sufficient time.

4-2. Target Processing

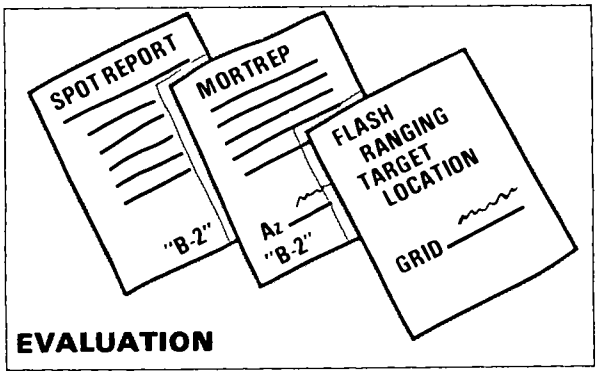
Target information procedures generally follow the techniques of intelligence information processing in FM 30-5. Target production is the step in the target acquisition cycle whereby target information or target indicators become targets. Target production is done by fire direction and fire support personnel at all levels. At locations other than the div arty TOC, this is a very informal procedure usually taking only a few seconds. Div arty is the only level within the field artillery staffed for formal target processing. The div arty TOC has both a target production section and an order of battle section that work together to develop targets. The fundamental principles of target processing are discussed below. Details of formal target

processing are in chapter 8. Processing consists of three operations: recording, evaluation, and interpretation.

Recording. Recording is the systematic arrangement of target information to facilitate its processing into targets. The recording function supports evaluation and interpretation, which are the decisive actions. Unless information is recorded quickly and economically, timely evaluation and interpretation may not be possible. The procedures used in recording should be simple yet adequate to handle the volume of information received.


RECORDING

Evaluation. Evaluation includes determining the *pertinence* of the information, *reliability* of the source and agency through which the information was derived, and its *accuracy*. Evaluation of information at the low echelon is a simple step compared to the procedures employed at higher echelons. This difference between higher and lower echelons is primarily because a large part of the information received by higher headquarters comes from indirect sources or agencies. The information collected by organic agencies at lower echelons is generally acquired by direct observation or actual contact with the enemy.



EVALUATION

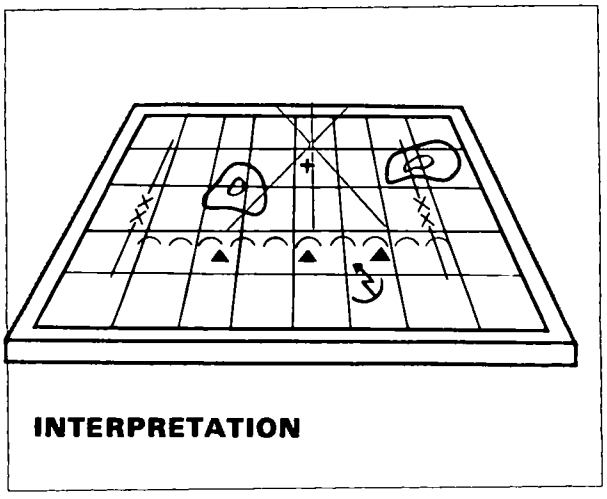
Pertinence. The examination of information for pertinence specifically determines whether or not the information is:

Pertinent with regard to the enemy or to the characteristics of the area of operations.

Needed immediately, and if so, by whom.

Of possible present or future value, and if so, to whom.

Reliability. The source of information and the collection agency are both evaluated for reliability. Reliability of a source or an agency is judged primarily on experience. The intelligence headquarters closest to the source or agency is ordinarily the best judge of the reliability of the source or agency. Consequently, a higher headquarters normally accepts the reliability evaluation of the lower headquarters and will consider only the reliability of the reporting headquarters.


INTERPRETATION

Accuracy. Accuracy means the probable

truth of the information. Judgment of accuracy is based on the answers to the following questions:

Is it possible for the reported fact or event to have taken place?

Is the report consistent within itself?

Is the report confirmed or corroborated by information from different sources or agencies?

Does the report agree or disagree in any way with other available information?

If the report does not agree with information from other sources or agencies, which one is more likely to be true?

The most reliable method of judging the accuracy of a report is by comparing it with similar information that may already be available. When possible, confirming or refuting information should be obtained through different agencies and from many sources.

Marked differences in the evaluation of the accuracy of information may occur between higher and lower echelons. The reason for this difference is the fact that higher echelons, which have more sources of information and intelligence than lower echelons, have a correspondingly greater opportunity to confirm,corroborate, or refute the accuracy of reported data. Regardless of the source, the accuracy of incoming information and intelligence is reevaluated at each echelon.

Evaluation Rating. The use of evaluation rating allows for quick identification and correlation of information so that usable intelligence can be derived. These ratings are *not* used as criteria for developing targets from target indicators or to evaluate targets. The ratings as presented only assist the targeting element to communicate with other intelligence agencies.

The evaluation of each item of information is indicated by a standard system. The evaluation of reliability is shown by a letter and the evaluation of accuracy by a numeral as depicted in the paragraphs to follow. Evaluation ratings are made at the lowest headquarters possible.

Evaluations of the reliability of source and agency are as follows:

A	Completely reliable.
B	Usually reliable.
C	Fairly reliable.
D	Not usually reliable.
E	Unreliable.
F	Reliability cannot be judged.

An "A" evaluation of a source is assigned under only the most unusual circumstances. For example, this evaluation may be given when it is known that the source has long experience and extensive background with the type of information reported. A rating of "B" indicates a source of known integrity. An "F" rating is assigned when there is no adequate basis for estimating the reliability of the source.

Agencies are ordinarily rated A, B, or C. However, when the source of an item and collecting/reporting agency are evaluated differently, only the lower degree of reliability is indicated.

Evaluation of the accuracy of an item of information is indicated as follows:

1	Confirmed by other sources.
2	Probably true.
3	Possibly true.
4	Doubtfully true.
5	Improbable.
6	Truth cannot be judged.

It must be recognized that the scale "1" to "6" does not represent progressive degrees of accuracy. The stress must be given to the literal rating represented by the numeric symbol.

If it can be stated with certainty that the reported information originates from a source other than that for already existing information on the same subject, it will be classified as "confirmed by other sources" and will be rated "1."

If no proof in the above sense can be established, and if no reason exists to suspect that the reported information comes from the same source as the information already

available on this subject, it will be classified as "probably true" and will be rated "2."

If essential parts of the report are confirmed by information already available, the procedure above will also apply to unconfirmed information contained in the report.

If the investigation reveals that the reported facts—on which no further information is yet available—are compatible with the previously observed behavior of the target, or if the known background of a person leads to the deduction that he might have acted as reported,the information will be classified as "possibly true" and will be rated "3."

Reported by unconfirmed information, the contents of which contradict the estimate of the development or the hitherto known behavior of the target, will be classified as "doubtful" and will be rated"4" as long as this information cannot be disproved by available facts.

Reported information that is not confirmed by available data and that contradicts the experience hitherto assumed to be reliable with regard to the development of a target or issue is classified as "improbable" and will be rated in category "5." The same classification is given to reported information that contradicts existing data on a subject originally rated "1" or "2."

If the investigation of a report reveals that a basis for allocating ratings "1" to "5" is not given, the reported information will be classified as "truth cannot be judged" and will be rated "6."

The statement that a report cannot be judged as to accuracy must always be preferred to an inaccurate use of the ratings "1" to "5." If there is no sound basis for a rating of "1" to "5," because of the complete absence of other information on the same target, the rating "6" has to be given.

Although both letters and numerals are used to indicate the evaluation of an item of information, they are independent of each other. a completely reliable agency may report information obtained from a completely reliable source which, on the basis of other information, is judged to be improbable. In such a case, the evaluation of the information is *A-3*. A source known to be unreliable may provide raw information that, when confirmed by reliable sources, is accepted as accurate information. In such a case, a report is evaluated *E-1*. A report evaluated *F-6* may be accurate and should not be arbitrarily discarded.

Information disseminated to higher, lower, and adjacent units should contain the evaluation for each item of information.

The S2 must understand this system of evaluation and interpretation to assist him in processing information received from other headquarters.

Interpretation. The processing of information continues with interpretation, which consists of three steps—analysis, integration, and deduction.

Analysis. Analysis is the sifting and sorting of evaluated information to isolate significant elements with respect to particular types of targets. Analysis requires good judgment and a thorough knowledge of the principles of military operations, the characteristics of the area of operations, and the enemy situation, to include enemy doctrine and past practices.

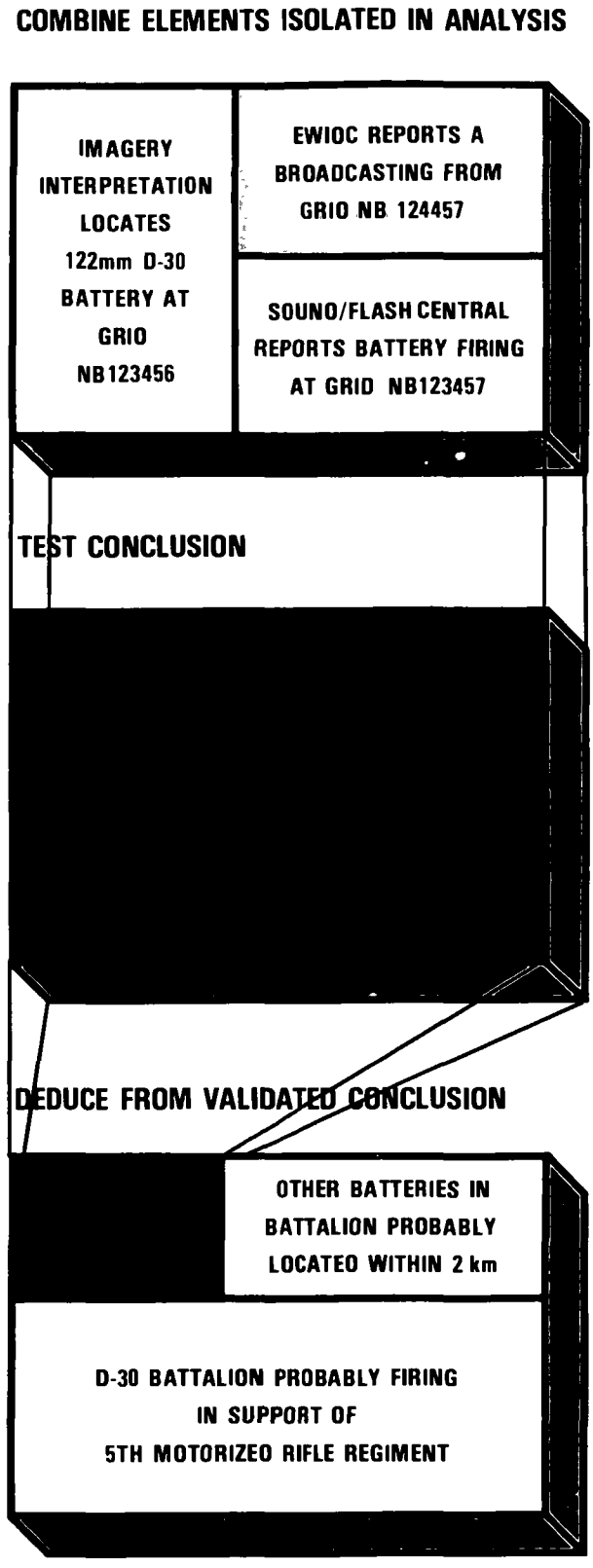
Integration. Integration is the combination of the elements isolated in analysis with other known information to form a logical picture or hypothesis of possible or probable target locations. In the process, more than one hypothesis may be formulated, based upon existing intelligence.

Integration, particulary the development of hypothesis, requires the same good judgment and thorough background knowledge essential to making a good analysis.

After they are formulated, all hypotheses are analyzed and tested. Analysis of a hypothesis includes determining the indications that should exist if the hypothesis is a valid one. Testing includes verifying the existence or nonexistence of these indications within the limitations of available time and means.

Integration may be a mental process completed in a few moments, or it may be a lengthy process involving the collection of a large volume of additional information.

Deduction. The last step in the interpretation of information is deduction. Here meaning is deduced from the hypothesis developed; it is then tested and considered valid as a result of integration. Deduction is designed to answer the question, "What does this information mean in relation to the area of operations and the enemy situation?" The resulting answer provides a useful conclusion that can serve as a basis for determining present and future target locations.



4-3. Dissemination of Target Information

The rapid movement of target information from the collection source or agency to the place(s) where it can be used has proved to be more difficult in the field than it appears. Timeliness in dissemination is the most difficult problem to overcome because of the fleeting nature of most targets. The sources and agencies under direct control of the field artillery, whose primary function is target

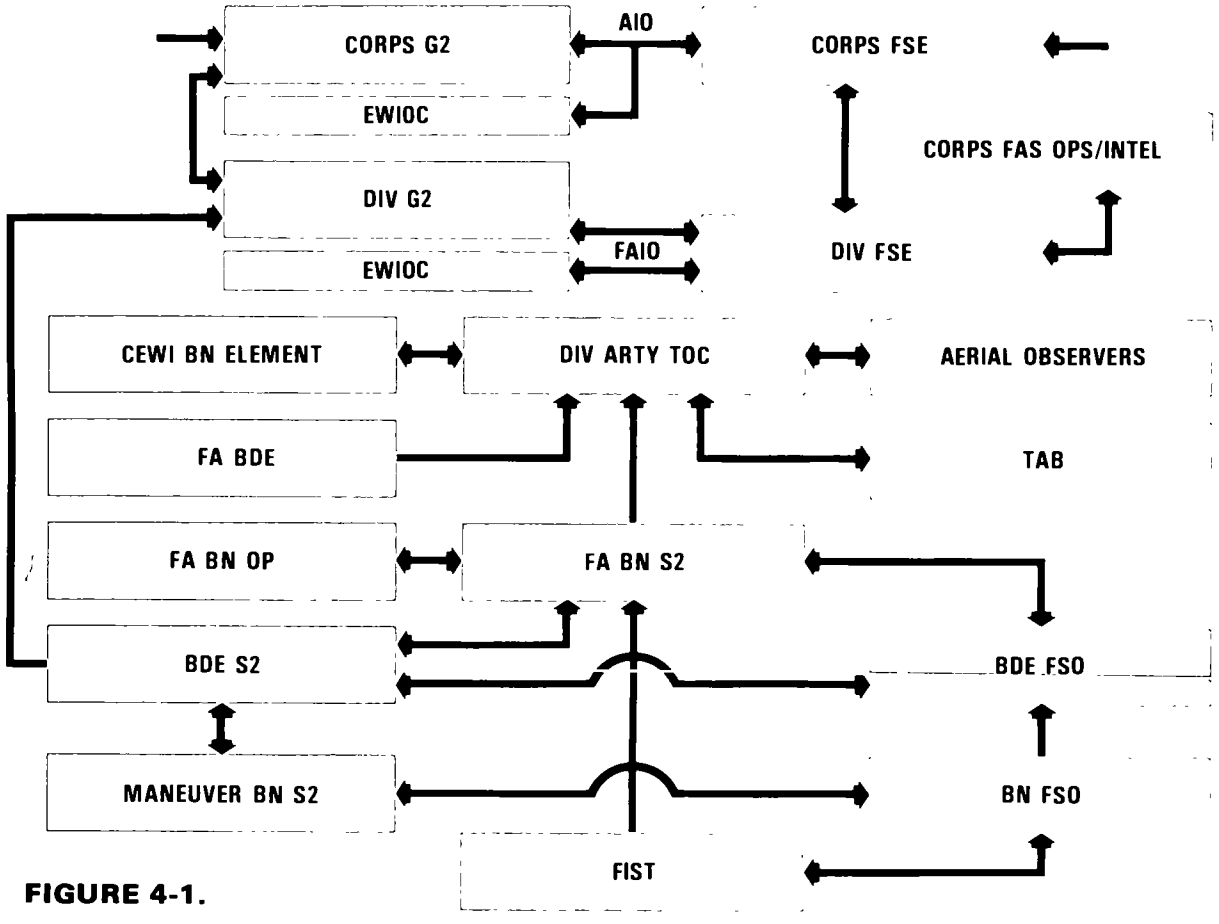


FIGURE 4-1.

acquisition, have few problems. The sources and agencies know before they collect the information exactly where it is to go and are usually provided a primary and at least one alternate means of communication to get it there. On the other hand, information forwarded through all-source information channels usually comes from agencies and sources whose primary function is to collect information to assist the maneuver commander in making tactical decisions. The field artillery cannot expect the G2 personnel at corps and division level to take the time to make a decision related to their secondary function until their primary activities are completed. This means that little or no target information will come from the G2 during critical periods of extreme activity. To overcome this problem, the field artillery has a representative, the field artillery intelligence officer (FAIO), who works within the G2 area for the FSCOORD. Sorting the myriad of information passing into the G2 for target information and then providing it to the FSE for use and further dissemination is his primary function. Figure 4-1 shows the flow of target information. When time does not permit the dissemination of information, as depicted, then a quick judgment must be made to determine who, if anyone, should be given the information. The overriding consideration in making this judgment is the successful accomplishment of the force mission. Information likely to be critical to the accomplishment of the force mission must be transmitted to where it is needed. Other information can wait its turn in the logical priority of events.

Chapter 5
The Role of Target Acquisition

WHY
TA is a principal means for developing target information during battle.

WHAT
This chapter describes:
the need for target acquisition
target acquisition responsibilities
target acquisition on the battlefield

5-1. A Target Acquisition System

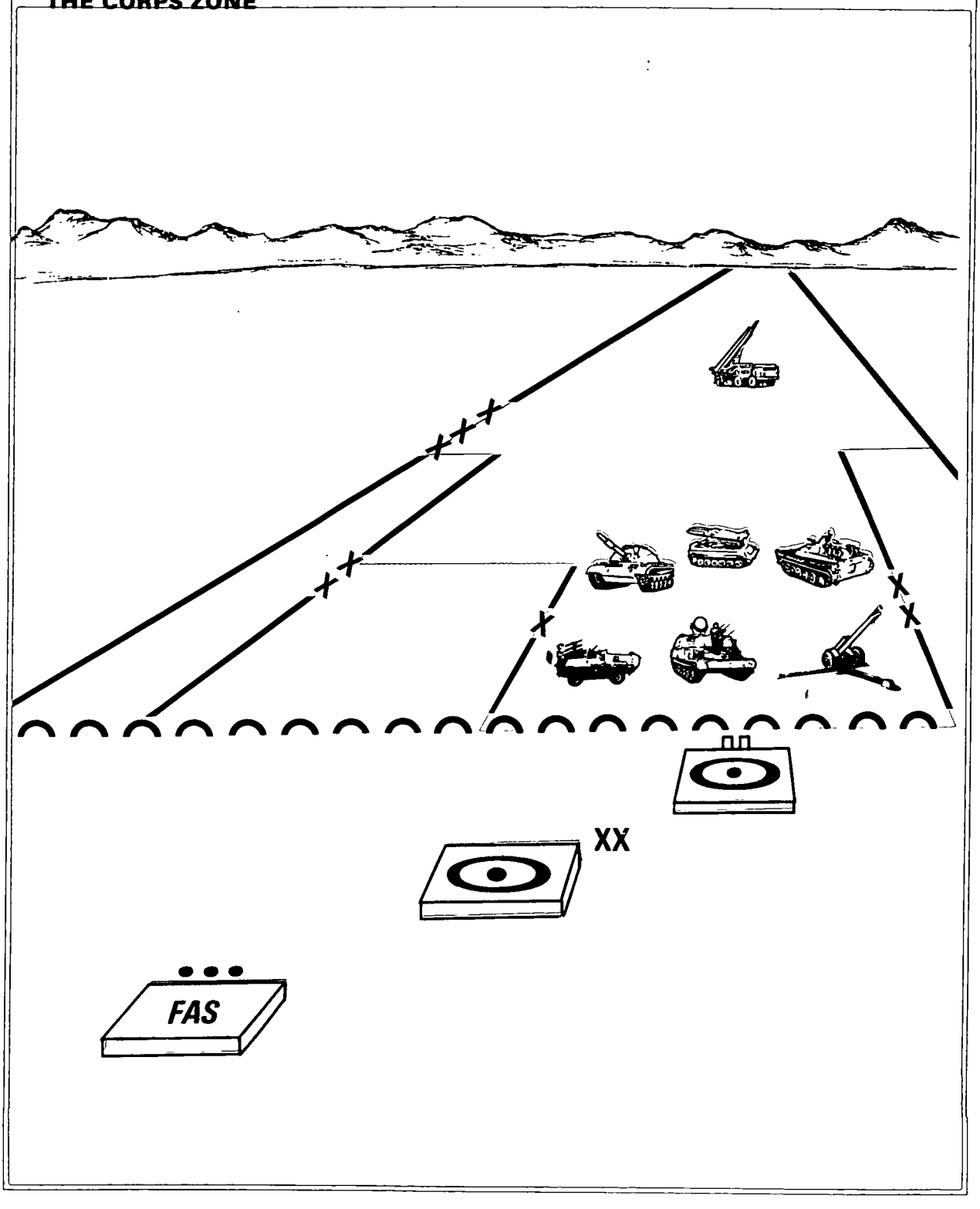
A target acquisition system consists of the equipment and personnel necessary to perform timely detection, identification, and location of ground targets in sufficient detail to permit the effective attack, or to orient or cue other devices or intelligence sources on a specific area or areas. To provide a standard method of describing ground locations, areas, and boundaries, the NATO Forces have concurred in the provisions of STANAG No. 2029, *Method of Describing Ground Locations, Areas, and Boundaries,* which is contained in its entirety in appendix I.

5-2. The Need for Target Acquisition

Success on the battlefield is contingent upon the effective application of combat power. The application of combat power is influenced by many factors including command and control, communications, logistics, intelligence, terrain, weather, mobility, training, morale, and esprit de corps. Its two physical components are, however, maneuver and firepower.

TA is absolutely essential for the effective employment of indirect fire weapons such as field artillery cannon and missiles, naval gunfire, and most air delivered fires. Without target data, indirect fire weapons are of limited value.

FIGURE 5-1. FA UNITS RESPONSIBLE FOR TARGET ACQUISITION WITHIN THE CORPS ZONE



To effectively use the available firepower, fire support personnel at all levels must have access to all target information, determine which targets are most critical to the accomplishment of the commander's mission, and then direct the attack of those targets by the best available means at the most opportune time.

5-3. TA Responsibilities

The FA is responsible for coordinating all fire support on surface targets. Inherent in this responsibility is the inseparable additional responsibility to locate targets. This does not mean that only the FA is involved in TA. Effective TA relies upon input from all individuals, units, and resources on the battlefield or having access to battlefield information. This presupposes that those who locate targets, or have targeting information, will report it.

DS Battalion. To effectively perform its mission, the direct support (DS) FA battalion must be able to acquire targets within the supported unit's zone. Many targets will be of a close support nature reported by forward observers of the fire support team (FIST); the DS battalion will frequently have 1 or more weapon locating radars attached or under its operational control, giving it the ability to locate mortars and artillery, which can be attacked or reported to division artillery for attack. The DS battalion S2, in close coordination with the S3, is responsible for staff supervision of the battalion TA effort.

Div Arty TOC. The div arty TOC is responsible for supervising the counterfire effort of the division, and therefore has the inherent responsibility of locating and correlating counterfire targets (counterfire being the attack of hostile indirect firing systems). The TOC uses all sources of targeting information, organic and nonorganic, to locate targets. Although the major targeting effort of the TOC is directed toward counterfire targets, it is interested in other targets as well.

FA Brigade. The FA brigade headquarters organization includes personnel to manage counterfire; however, with the exception of four air observers, it has no target acquisition capability.

Corps FAS. The corps field artillery section uses, primarily, corps level and higher intelligence sources for its target acquisition effort. TA at corps level will usually be oriented toward deep targets outside the range of division weapons and TA devices.

5-4. TA on the Battlefield

Technology has made the battlefield extremely lethal. Anything that can be located can be destroyed. To survive under these threat conditions, one must find and attack the enemy before he has the opportunity to find and attack you. This means looking earlier, and beyond the first hill, for an enemy who will use deception and the terrain to hide his presence and intention.

TA Before the Battle. Target acquisition should be employed before the battle begins. If we are able to locate and destroy critical elements of the enemy's combat power before they can be employed, the result is much less costly than locating and destroying the same elements after they have commenced operations and inflicted substantial damage on us. Locating passive enemy elements is not an easy job. There are fewer overt signs to detect. TA devices and systems organic to the FA are particularly handicapped by the enemy's inactivity because:

Artillery and mortar locating radars cannot find nonfiring weapons.

Sound and flash bases must have those particular telltale signatures (sound and flash) to locate weapon positions.

Moving target locating (line-of-sight) radars are less likely to locate targets from the few movements associated with a passive situation.

Ground observers are mostly effective for locating close-in targets during active offensive and defensive situations.

The aerial observers can usually see deeper because of their altitude than ground observers and cover more lateral area because of their mobility, but they are also attuned to locating close-in active targets.

Organic FA TA assets must therefore be supplemented through the use of all other sources of intelligence during both active and passive situations, but particularly during passive situations. Useful target intelligence gathering assets belonging to national and defense intelligence agencies, military intelligence (including EW), the USAF, and maneuver forces must also be used to the maximum extent possible.

TA During the Battle. During the battle, targets must be acquired for both close support and general support.

Close Support. Target acquisition for close support fire generally presents no major problem during either offensive or defensive operations. There are many eyes, ears, and surveillance devices along the forward edge of the battle area that are capable of reporting close-in targets.

General Support. General Support (GS) includes counterfire, interdiction, suppression of enemy air defense systems (SEAD), and augmenting fires. Target acquisition for general support is more complex than TA for close support, since GS targets are normally out of the visual acquisition range of frontline forces. Information from all sources of intelligence will be extremely valuable in locating many general support targets; however, the target acquisition battery organic to division artillery has the most readily accessible assets for locating counterfire targets. The TA battery is primarily designed, organized, and equipped for the counterfire function. Crater analysis reports (SHELREP and MORTREP) from combat, combat support, and combat service support personnel at all locations on the battlefield will also provide another means to locate counterfire targets.

Chapter 6
Targeting at Corps

WHY
The intelligence resources of the corps can provide information concerning lucrative targets that cannot be detected by systems at division.

WHAT
This chapter describes:
corps targeting
target intelligence flow

6-1. Introduction

Corps intelligence collection and processing efforts are focused at the electronic warfare/intelligence operations center (EWIOC). Intelligence information from national/strategic assets, from theater collection systems, from Navy and Air Force assets, from the corps and division intelligence organizations, from maneuver battalions, and from target acquisition systems of the field artillery are combined at corps to provide the corps commander a complete picture of the battlefield.

The corps commander needs targeting information to use against enemy forces beyond the range of division assets; to use against enemy forces threatening survival of the corps by use of nuclear weapons; and to use against buildups of enemy forces beyond the capabilities of divisional assets to neutralize.

6-2. Corps Targeting

Targeting at corps takes two forms. First, data may arrive at the corps electronic warfare/intelligence operations center (EWIOC) described in sufficient detail to pass to the corps FSE as a target. Second, a conglomerate of information may be analyzed resulting in target production (fig 6-1).

The corps will employ target collection assets against enemy elements generally in the zone 15-100 km from the FEBA—the zone beyond the capability of divisional assets.

FIGURE 6-1. ANALYZING TARGET INFORMATION AT CORPS

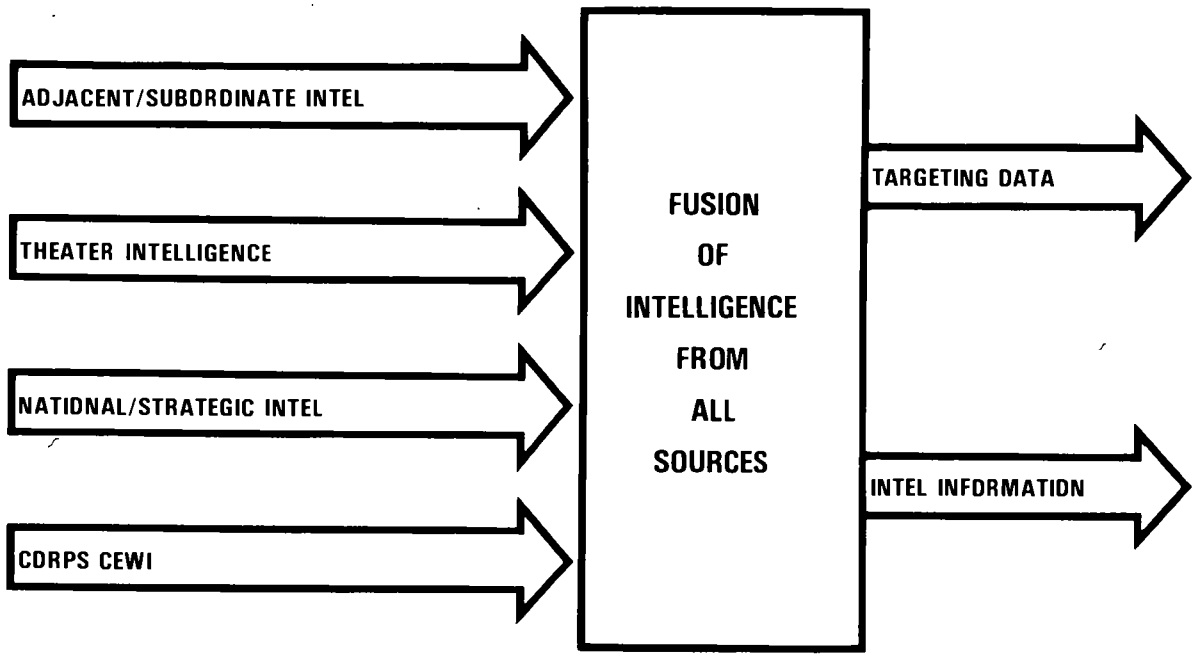


FIGURE 6-2. CONSIDERATIONS IN TASKING CORPS INTEL ASSETS

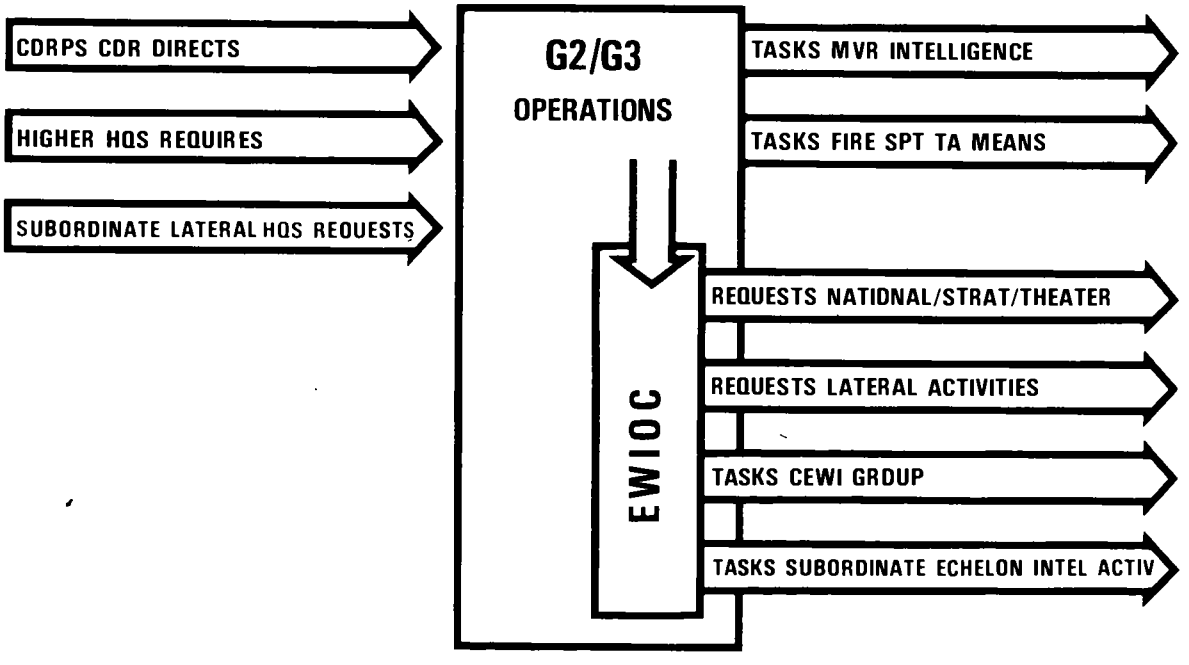
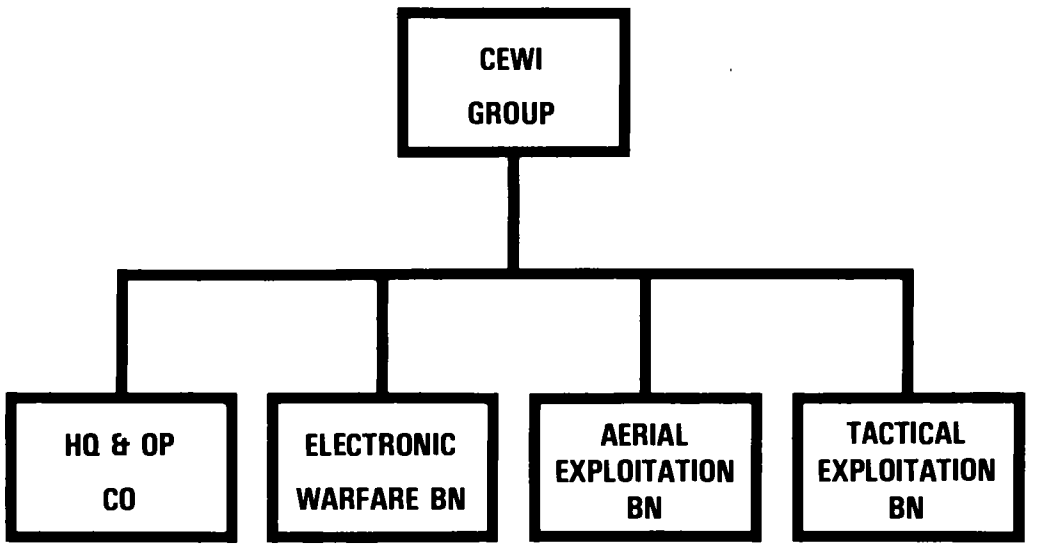


FIGURE 6-3. BASIC CEWI GROUP ORGANIZATION



Weapons available to the corps include cannon battalions of field artillery brigades not assigned missions supporting divisions; Lance battalions; air forces' fighters and bombers; and naval gunfire. Theater weapons such as Pershing and long range bombers may be used if required. The range of corps weapons and the speed of enemy force relocations are critical considerations in the tasking of corps intelligence assets (fig 6-2).

Basically, the corps intelligence assets consist of a combat electronic warfare/intelligence (CEWI) group of three basic battalions plus a headquarters operations company to provide support to the G2 and group administrative functions. Detailed organization is contained in appendix E.

The electronic warfare battalion, with its greater resources, expands the electronic environment to enable the commander to "see" more of the battlefield. It operates against enemy long-range communications and against command and control communications and radars of enemy forces, and augments the EW assets of the divisional CEWI battalion. The battalion has jammers that will be engaged against similar enemy assets through the use of airborne platforms for listening and locating.

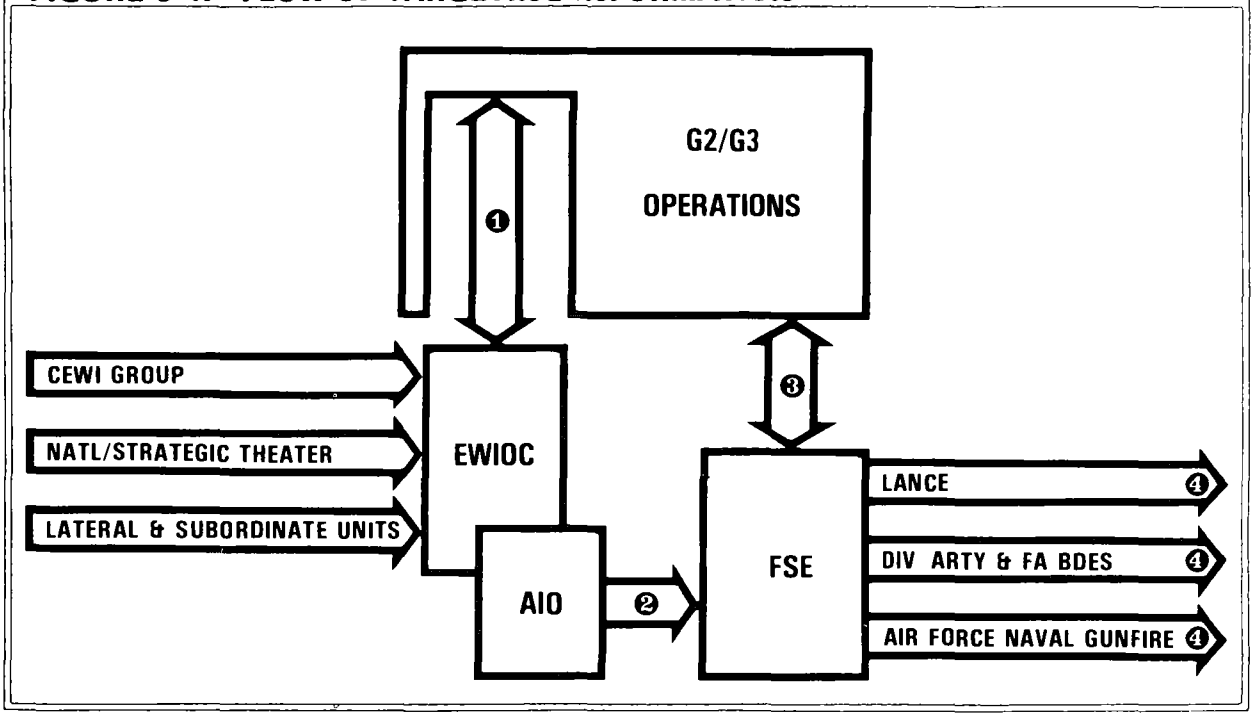
The aerial exploitation battalion will operate airborne platforms for photo, radar, infrared, electronic surveillance and locating, and radars and communications jamming.

The tactical exploitation battalion will provide interrogators and technical intelligence analysts to exploit information gained on enemy forces and provide operations security measures for our own forces.

6-3. Target Intelligence Flow

The corps G2 has available in the CTOC a section of trained analysts that put together the picture or template of enemy forces necessary to estimate enemy capabilities and

FIGURE 6-4. FLOW OF TARGETING INFORMATION



possible intentions. Targets result from data inputted for analysis and as a direct result of that analysis.

The corps EWIOC provides the personnel for analysis of intelligence information received from all assets available to the corps, for tasking intelligence collection assets and jammers organic to the corps, and for passing requirements for information to lateral and higher headquarters for integration into their intelligence collection plans. Intelligence of targeting value is passed to the FA assistant intelligence officer for action (fig 6-3).

The AIO, who is assigned to the corps field artillery section, is key to the targeting process. He works in the EWIOC area of the corps TOC, expediting the passing of targets to the FSE; especially important to the force is the AIO's expediting the flow of information relating to the high priority target requirements of the corps and division commanders.

The AIO also provides liaison between the fire support coordinator and the G2 to insure that intelligence production and collection personnel have current targeting requirements.

The corps operations and intelligence elements are fused in the CTOC, working so closely together that the G2/G3 duty officers are continually abreast of both operations and intelligence actions that are ongoing. This results in de facto coordination to allow both intelligence and operations personnel to pass targets directly to the FSE.

Chapter 7

Targeting at Division

WHY
The division can develop target information from a variety of sources.

WHAT
This chapter describes:
FA-intelligence coordination for targeting
processing and dissemination of intelligence
techniques to speed the flow of target information
high priority targets

7-1. Introduction

The threat, although awesome, can be countered and defeated by our use of superior tactics, weapons, intelligence, and target acquisition. Through the judicious use of all our intelligence and target acquisition collection agencies, we must detect the enemy before he attacks us so that our maneuver and fire support units will be able to make best use of their tactics and weapons.

Division tactical intelligence units possess some of the most important collection capabilities of the Army. The information that they obtain by listening to and locating enemy radios and radars; interrogation of prisoners of war, patrols, and observers; and analysis of the battlefield provides critical information for tactical decisions by division commanders and for the attack of targets by maneuver and fire support elements.

The primary mission of tactical intelligence units is to provide intelligence support to the force commander through the exploitation of information gained on the enemy. The commander has the final authority concerning the priorities for collection and processing of intelligence information except in certain circumstances as prescribed by AR 381-3. In view of this, it is recognized that field artillery units are only *one* user of division intelligence products.

Field artillery target acquisition systems such as weapon locating radars and sound ranging equipment are limited to acquiring the enemy after he has begun firing. Intelligence units have the capability to detect, identify, and locate enemy units *before* they fire. Procedures and techniques for the use of intelligence units as a responsive target acquisition asset for fire support are discussed in this chapter.

7-2. FA-Intelligence Coordination For Targeting

Most of the coordination between field artillery and intelligence personnel will take place in the division main command post. Key personnel in this coordination effort are:

The ACofS, G3.

The ACofS, G2, and senior tactical intelligence officer (or order of battle warrant officer) located in the SI secure area of EWIOC.

The assistant fire support coordinator (AFSCOORD) in the fire support element (FSE) and his field artillery intelligence officer (FAIO).

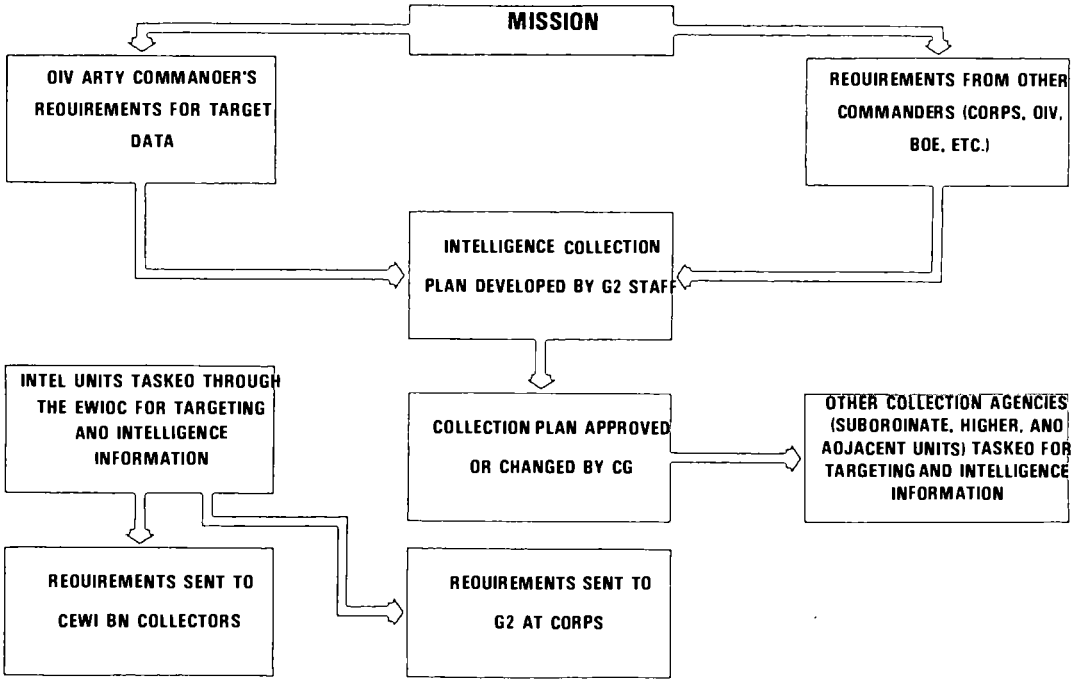
The CEWI battalion commander.

The physical location of these personnel and their staff relationships will vary somewhat from division to division; therefore, the procedures described here for coordinating matters of mutual interest to the field artillery and intelligence personnel are provided as a guide.

7-3. Collection of Targeting Data

The first step in acquiring timely, accurate targets from intelligence assets is for the AFSCOORD or FAIO to state to the G2 the field artillery commander's needs for targeting information. The procedure for processing this request and other intelligence collection requirements is shown in figure 7-1.

FIGURE 7-1. FLOW CHART FOR DEVELOPING COLLECTION PLAN



Planning for the collection of targeting and intelligence information is a continuous process. As the battle changes, so will the requirements for information and the capabilities to collect it.

There may be conflicting requirements for intelligence collection assets from the field artillery and other requesters. Therefore, priorities for the collection of information are determined by the force commander. As intelligence needs become apparent, requests are passed to the G2 for collection action. The following are examples of the artillery commander's specific intelligence needs:

Where are the enemy nuclear capable weapons positioned?
Where are the enemy 122-mm multiple rocket launchers?
Where are enemy countermortar/counterbattery radars located?
Where are the enemy division CP's?

The intelligence collection requirements recommended by AFSCOORD will be considered by the G2 along with the requests for information submitted by other units and the division staff, based upon the division commander's specific intelligence requirements. Changes in the mission will, of course, cause the requirements for information to change.

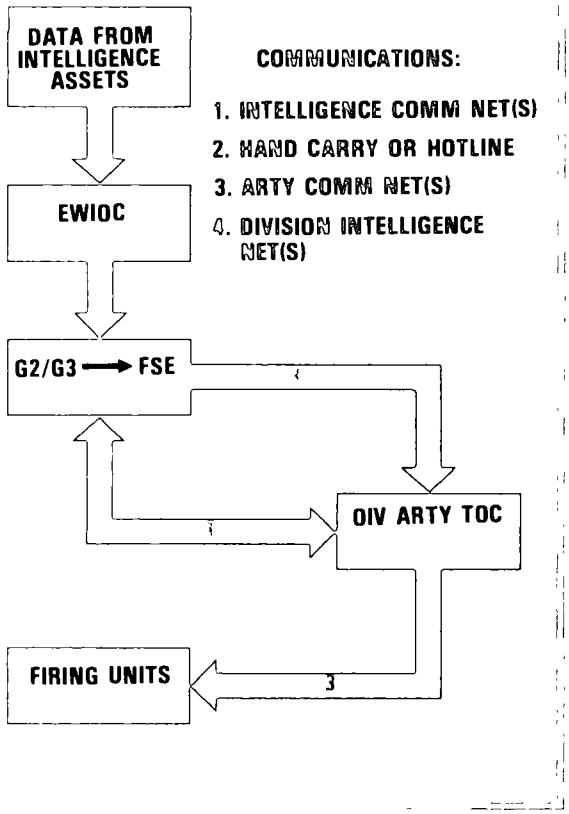
7-4. Processing and Dissemination

One of the most difficult tasks for the G2 is to establish a system in which all the pertinent information is anlyzed and disseminated on a timely basis. Targeting data for the field artillery is no exception. The discussion of this complex process will be limited to the intelligence-acquired information that enters the EWIOC at the division main command post. This information may have been obtained from one of the sensors or other collectors organic to the division CEWI battalion, or it may have been obtained from other intelligence assets at corps or higher level.

The information sent to the EWIOC often will be classified. In many cases, the data will be special intelligence. Because of this, entry to the EWIOC requires a clearance allowing access to special intelligence. The number of SI positions (billets) within a division is limited to key positions on the division staff and on the staffs of subordinate headquarters, to include the AFSCOORD and FAIO.

The normal flow of data from the intelligence collector to division artillery is shown in figure 7-2. (Fig 7-3 shows data flow expedited.)

FIGURE 7-2. NORMAL FLOW OF TARGETING DATA TO THE FSE



The data that enters the EWIOC directly from intelligence assets may not be in sufficient detail to provide a target suitable for immediate attack by fire support means. Instead, the intelligence analyst may have to combine data with information from other sources available to develop intelligence and predict targets keyed to the EEI and OIR of the commander.

Often the analysts will be able to develop targets for attack by field artillery at the same time they are developing intelligence. This is why it is critical that the field artillery's needs for targeting be clearly stated in the G2 collection plan.

It is important that procedures be established so that the security procedures within the special intelligence (SI) secure area are not so stringent that they paralyze the timely dissemination of priority targeting data.

The integration and use of all-source intelligence to include signal intelligence (SIGINT) is not an activity limited to personnel in the SI secure area at the division main command post. The div arty TOC needs targeting data as well as fully developed targets. This headquarters is manned with personnel having sufficient experience and training to collate targeting data and predict the location of targets that can be attacked with field artillery. The mix of targets developed by the analysis and production section at division with locally developed targets at div arty will increase the responsiveness of fire support.

Analysts at all levels should be cautioned that targets developed from a single source, such as SIGINT stations, may not be as reliable as targets predicted by combining two or more reliable sources.

The field artillery intelligence officers assigned to the FSE provide liaison with personnel in the G2/G3 elements and EWIOC. The analytical process takes time, but the more information that is collected and analyzed about a subject, the more reliable the product becomes. The tradeoff between timeliness and reliability (accuracy and completeness) of the intelligence or target location must be kept in balance. A thoroughly rigorous analysis is useless when the results arrive too late for action to be taken. Similarly, a timely analysis that contains both errors of fact and errors of inferences can lead to disastrous results. The timeliness of intelligence production clearly is one of the most difficult tasks an analyst faces.

7-5. Techniques to Speed the Flow of Target Information

The following three measures can be taken at division level to bypass the potential delays in disseminating targeting data to the field artillery if the division commander desires to do so. The tradeoff between timeliness and accuracy needs to be considered when these techniques are applied.

Priority. Predetermine the type of targets that are to be passed immediately to the FSE for fire missions. The perishability of the information will be a prime factor in predetermining these targets. For example, the division commander may decide that highly mobile artillery and air defense weapons such as 122-mm MRL and SA-6's must be attacked at once.

Timely Transmission. Emphasize speed in transmitting target data from the EWIOC to the G2/G3 element in the TOC and then to the FSE and div arty TOC.

Abbreviated Target Data Flow. Provide the high-priority predeter-

FIGURE 7-3 ABBREVIATED FLOW OF TARGET DATA

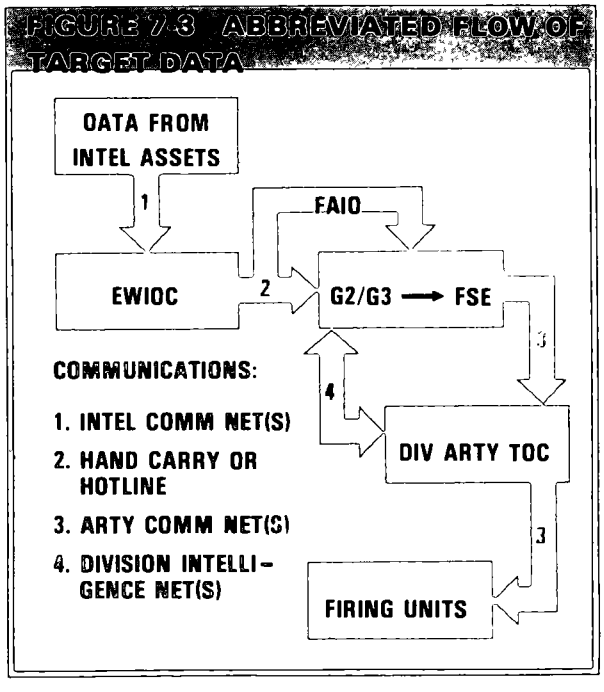
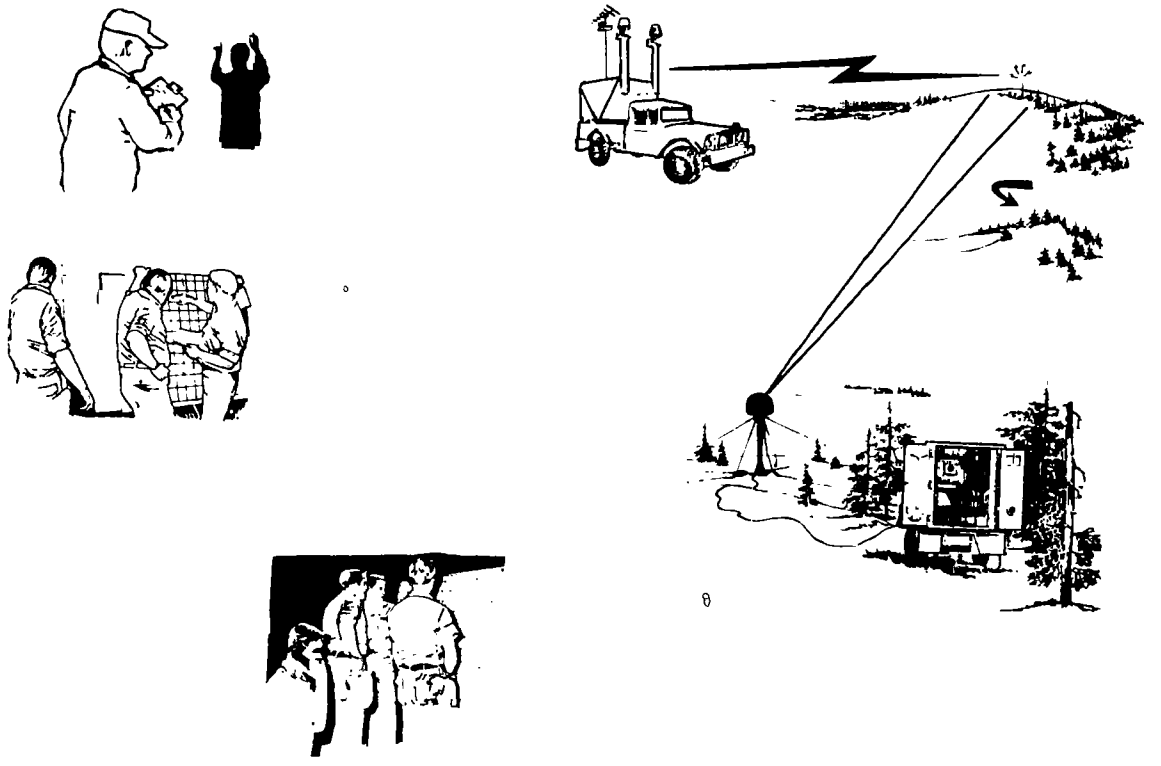


FIGURE 7-4. DEVELOPING TARGET LOCATIONS



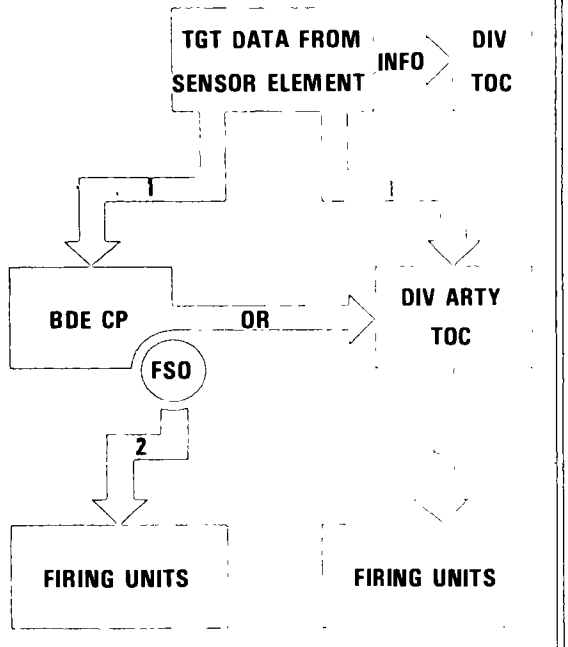
mined targets from the EWIOC to the FSE and the G2/G3 TOC element *at the same time,* as shown by the schematics in figure 7-3. The FAIO plays an important role in the timely transmittal of targets from the EWIOC to the div arty TOC. The G2 and G3 must approve this flow of targeting information.

Figure 7-4 demonstrates how a target location might be developed by use of multiple sources of target information and intelligence. The target may be attacked based on a sole source of intelligence (IPW report) or at any other stage of development depending on the tactical situation.

7-6. High Priority Targeting

In exceptional situations, the division commander may determine that the rapid dissemination of information is so vital to mission accomplishment or survivability of one of his subordinate units that he authorizes the direct reporting of time or threat critical information. For example, a brigade performing a critical mission for the division could receive information as shown in figure 7-5.

FIGURE 7-5. PRIORITY TARGETING DATA FLOW



For the event-triggered reporting of information, the sensor element can enter a designated communications net of the supported unit. This will require that the supported unit provide the appropriate cryptographic keying material for designated nets.

Much of the information passed to the brigade CP in the exceptional situation could be targets that require attack by field artillery. In this case, the division commander will authorize the direct dissemination of information to the concerned brigade CP or div arty tactical operations center. The procedures for releasing the information are based on guidance issued in advance by the EWIOC. A listing of predetermined targets for rapid dissemination at the brigade level should be developed.

The following factors should be considered to insure rapid dissemination of information to the appropriate user.

- Precisely identify the nature of the information (target) desired.
- Coordinate with the division EWIOC for the direct dissemination of information by the sensor elements.
- Disseminate orientation (cuing) information to the intelligence collection agency to reduce the search time for listening and locating stations working against jammers.
- State the critical time frame during the operation in which the information is needed.
- Establish necessary communications reporting channels between the designated sensor elements and the users.

Chapter 8

Targeting at Division Artillery

WHY
The div arty TOC is the focal point of targeting activity in the division, and the linchpin of field artillery support operations.

WHAT
This chapter describes:
targeting requirements
terminology
targeting element
target production section
order of battle section
a team effort

8-1. General

The focal point for field artillery targeting is the division artillery tactical operations center (TOC). The div arty TOC combines the *management of targeting and target attack* in a common facility to provide efficient use of available field artillery resources. This chapter concentrates on the targeting function. A full discussion of the div arty TOC, its organization, and functions is found in FM 6-22, appendix A.

8-2. Targeting Requirements at the Div Arty Level

Targeting requirements are driven by the division commander's guidance and field artillery doctrine. The div arty TOC is the only targeting facility on the battlefield that is specifically charged with the responsibility of locating the counterfire target. The serious threat posed by enemy artillery causes emphasis to be placed on counterfire targeting in the div arty TOC. Other targets are developed in accordance with priorities. Div arty targeting personnel are actively engaged in the refinement of data for targets that present the greatest threat to the division and those that can be effectively attacked by field artillery. These data must insure accurate locations of targets, timely targets, and well identified targets.

Location Accuracy. Targets must be located with sufficient accuracy to achieve the required level of damage with the minimum expenditure of ordnance. Ammunition cannot be wasted, particularly in our outnumbered environment. By minimizing expenditures during target engagement, the exposure of friendly weapons to enemy target acquisition devices is reduced accordingly.

Timeliness. There are few guarantees on how long a target will remain stationary. Many targets require immediate engagement. Multiple rocket launcher positions must be located and attacked at the earliest possible opportunity. Once they have fired, they will likely be moved.

Identification. The target must be sufficiently identified to aid in deciding the most efficient method of engagement. Targeting personnel must furnish the best possible description of the target.

Through good training and the systematic use of all available information, the enemy *can be found*. The targeting element is the one agency specifically organized to find the enemy so that effective field artillery fires can be delivered against him.

8-3. Terminology

The following terms are used throughout this chapter.

Target Production. Target production is the processing needed to develop a target. In its simplest form, target production could be the mere passing of combat information from a known, accurate, and reliable source to the fire control element for attack. In its more difficult form, it is the complex synthesis and analysis of data from diverse sources into a target location sufficiently accurate to permit attack.

Target Indicator. A target indicator is a possible target that requires further correlation or additional information before it is considered a target. For instance, if there is doubt as to whether or not a location is occupied or is perhaps a dummy position, it is a target indicator.

Target Selection Standards. Criteria by which all targeting data must be evaluated to determine if the data will lead to the production of a valid target are target selection standards. Target selection standards are dynamic—they are changed as the enemy situation changes to reflect the most current knowledge of the enemy. Since every location associated with each bit of information cannot be fired upon, these standards allow the target production personnnel to distinguish between a target and a target indicator. This distinction must be made for several reasons.

Because the enemy has the capability to deceive target locating sources, standards of acceptance are required for source data. For example, a well camouflaged dummy air defense site, seen either by an aerial observer or photograph, may look real. The sources must be considered along with what is known about the enemy at the time of the sighting or photo mission before the judgment can be made as to whether or not a target exists.

When it has been determined that the enemy is using deception as a tactic, the effect of his operations on our targeting efforts must be evaluated to determine whether target selection standards should be changed. Thus, selection standards are established in order to streamline and speed the efforts of targeting personnel. Indicators are tested and retested, each time more data are added, and when the indicator shows reasonable evidence that its location is accurate and actually occupied, it is declared a target.

Target selection standards are normally presented in the form of sources that are at that time considered as either targets or target indicators. A location from a weapons locating radar, for example, is almost always considered to be a target, because the radar cannot be deceived. A target indicator, on the other hand, might be sound ranging if the

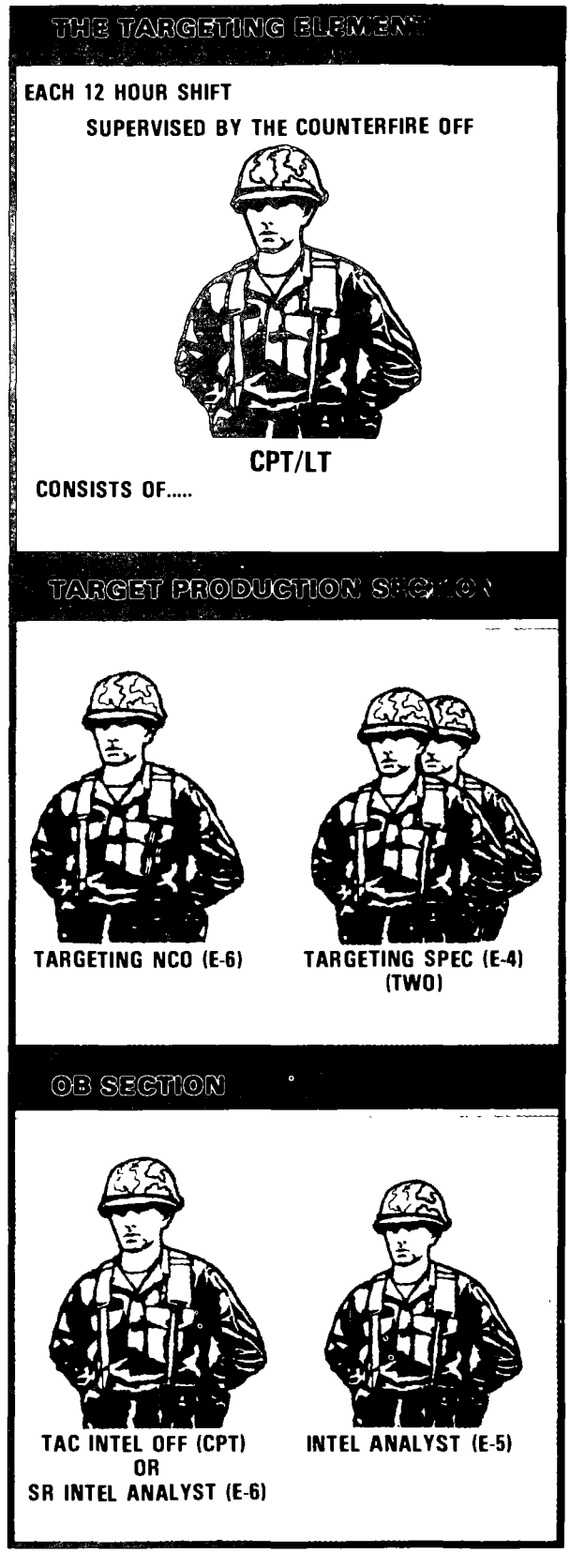
enemy is using explosives to simulate weapons firing.

Target Prediction. Target prediction is a "best guess" about a target location. Targeting personnel must be thoroughly familiar with enemy organization and tactics. When this knowledge is combined with careful terrain analysis and close examination of available information, logical and accurate conclusions can be reached about possible target locations. Likely locations of various enemy positions are constantly analyzed and targets are "predicted." While the predicted target location does not stand the target selection standards test discussed earlier, it often is the best available data and must be used for fire planning purposes.

8-4. Targeting Element

Targeting functions in the div arty TOC are performed by the targeting element, which consists of a target production section and an order of battle section. The target production section is composed of personnel from the target acquisition battery processing section. Each 12-hour shift consists of a targeting NCO (E7 or E6) and two targeting specialists (E4). The order of battle section is manned by military intelligence personnel and each shift consists of either a tactical intelligence officer (CPT) or a senior intelligence analyst (E6) and an intelligence analyst (E4). Both elements are supervised by the counterfire officer (CPT), who is directly responsible to the S3 or operations officer.

Targeting data obtained from all sources of intelligence will either produce targets or target indicators based on the target selection standards. Target indicators may provide the general location of a possible target and can be correlated with other targeting data to produce targets. When the general location is known, the TOC cues target acquisition and requests intelligence agencies to pinpoint the location to sufficient accuracy to justify attack.



The targeting element has the following responsibilities:

- Develops targets and target indicators.
- Passes targets to the fire control element of the TOC.
- Predicts and refines target data.
- Recommends positions for target acquisition assets.
- Passes target data to appropriate agencies.
- Maintains current enemy artillery situation and order of battle.
- Maintains order of battle map.
- Maintains target production map.
- Maintains current target file.
- Requests damage assessments.
- Monitors and operates in the division intelligence net (FM) and the target acquisition battery command net (FM).

The duties of key personnel are outlined below.

Counterfire officer: Supervises the targeting element and the fire control element of the TOC; establishes target selection standards; directs or coordinates the engagement of targets; and insures compliance with the commander's attack guidance.

Tactical intelligence officer: Provides current enemy order of battle information; predicts and produces targets; supervises the order of battle section; and insures proper posting of OB map and OB files.

Targeting NCO: Supervises the target production section; insures proper maintenance of target file; insures proper posting of data on target production map; and supervises the correlation of target data and production of targets.

Senior intelligence analyst: Same as the tactical intelligence officer.

Intelligence analyst: Performs recording and plotting tasks as directed and predicts and produces targeting information.

Counterfire specialist: Performs recording and plotting tasks as required; maintains target file; and evaluates targeting information.

8-5. Target Production Section

Target Production Map. One basic tool for this section is the target production map. This map is on a scale of 1:50,000 and should be physically located next to the order of battle map (para 8-6) to facilitate the correlation of targeting data. The map depicts the current boundaries, location of friendly target acquisition devices, the counterfire reference grid, ray overlay, all counterfire target indicators and, as a minimum, targets in categories 1, 2, and 3. It is used to visually correlate target indicators to produce targets. Likewise, this map is used for orienting and positioning target acquisition devices and intelligence agencies capable of obtaining necessary additional information to produce targets. The counterfire specialists post the target production map and maintain all related documents in the

TARGET PRODUCTION MAP

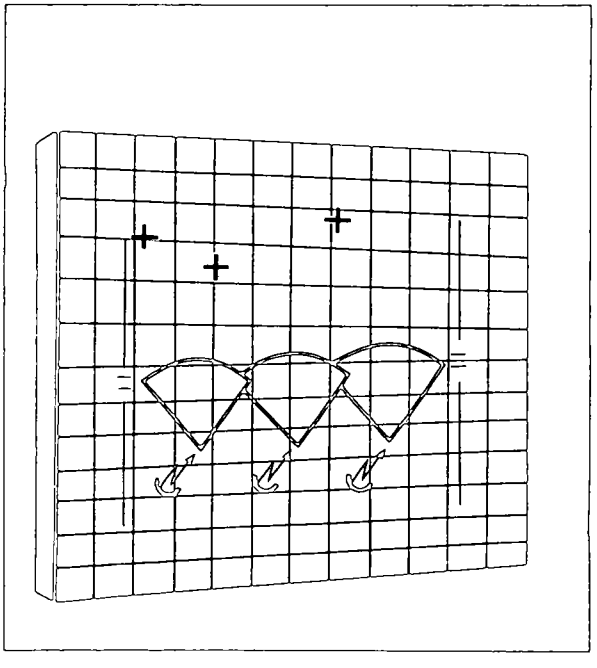


FIGURE 8-1. TARGET INDICATOR SYMBOL

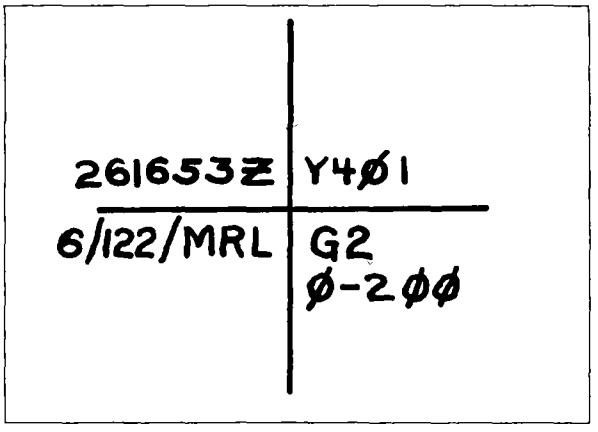
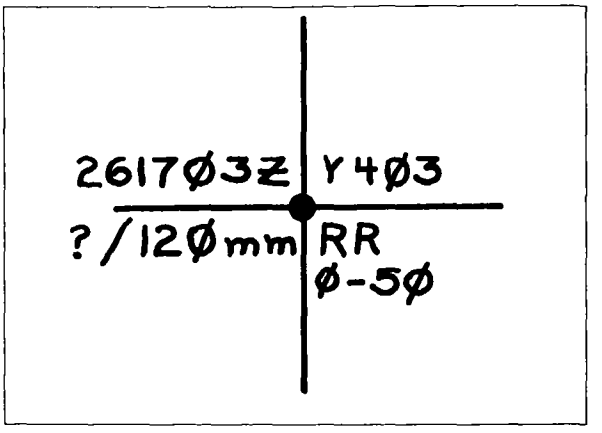


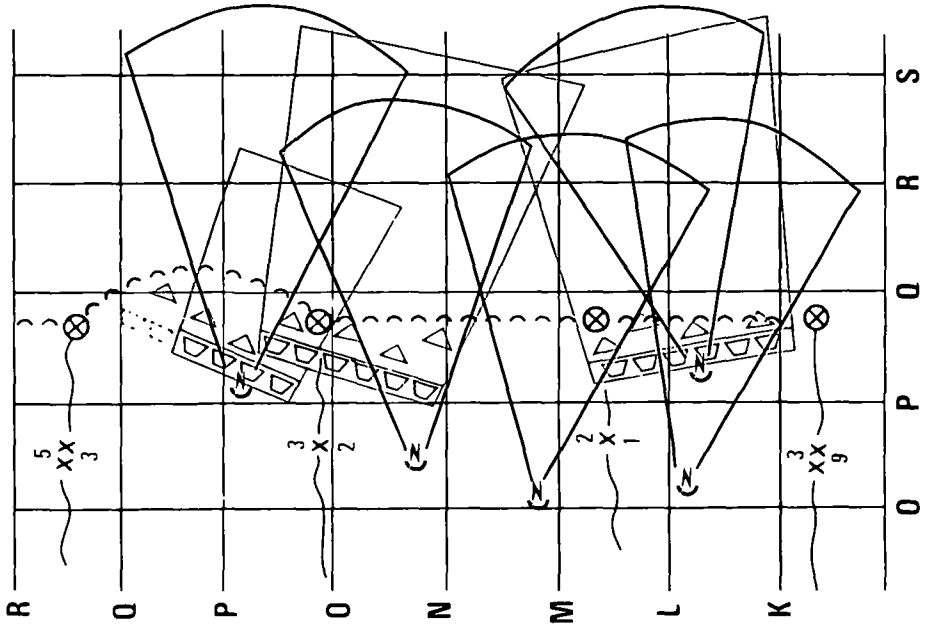
FIGURE 8-2. TARGET SYMBOL



target file. Target indicators and targets are plotted as shown in figures 8-1 and 8-2. Directional information is attached to the target production map in the form of an overlay.

Another important tool of the section is the target acquisition capabilities chart (TAC). The TAC is constructed from visibility diagrams submitted by forward observers, flash OP's, and radar sections; and it is used to evaluate the areas covered by target acquisition resources and to identify those areas that are not covered. TAC's may be physically configured as charts, overlays, or diagrams; and their construction is dependent on time, situation, and mission. A copy of a consolidated TAC is forwarded to the division G2.

TARGET ACQUISITION CAPABILITIES CHART



Target Production Forms.

DA Form 2185-R, Artillery Counterfire Information (fig 8-3). This form conforms with STANAG No. 2008 (app E) and is used by elements of the TOC. It is used to aid in the recording of target information only and is not kept on permanent file.

DA Form 4695, Target Card (fig 8-4). Target cards are used to record all targets and target indicators. At any given time, the target card provides the most accurate grid associated with a target as well as a record of target engagement and damage assessment. A card is prepared for each target and each target indicator. All subsequent data pertaining to that target or indicator will go on the same target card. The target card may also be used to pass target data from the targeting element to the fire control element.

The Counterfire Reference Grid (CRG). (fig 8-5) The counterfire reference grid consists of a series of 5-kilometer squares covering the division's entire zone of action. Each grid line is lettered and the grid is read as a military map is read. The grid is placed on the OB map, the target production map, and the fire control map. Additionally, artillery battalion FDC's, radars, sound/flash platoons, and the FSE's use this reference grid on their situation maps. The CRG is an aid for TOC personnel. It can be used to coordinate and plan target search and for directing immediate target engagement.

FIGURE 8-3. DA FORM 2185-R

ARTILLERY COUNTERFIRE INFORMATION
(FM 6-121)

RECEIVED BY 3Δ D/A TOC | FROM S2, 2-6FA | TIME 0710 | NUMBER 16

SECTION I - BOMBREP, SHELREP OR MORTREP (Cross out items not applicable.)

UNIT OF ORGIN (Current call sign address group or code name)	POSITION OF OBSERVER (Encode if liquor important OP or Src E gives info on location)	DIRECTION (Grid bearing of FLASH, SOUND or GROOVE of SHELL (state which in mils unless otherwise stated) (Omit for aircraft)	TIME FROM	TIME TO	AREA BOMBED SHELLED OR MORTARED (Grid ref--in Clear) or (Grid bearing to impact in mils and dis from observer in meters--ENCODED) (Dimensions of the area in meters) by (the radius) or (length and width)	NO AND NATURE OF GUNS (Mortars, rocket launchers, aircraft or other methods of delivery)	NATURE OF FIRE (Adjustment, fire for effect, harassing ETC.) (May be omitted for aircraft	NO., TYPE, AND CAL (State whether measured or assumed) of SHELLS ROCKETS or MISSILES) BOMBS ETC.)	TIME TO FLASH TO BANG (Omit for aircraft)	DAMAGE (Encode if required)
S-2 2-6FA										
A	B	C	D	E	F	G	H	I	J	K

SECTION II - LOCATION REPORT							SECTION III COUNTERFIRE ACTION		
REMARKS	SERIAL NUMBER (Each location which is probed by a locating unit is given a serial number)	TARGET NUMBER (If the weapon/activity has previously been given a target number it will be entered here)	POSITION OF TARGET (The grid reference or grid bearing and distance of the located weapon/activity)	ACCURACY (The accuracy to which the weapon/activity was located. CEP in meters and the means of location if possible)	TIME OF LOCATION (The actual time the location was made)	TARGET DESCRIPTION (Dimensions if possible) 1. radius of target in meters 2. target length and width in meters	TIME FIRED (Against hostile target)	FIRED BY	NUMBER OF ROUNDS - TYPE OF FUZE AND PROJECTILES
		B312	NB 9264 5187	0-100 FIST	26m 0658	2/120mm MORTARS	26 0704	2-6FA	6 HE DP/ICM
L	M	N	P	Q	R	S	T	U	V

DA FORM 2185-R, 1 May 78 (Conforms with STANAG NO. 2008) Edition of 1 Nov 67, is obsolete.

FIGURE 8-4. DA FORM 4695 , TARGET CARD

DA Form 4695 is available through normal AG supply channels

TARGET CARD

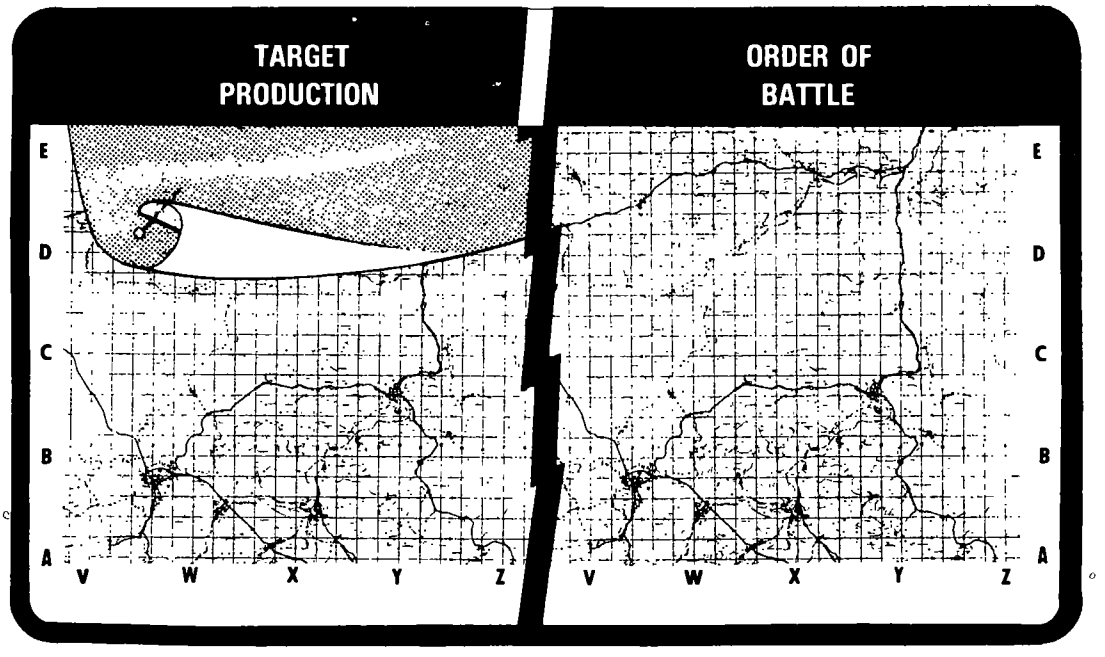
For use of this form, see FM 6-121, the proponent agency is US Army Training and Doctrine Command

Target No. B301 | Target ☑ (V Yes) | Category (Circle) ① 2 3 4 5 6 7 8 | Fired ☐ (V Yes)

SOURCE	LOCATION	ACCURACY	DTG	DESCRIPTION/REMARKS
AO	93305170	0-50	260630	4/M /H

FCE BCC
OPS CMS
OB CBS

FIGURE 8-5. COUNTERFIRE REFERENCE GRID



The counterfire officer directs the labeling of this grid by designating a random start point (see figure 8-5). The letters I and O are never used in the CRG.

Target Categories. The use of target categories simplifies information processing within the div arty TOC and facilitates the order to fire on specific targets when counterfire is required. Eight categories have been established and are shown below.

1	Cannons
2	Mortars
3	Rockets
4	Arty OP's
5	Tgt Acq Sys
6	Nuc Delivery Sys
7	ADA Wpns
8	General

The categories (1 through 8) are provided to facilitate filing and avoid confusion when coordinating with other headquarters. The type targets listed in categories 1-8 should not be changed. Categories may be added to meet local requirements if necessary. Used together, target categories and the counterfire reference grid can greatly simplify TOC operations. For example, assume the div arty TOC is responding to a request for immediate counterfire (category 1) from Company A. Enemy units capable of ranging that company are located on the fire control map and a GS artillery battalion is directed to fire all category 1 targets in counterfire grid BRAVO-ECHO while another battalion will fire against the same category of target in grid ALPHA-ECHO. In addition, TA devices such as AN/MPQ-4A radars are oriented by means of the reference grid to search the suspected areas.

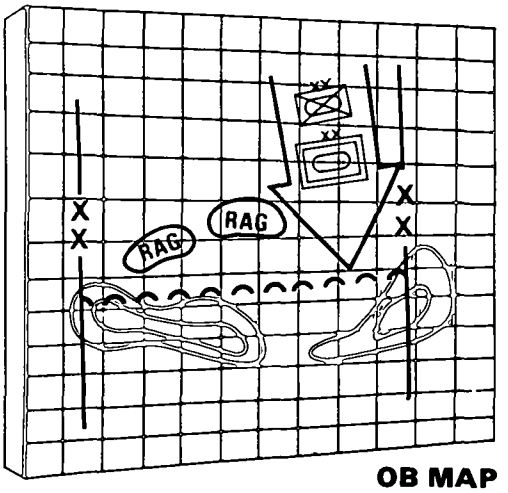
Damage Assessment. Tactical damage assessment allows the targeting element to judge the effectiveness of the fire support system and the accuracy of the target location system. Damage assessment can greatly assist the purging of data no longer valid from existing maps and files. It can also lead to better methods of target engagement and can provide data that may produce additional targets.

Purging Systems. The targeting element must devise a system for evaluating and purging targets. The local situation, volume of targeting information, rapidity of movement across the battlefield, and personnel and time available will all impact upon the system used. If an evaluation and purging system is not used, the volume of targets and target indicators will soon become unmanageable. The system may be as simple as an hourly check to purge all targets/target indicators based on a time period or as complex as the establishment of individual criteria for each category of target. The counterfire officer is responsible for establishing a purging system.

8-6. Order of Battle Section

Tools of the OB Section.

The OB Map. The OB map is the basic tool of this section and is maintained by the military intelligence personnel who compose the section. Enemy composition and disposition associated with indirect fire positions and information needed to develop such positions are graphically depicted on this map.



OB MAP

The primary purpose of the map is target prediction. Enemy order of battle evolves on the OB map and target locations can be predicted. Target acquisition assets sensitive to the signature of the target can then be employed to accurately locate the predicted target. The primary collectors of information for the map are intelligence agencies both above and below division artillery level. This map should be located next to and used with the target production map. Firm targeting data may be produced by the collation of information from the OB map and the target production map.

The Staff Duty Journal. The staff duty journal (DA Form 1594) is used to record significant events and the action taken. The journal is kept as a permanent record and is maintained chronologically. DA Form 1594 will be conveniently located in each element and will be collected and filed by the operations sergeant at the end of each shift.

The Targeting Workbook. The targeting workbook is maintained by the section to record, sort, interpret, and evaluate OB data. The workbook uses no set format, but is usually organized by subject (type target). The tactical intelligence officer organizes and formats the workbook to best suit his particular needs in determining the enemy indirect fire order of battle. The recording is done by the intelligence analyst.

Publications. There are specific publications available to assist in developing an order of battle analysis. A div arty OB library should be established and include, but not be limited to, the following:

Register of Intelligence Publications/ Scientific, Technological Intelligence Reports (RIP/STIR).

DIA Handbook on (specific country) Armed Forces.

DIA and/or CIA periodical Technical Intelligence Reports.

Area Studies Handbook (specific area).

Order of Battle Book (specific country).

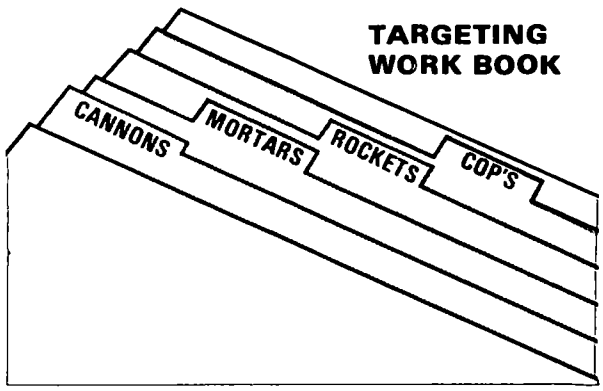
Foreign Material Catalogue (FOMCAT).

DIA Projectile Fragmentation Guide.

Division and corps intelligence products.

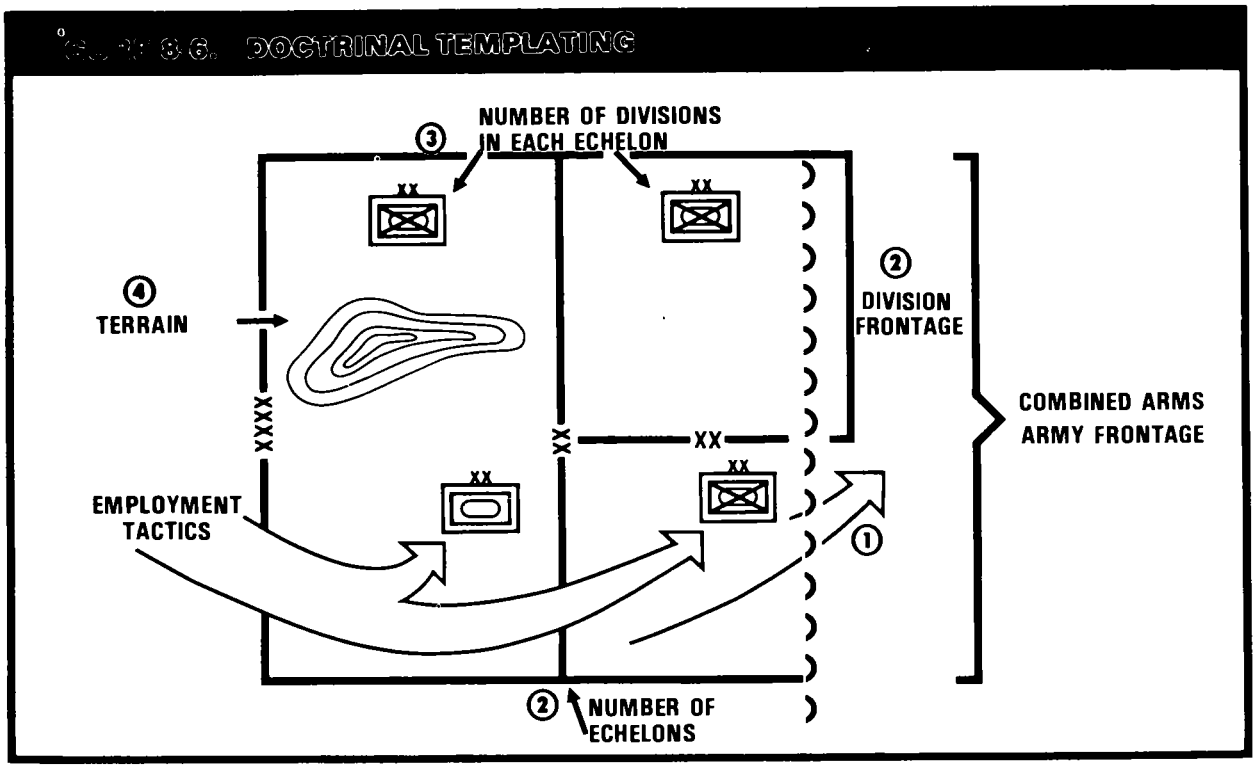
OB at the Div Arty. The OB effort at div arty is an extension of that which takes place at the division main. However, the div arty OB section does not mirror the G2 effort. Rather, it orients on that portion of OB collection that will produce valid field artillery targets. If, for example, an OB report received at div arty TOC from the division EWIOC describes the general location of a motorized rifle regiment, that information, when analyzed in the div arty TOC, should lead to the predicted location of the associated enemy artillery and other targets of interest to the div arty TOC.

Order of battle is the identification, strength, command structure, and disposition of the personnel, units, and equipment of any military force. To collect and interpret data on the enemy, the analyst needs a well-rounded knowledge of the enemy order of



battle. Enemy order of battle consists of evaluated information regarding composition, disposition, strength, tactics, training, logistics, and combat effectiveness. A detailed explanation of these OB terms is provided in FM 30-5, Combat Intelligence.

To obtain order of battle information in combat, a collection effort must be established. The order of battle analysts at div arty do not have a collection capability. Rather, they rely on agencies and units internal and external to div arty to provide the data. The astute order of battle analysts know these agencies and their capabilities and gather timely and accurate OB information from them to predict targets. It is through



judicious use and blending of data from these sources and agencies that the OB analyst is able to accurately develop order of battle information that can result in the employment of firepower.

OB analysts have three basic techniques that they use in concert for target production analysis.

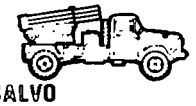
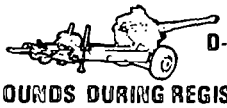
Space Analysis. Space analysis is the placement of the opposing forces in a logical manner on the terrain based on size of unit and tactical doctrine.

Two motorized rifle regiments have been identified in one brigade zone. The opposing force usually employs a combined arms team and echelons his forces in depth. He also believes in centralized command and control. With this knowledge, his headquarters elements are likely to be positioned well forward and centrally located with easy access toward both the FEBA and his rear area. He, likewise, is going to conceal his HQ elements from direct observation. These bits of information, when considered with the prevailing weather, terrain, and tactics, fill in the picture and give us a good idea of possible target arrays.

Another form of space analysis involves a concept known as doctrinal templating. Templates have been designed that reflect enemy tactics and doctrine in a variety of situations. These devices aid in evaluating enemy capabilities and vulnerabilities, estimating intentions, and rapidly disseminating this information. Templates and target arrays are initially prepared reflecting known enemy doctrine and the composition and disposition of the enemy as provided by current intelligence. Then they are applied to the OB map. General considerations in the development of templates and target arrays are tactics, frontages and depth, echelons, and terrain. Doctrinal templates represent a starting point from which event templates are developed. They are based on the enemy situation, intelligence, and recent experience.

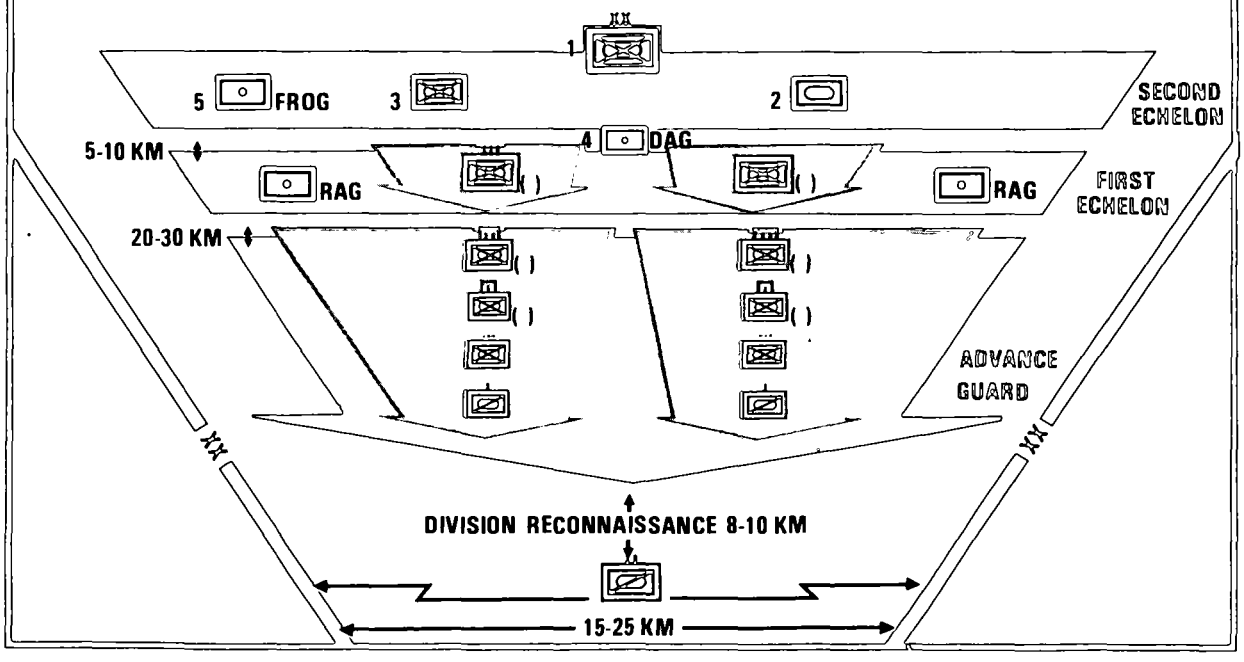
These templates are modified or updated based on significant changes in enemy task organization, equipment, and the effects of weather and terrain. A doctrinal template for a combined arms army might look like figure 8-6. Once a template has been developed, the specific targets within the array can serve as the basis for directing the target collection effort. The characteristic signatures of each target should be determined to optimize the use of intelligence collection/target acquisition assets. Examples of target signatures are shown below.

FIGURE 8-7. EXAMPLE TARGET SIGNATURES

	 BM-21	 D-20 152mm G-H
METHOD OF FIRING:	RIPPLE/SALVO	1-4 ROUNDS DURING REGISTRATION; BATTERY VOLLEYS WHEN ENGAGING TARGETS.
VEHICLE:	TRUCK LAUNCHER, EASILY IDENTIFIABLE. TERRAIN LIMITS MOBILITY.	CARGO TRUCKS.
ECHELON:	NORMALLY IN THE DIVISION ARTILLERY GROUP.	MAY BE FOUND IN THE REGIMENTAL OR DIVISIONAL ARTILLERY GROUP.
POSITION:	ALL SIX LAUNCHERS OCCUPY A BATTERY POSITION, NORMALLY ON LINE.	BATTERY EMPLOYED ON LINE NORMALLY IN THE OPEN. THE THREE BATTERIES IN A BATTALION ARE POSITIONED WITHIN A 1-2 KMS RADIUS OF EACH OTHER.
COMMUNICATION:	VOICE RADIO AND WIRE.	VOICE RADIO AND WIRE.

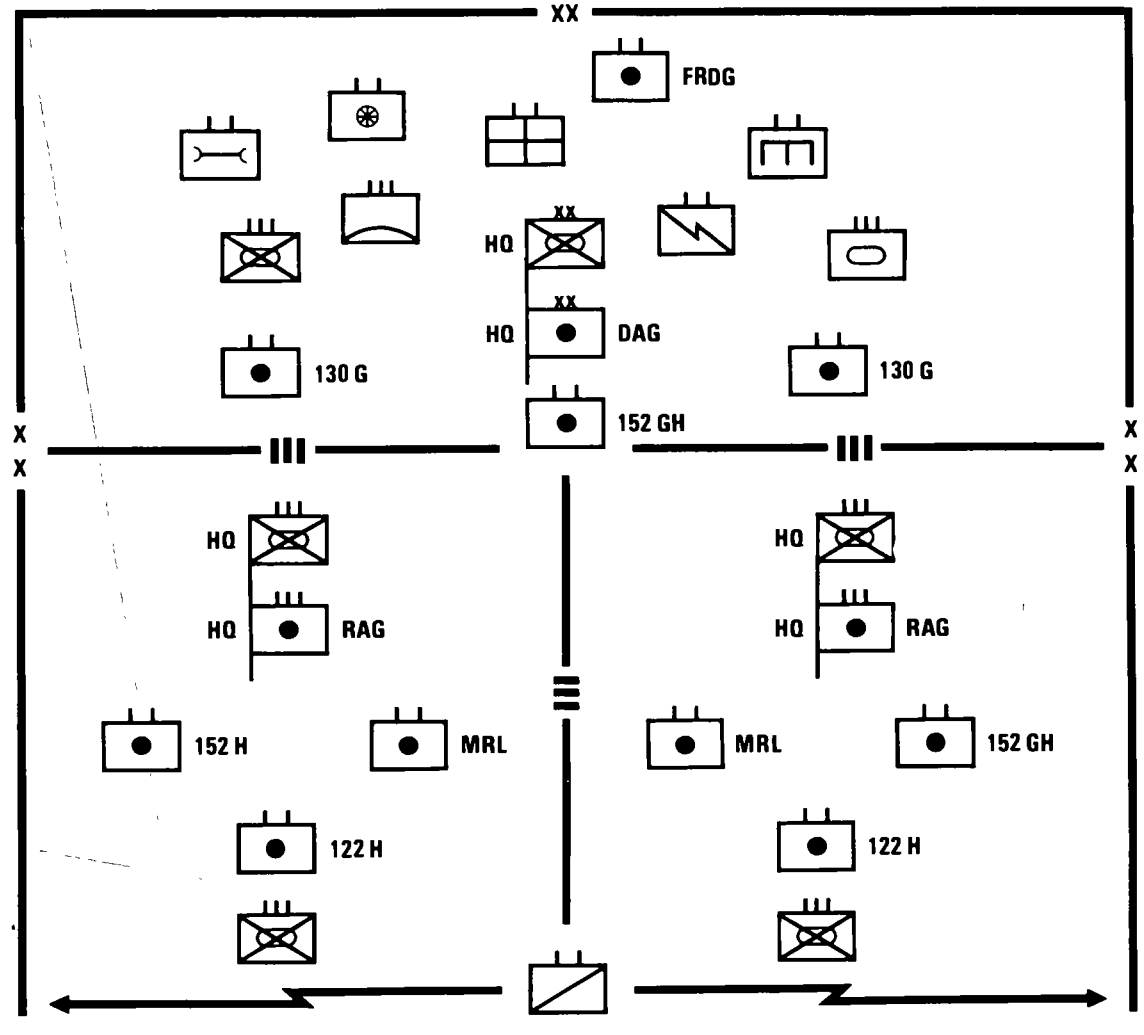
Target arrays is another concept used for space analysis. Examples of target arrays for a motorized rifle division (MRD) are shown in the following schematics. A threat force can adopt many different types of formations.

FIGURE 8-8. MOTORIZED RIFLE DIVISION ADVANCING TO CONTACT



The arrays on the following pages reflect one probable variant for a threat ground force unit. This array reflects an MRD advancing to contact with two regiments abreast in battalion column. Artillery support may consist of the six divisional artillery battalions (three cannon, multiple rocket launcher (MRL), one free rocket over ground (FROG), and one antitank) and five reinforcing battalions from higher headquarters. These artillery battalions may be organized into a three-battalion division artillery group (DAG), two three-battalion regimental artillery groups (RAG), a FROG battalion, and an antitank battalion.

FIGURE 8-9. DIVISIONAL AND REGIMENTAL TARGET ARRAYS

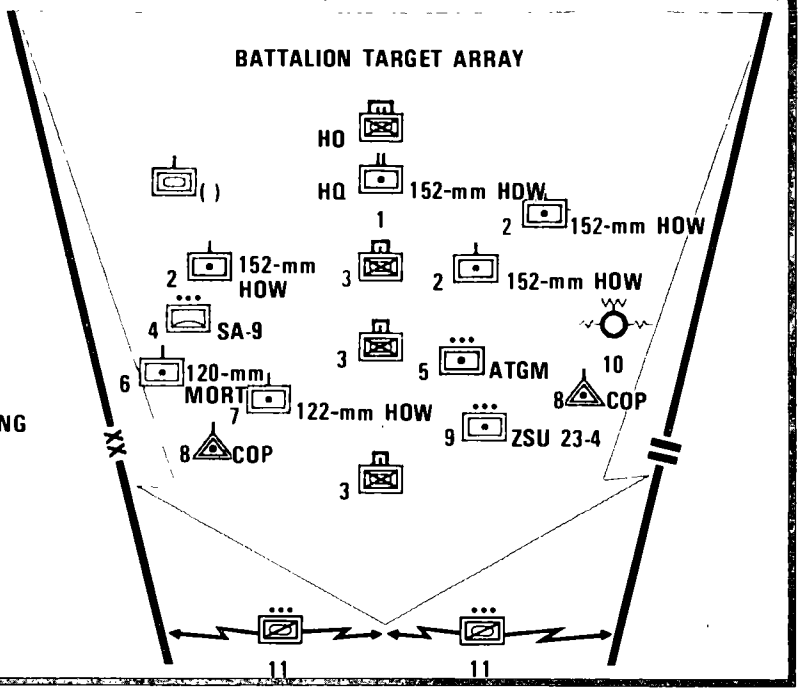


SINCE THIS IS AN ARRAY AND NOT A TEMPLATE, THE RELATIVE DISTANCES ARE NOT DEPICTED. MAJOR UNITS ARE DEPICTED GENERALLY WHERE THEY MIGHT BE FOUND IN RELATION TO EACH OTHER (ROUGHLY).

FIGURE 8-10. BATTALION TARGET ARRAY

SELECTED BATTALION TARGETS

1 MOTORIZED RIFLE BN & 152mm HOW BN HQ
2 152mm HOW BATTERY (RAG)
3 MOTORIZED RIFLE COMPANY TEAM
4 SA-9 SAM PLATOON
5 ANTITANK MISSILE SECTION (BRDM MTD)
6 120mm MORTAR BATTERY
7 122mm HOW BATTERY (ACCOMPANYING ARTILLERY)
8 BATTERY/BATTALION COMMAND OBSERVATION POSTS
9 ADA (ZSU-23-4) SECTION
10 RADIO/RADAR JAMMING SECTION
11 RECONNAISSANCE PLATOON



Time Analysis. Time analysis is the identification of related activities based on time patterns or sequences. Consider a message received from the artillery intelligence officer at division headquarters stating that EW personnel have intercepted a message associated with Soviet artillery operations. The message was intercepted at 0730. Sound and flash central reports the firing of an artillery piece from a woodline at 0733. Analyzing both bits of information with respect to time, and the consideration of space, the radio transmission appears to have come from either a COP or OP and was a call for fire to a firing unit. Having located both of these targets, appropriate action would be taken for either firing or planning fire on these counterfire targets.

Topic Analysis. Topic analysis is arranging information in a logical manner and grouping items by category. We are interested in artillery topics such as cannons, mortars, rockets, target acquisition assets, special weapons, deception activities, and artillery related order of battle. Probable enemy courses of action have been analyzed and the indicators are that the enemy will attack. He puts his artillery well foward in an attack formation. So, that is where the targeting effort will orient. If two batteries of a battalion are located well forward, we try to locate the third through doctrinal templating. Based on a knowledge of enemy order of battle and a detailed analysis of the terrain, we then predict where the enemy targets are located.

8-7. Div Arty Targeting—A Team Effort

The OB section receives a multitude of enemy oriented data from various sources to include the field artillery intelligence officer using the division intelligence radio net. The section personnel record, plot, correlate, and analyze the data in order to make that "best guess" to locate enemy targets. Simultaneously, the target production section is receiv-

ing target information from the TAB, FA battalions, and field artillery aerial observers to include additional information from crater analysis. Through careful plotting of all this information on the target production map, the section correlates the information to produce targets. While there are no specific functions performed independently by both the target production and the order of battle sections, the activities of both are complementary, mutually supporting, and performed in concert. These efforts provide valid field artillery targets to the fire control element of the TOC to insure that timely, accurate, and decisive field artillery fires are delivered in support of the maneuver forces.

Chapter 9
Target Acquisition Battery

WHY
During combat the TAB is the primary source of counterfire targets.

WHAT
This chapter describes:
functions
organization
employment
RSOP

9-1. General

This chapter is a guide for the target acquisition (TA) battery commander, div arty staff, and other key personnel within the division, on the tactics and techniques of employment of the TA battery. Doctrine is set forth pertaining to the organization, duties of personnel, and employment of the TA battery.

Four principal functions are performed by the TA battery: acquire counterfire and other targets, register and adjust FA weapons, perform comparative calibration of FA weapons, and verify the location of nuclear bursts fired by friendly forces.

Acquire Counterfire and Other Targets. The acquisition of counterfire targets is the primary function of the target acquisition battery. It is the principal agency for locating active indirect fire weapons. Location is determined by the sound/ flash and radar platoons. Battlefield information is determined by the sound/flash observation posts and the moving target locating radar section located along the forward edge of the battle area.

Register and Adjust FA Weapons. The registration and adjustment of FA cannon can be conducted by using sound/flash ranging or radar. Artillery can be registered and adjusted during periods when other methods of observation are not possible. However, sound/flash ranging and radar units should not be diverted from their primary mission for this purpose (ref FM 6-40, chap 19 and 24.)

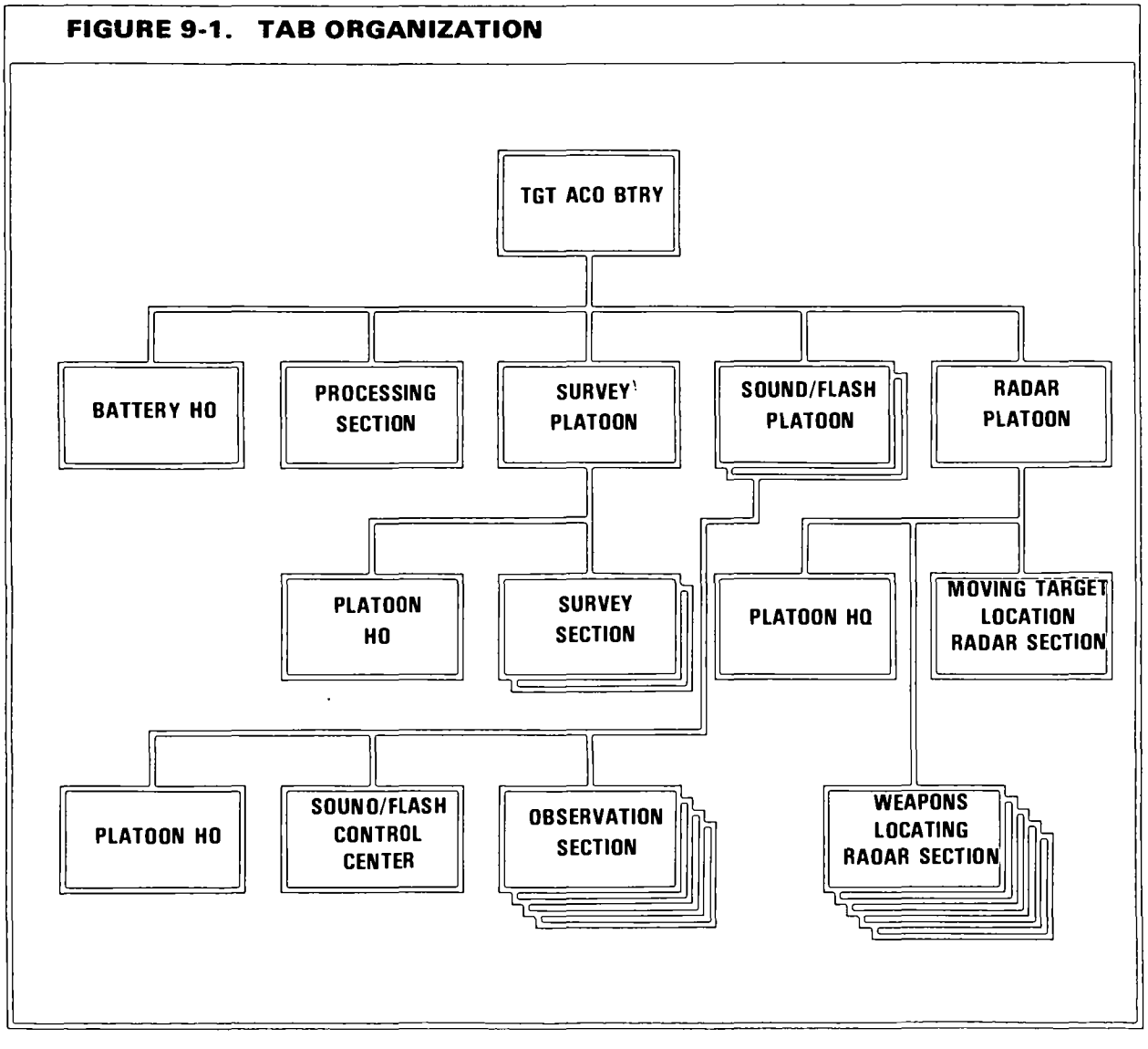
Perform Comparative Calibration of FA Weapons. The flash element of the sound/flash ranging platoon and the weapons locating radars can perform comparative calibration of div arty weapons (ref FM 6-122 and FM 6-161).

Verify the Location of Nuclear Bursts Fired by Friendly Forces. The flash element of the sound/flash ranging platoon can verify the location of a nuclear burst fired by friendly forces (ref FM 6-122).

9-2. Target Acquisition Battery Organization

The battery organization presented in this section is derived from TOE 6-307H, which applies to armored, infantry, and mechanized infantry (AIM) divisions. The AIM div arty TA battery consists of a battery headquarters, a processing section, one survey platoon, two sound/flash platoons, and one radar platoon (fig 9-1). Duties of the personnel of the battery are found in appendix H.

FIGURE 9-1. TAB ORGANIZATION



9-3. Employment of the TA Battery

Employment of the TA battery is based on the factors of METT (Mission, Enemy, Troops, and Terrain). When employed to support the div arty, it is totally absorbed by the div arty with its elements spread across the width of the division. The employment of the TA battery involves a careful analysis of the mission and the situation, to include the friendly scheme of maneuver, the enemy, his capabilities and deployments, the availability and training of the personnel of the battery, and the prevailing weather within the zone of action. This analysis will normally be performed by the div arty assistant S3 for plans with the advice of the TA battery commander, the recommendations of the counterfire officer, and input from the division G2 section.

Efficient use of the separate elements of the battery requires the div arty S3 and his staff to have a thorough understanding of the capabilities, limitations, and the complementary aspects of these elements. Employment must also consider the other acquisition systems within the division to insure optimum use of all assets and that critical areas forward of the FEBA do not go without appropriate coverage.

Consistent with the scheme of maneuver, any element of the TA battery may be attached or placed under the operational control of the div arty TOC, an FA battalion, the FA brigade headquarters, or any one of its battalions. These elements of the TA battery may be positioned by and report directly to the support headquarters; however, the div arty TOC specifies the enemy area to be covered by the attached TA elements. The supported headquarters will report to the div arty TOC all target information from the TA assets under its control and any action it has taken. The div arty TOC will keep all headquarters controlling TA assets continuously updated on enemy activity in order that the TA assets may be most effectively used. The employment of the elements is as follows:

Processing Section. The processing section of the TA battery, when the battery is deployed, works for the counterfire officer in the div arty TOC. This section forms the target production section of the targeting element of the TOC.

Radar Platoon. The radar platoon has six radar sections assigned to support the target acquisition mission of the battery: five AN/MPQ-4A weapons locating radars and one AN/TPS-25A or -58 moving target locating radar. Employment considerations for these assets are as follows:

Weapons Locating Radar Sections. Each weapons locating radar section has one weapon locating radar AN/MPQ-4A. The number of Q-4 radars allocated to subordinate field artillery organizations will depend upon the threat analysis, the mission, and commander's guidance. When attached to subordinate FA organizations or placed under their operational control, the unit to which attached or exercising operational control may be required to provide survey control and mess and assist or coordinate security for the radar(s), and supplement communications capabilities.

The controlling headquarters, based on direction, guidance, and intelligence information from the div arty TOC, will designate and coordinate the use of the general area of the radar position and the general sector of search so that the radar will supplement the div arty target acquisition plan. The controlling headquarters must report the specific radar location and specific sector of search to the div arty TOC so that the TOC is constantly aware of the coverage across the entire division zone, and can take action to insure coverage of all critical areas. Normally a DS battalion will be the controlling headquarters for one or more Q-4's. In this case, targets can be immediately engaged by the DS battalion without coordination with the div arty TOC, unless previously directed otherwise by the commander. When targets are acquired by the radar and reported to the supported battalion or other controlling

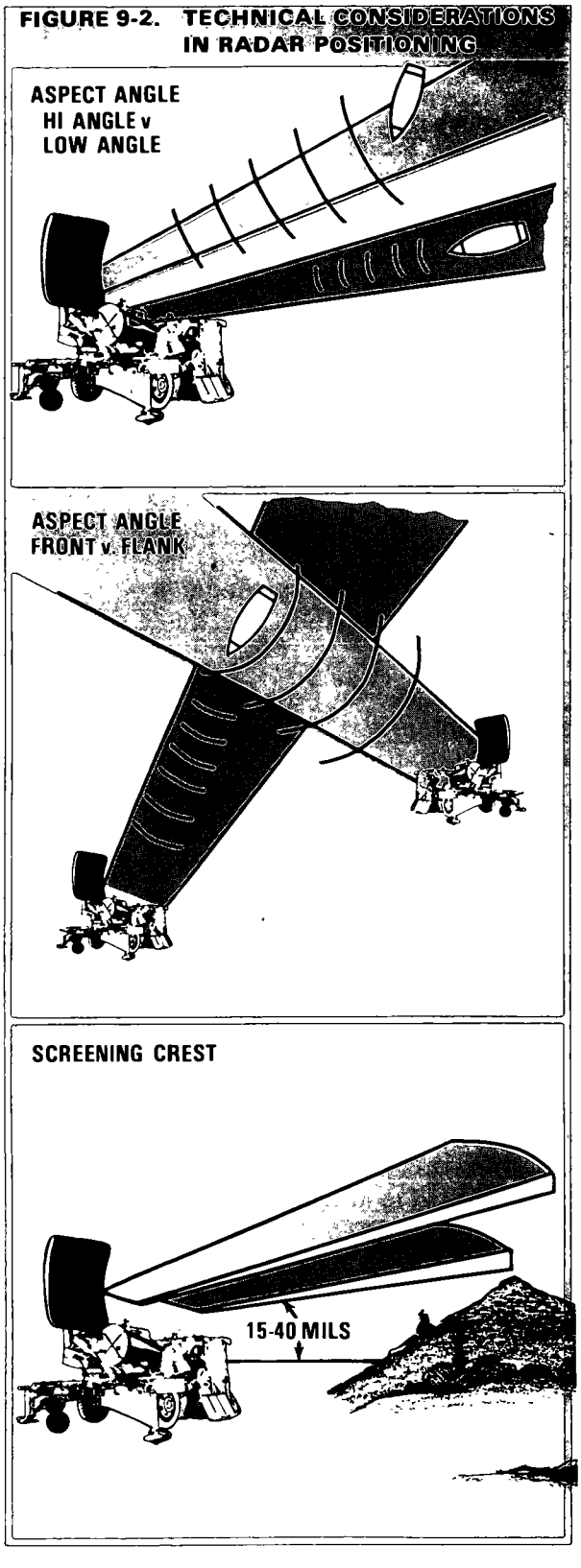
headquarters, they must be passed to the div arty TOC with the action taken against them. The position area selected by the controlling headquarters should be large enough to permit the radar technician or chief of section to select several suitable sites on the basis of the tactical and technical consideration affecting the operation of the radars. The selected position should facilitate survey control, mess support, and local security of the radar. If attacked or if attack is imminent, the section should be prepared to move quickly into an already selected, previously prepared alternate position.

The technical requirements for positioning of the radar consist generally of two factors: aspect angle of the incoming projectile and sufficient screening to reduce radar clutter. The aspect angle is the angle to the projectile at which the radar beam(s) strikes and is reflected back to the radar receiver. The smallest and least reflective surface is presented by a projectile with a low trajectory and whose nose is pointed at the radar. The most reflective area is presented by a side view of the projectile such as a mortar or other high-angle weapon or weapon that is firing well to the flank of the radar. Therefore, if the assigned mission of the radar is primarily the location of weapons with low- angle trajectories, the radar should be positioned to permit the most favorable aspect angle consistent with other considerations.

Although a screening crest has several advantages such as protection from small arms fires, direct observation by the enemy, and the minimizing of enemy direction finding, the primary purpose is to absorb radar energy so that ground clutter is eliminated or reduced. A crest of 15 to 40 mils is required and is dependent upon the depth and type of targets to be located.

There are no hard and fast rules for the tactical deployment of the weapons locating radar. Although a general guide of 2,000 to 7,000 meters from the FEBA is suggested, there are several considerations to be made before a position is selected. The 15,000-meter

FIGURE 9-2. TECHNICAL CONSIDERATIONS IN RADAR POSITIONING

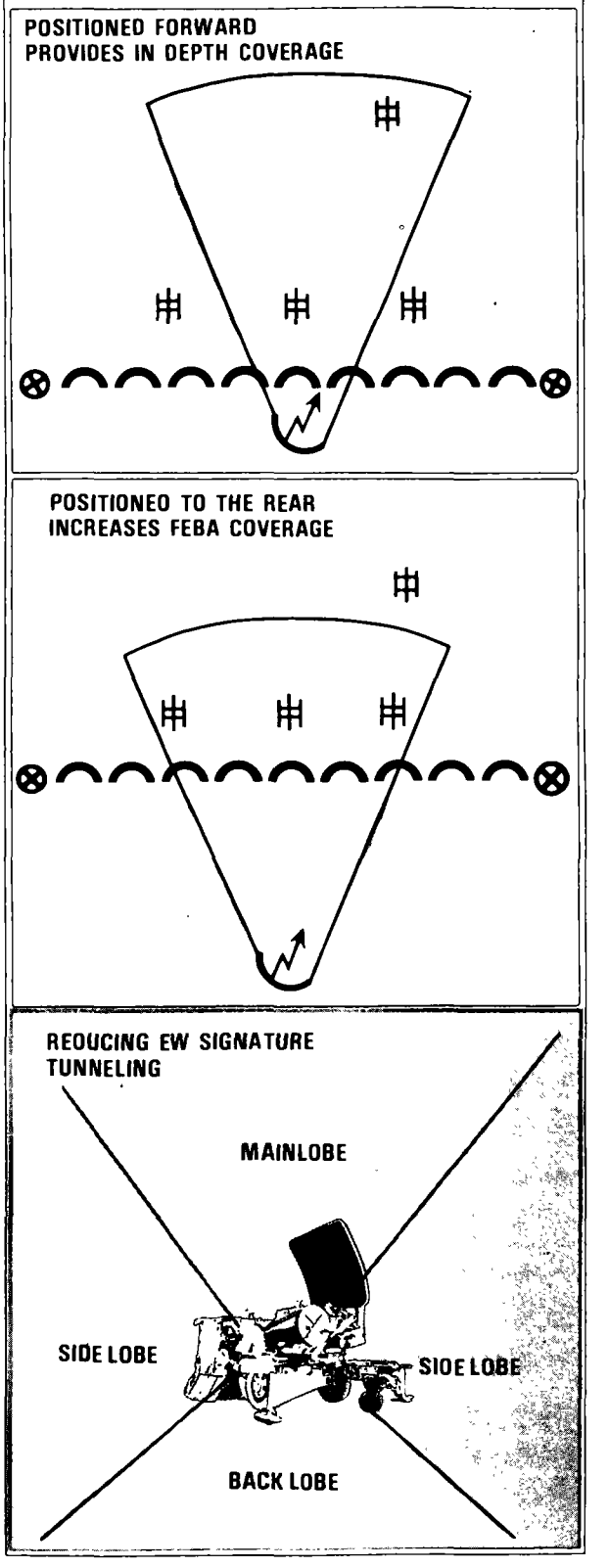


range capability of the radar and its rather narrow 445-mil sector of scan are two such considerations. To achieve maximum depth of coverage, the radar should be positioned as far forward as possible; however, a radar positioned well forward reduces its width of coverage. Conversely, a radar positioned to the rear increases its width of coverage but reduces its depth of coverage (fig 9-2 and 9-3). The controlling headquarters must position the radar so as to achieve the right balance of depth and width of coverage. Other considerations of positioning include the electronic warfare (EW) capabilities of the enemy, survey control, local security for the radar, and communication with the controlling unit. A position selected with an abundance of vegetation not only provides natural camouflage but will also tend to absorb the side and rear lobes of radiation thereby reducing its vulnerability to EW. To enhance security for the radar and to facilitate communications and other support, the radar position should be relatively close to the controlling headquarters considering other factors previously discussed. Locating the radar close to the support battalion FDC reduces communication, security, maintenance, mess, and other administrative problems; however, the benefits must be weighed against the hazards associated with the enemy's ability in EW. Detection and location of the radar by enemy radar direction finding equipment could reveal the location of the battalion headquarters to the enemy, jeopardizing the survival of the battalion command and control structure. The signatures of the firing unit should also be considered because they may jeopardize the radar position.

Since the weapons locating radar does emit a beam of energy extending far beyond its capability to locate targets, it is vulnerable to enemy direction finding, location, and subsequent attack and destruction. To minimize this vulnerability, a system of "cuing" must be established.

Cuing is the orienting and activation of the radar on a suspected weapons location determined by information/intelligence from other sources. The direct support battalion

FIGURE 9-3. TACTICAL CONSIDERATIONS IN RADAR POSITIONING



can best cue its attached radars by the use of spot reports from its fire support teams. The cuing technique minimizes the electronic signature of the radar while maximizing its effectiveness. Other sources of cuing can be used if the situation permits. Flash OP's, the target area base of a GS battalion, and current target indicators from the div arty TOC are examples. Sound ranging is an excellent cuing system for the radars for when it may be difficult to locate targets by sound due to too much firing or deceptive measures taken by the enemy, the radars could be "cued" or oriented on the general area of the sound source. The latter arrangement (the attachment of a weapons locating radar to a sound/flash platoon) is a good combination of target acquisition assets that complement each other while minimizing the limitations and vulnerabilities of the separate devices.

The Moving Target Locating Radar Section. This section is equipped with either an AN/TPS-25(A) (XE) or AN/TPS-58 radar. The area of surveillance is normally designated by the div arty S3, to provide coverage of a major avenue of approach into the division zone or another critical area not easily observed by other means. In performing this mission, the radar is normally attached to other field artillery headquarters in the division zone.

In the selection of a position, primary consideration must be given to having electronic line of sight into the area of responsibility. The radar will normally be positioned on commanding terrain overlooking its primary area of reaponsibility. Positions selected must allow the radar sections to achieve good camouflage and concealment due to the proximity to the enemy and the need for electronic line of sight. Emplacement is often required during darkness and march ordered before the set can be located by visual means. **The radar must be used judiciously.** Due to its relatively high power output and positioning, it is one of the pieces of equipment most vulnerable to electronic location and subsequent attack. This forces the div arty TOC or unit to which attached to cue the radars only when other less vulnerable sources cannot provide the needed coverage, particularly during periods of low visibility. Indiscriminate use of the radars will lead to the loss of this important asset prior to the critical point in the battle.

Sound/Flash Platoons. Each sound/flash platoon has a platoon headquarters, a sound/flash control center (or central), and one flash base. Each platoon has sufficient equipment to install one flash base of four OP's and two sound bases of up to six microphones each; however, the platoons lack the personnel to operate all equipment indefinitely. The platoon is normally in general support of the division and reports all target locations directly to the div arty TOC. The platoons are employed by the div arty S3 based on recommendations of the assistant S3 for plans, advice of the TA battery commander, and input from the division G2 section. The platoons are positioned to provide coverage of critical areas of the battlefield where a heavy concentration of enemy artillery is likely.

Sound/Flash Central. The primary function of the sound /flash central is to perform the calculations necessary to solve the sound or flash problem and to report this information. The sound/flash central also collects and processes sound ranging visual meteorological data and installs the microphone base.

Flash Base. The flash base consists of two or more OP's. These OP's are normally employed on dominant terrain near or on the FEBA. They are spaced 500 to 2,500 meters apart and provide a coverage of 6 to 10 kilometers of the front. They are installed using hasty or deliberate methods.

A hastily installed base normally consists of two OP's located to an accuracy of 1:500. When the OP's are provided or provide themselves with common survey control, targets are reported by the sound/flash central to the control headquarters by grid

coordinates for the first round fire for effect. When common survey control is not available, fire is adjusted onto targets. The width of the area of coverage with this type of base is approximately 4,000 meters. Although a two-OP base can be installed in 30 to 90 minutes by members of the OP's without outside assistance, each OP is capable of performing adjust fire missions immediately upon occupation of the OP and the establishment of communications with the sound/flash central or a predesignated firing unit. Use of simplified simultaneous observation techniques to determine a common direction and resection and/or intersection data fed into the FADAC computer can frequently reduce installation time to 30 minutes or less for a well-trained platoon. An advantage in the employment of two hastily installed bases is that it allows the platoon to provide limited flash coverage outside the area of coverage of the sound base while placing one base in front of the sound base to cue the sound system (fig 9-4).

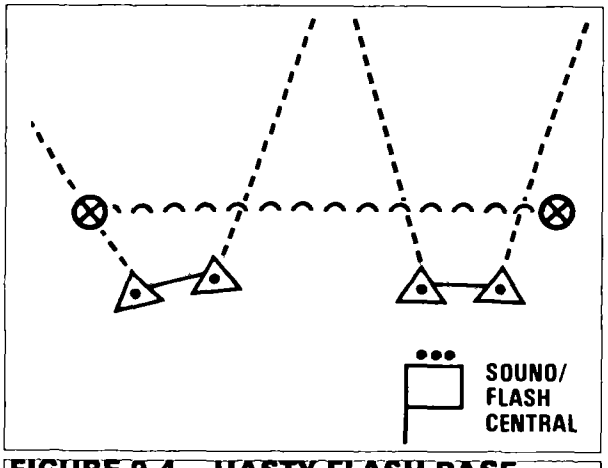
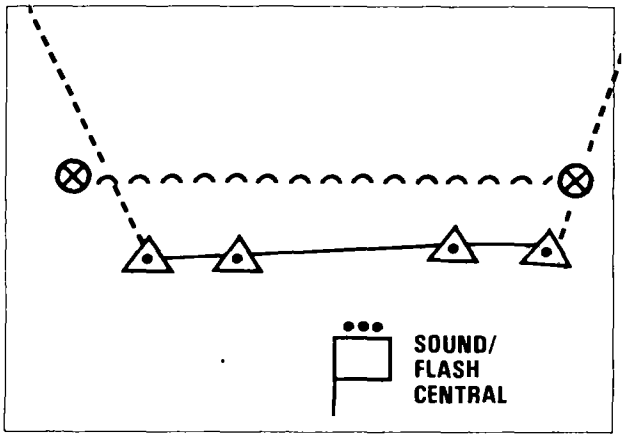


FIGURE 9-4. HASTY FLASH BASE

The deliberately installed base normally contains four OP's located using fifth-order (1:1,000) survey. With this type base, coordinates of hostile artillery can be determined at ranges up to the limit of visibility with an accuracy of 50 meters or less. The situation and the immediate need to determine grid locations of targets may require the use of hasty survey techniques that may or may not result in fifth-order accuracy. Accuracies of target locations are assigned to each target reported (FM 6-122). The width of the area of coverage may extend from 6,000 to 10,000 meters. The deliberately installed base (fig 9-5) using hasty survey techniques for initial OP locations should always be used unless time or terrain will not permit its use.

FIGURE 9-5. DELIBERATE FLASH BASE

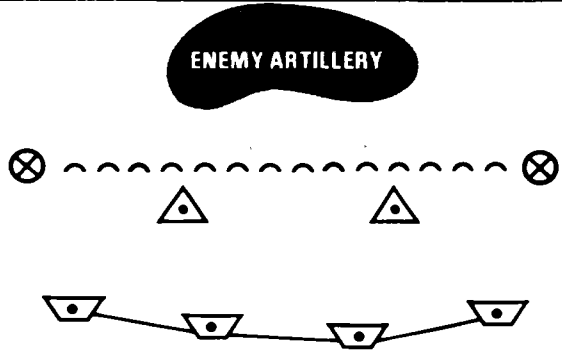


Sound Base Employment. The employment of the sound ranging element of the sound/flash platoon requires a thorough understanding of the capabilities and limitations of sound ranging. There are basically two types of sound bases, regular and irregular, with variations of each. Installation of these bases also varies based on the situation but are described as hasty and deliberate. Regardless of the type of base, the distance between adjacent microphones in the vertical plane cannot exceed 60 meters. In a hastily installed base, four microphones are installed—without an accurate internal survey and with no external survey—along an estimated straight line 1,000 to 1,500 meters apart. In the deliberate installation, four to six microphones are surveyed to an accuracy of 1:3,000 (fourth-order accuracy). Deliberately installed bases are used primarily to locate enemy weapons by grid reference, whereas hastily installed bases can be used only to adjust artillery on weapons located by the sound ranging method. Each has its own

place on the battlefield. A more detailed discussion of each with the variations follows:

In most situations where time is a consideration, the hastily installed sound base is usually the start point for the installation of the complete sound base. The base (fig 9-6) consists of four microphones whose positions are designated by the sound/ flash platoon leader or platoon sergeant based on information and guidance from the div arty TOC concerning the area to be covered. Microphones are 100 to 1,500 meters apart. Each microphone position is map spotted for grid location and that information entered into the FADAC computer in the sound/flash

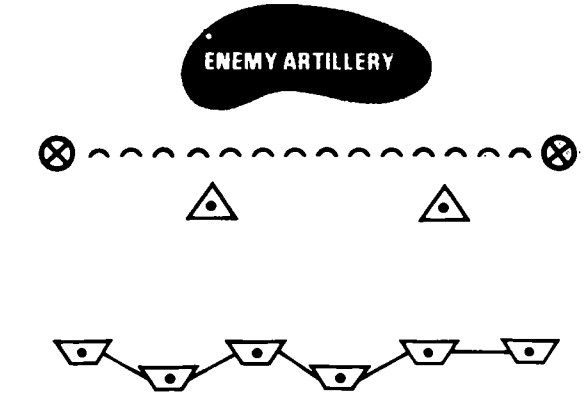
FIGURE 9-6. HASTY SOUND BASE



central. Installation of this type base can be accomplished in less than 1 hour with a well trained platoon and can cover an area about 6,000 meters wide and 10,000 to 12,000 meters deep. Since target grid locations cannot be reported with any degree of accuracy while in the hasty installation configuration, only sound-on-sound adjustments of artillery can be used to attack enemy targets. Sound-on-sound adjustments are very rapid and very accurate. It is necessary for the div arty TOC to identify and designate a firing unit to respond to calls for fire from the sound/flash central while in the hasty installation configuration. Survey of the base should have begun upon designation of the first microphone position. Each microphone should be located to fourth-order accuracy. As quickly as survey determines the exact grid location of a microphone, those grid coordinates replace the map spotted coordinates previously entered into the FADAC computer. When at least four microphones are surveyed, the base becomes a deliberate installation and target grid locations with acceptable accuracies can be determined. Two more microphones are added, survey continues, and the result is a six-microphone deliberate installation. When this configuration is reached, the div arty S3 should consider the necessity of reverting control of that sound/flash platoon back to the div arty TOC from the previous designated firing unit.

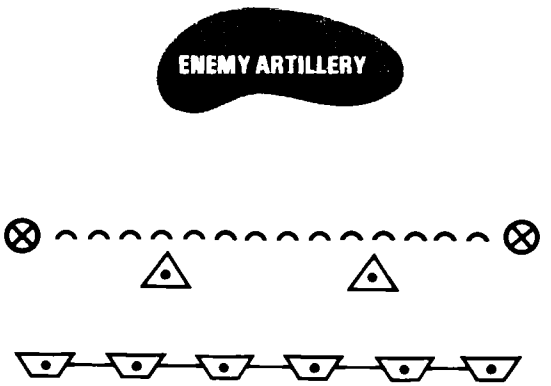
The irregular base (fig 9-7) is normally an expansion of the hasty installation as described above; however, if time is abundant and sufficient survey assets are available to rapidly provide grid locations of each microphone, the sound/flash platoon leader may elect to install and retain this type of base initially. The irregular base facilitates survey operations in that *each* microphone location is designated on the ground by the sound/ flash platoon leader. Terrain will often dictate the installation of this type of base.

FIGURE 9-7. IRREGULAR SOUND BASE



The use of the straight regular base (fig 9-8) greatly facilitates the reading of the sound record tape produced by the sound ranging recorder, AN/TNS-10. In this configuration the sound/flash platoon leader normally designates the location of a microphone, the azimuth of the base, and the distance between microphones. Survey is then required to locate all microphones exactly the same distance apart to an accuracy of 1:3,000.

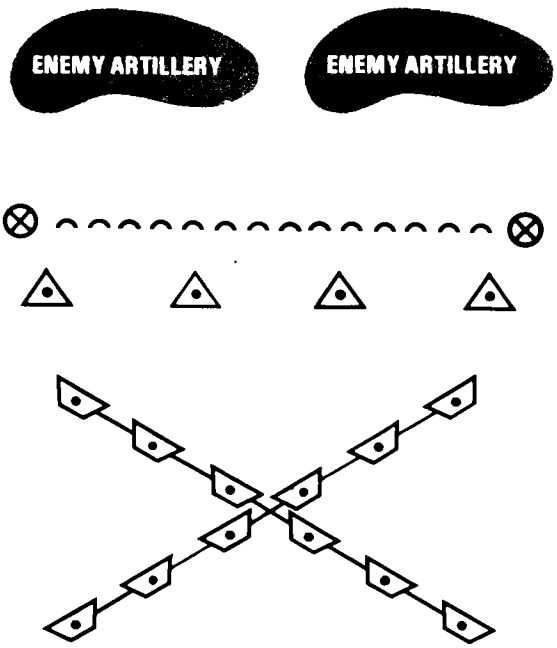
FIGURE 9-8. STRAIGHT REGULAR BASE



Installation of the straight regular base is the most time consuming and therefore may not be appropriate for fast-moving situations. Base lengths are described in meters or sound-seconds (SS) between microphones; e.g., a 4-second, six-microphone base is 6,752 meters long (1 SS = 337.6 meters x 4 seconds x 5). Distances to the sound source approaching 20,000 meters with accuracies of 150 meters can be achieved; however, the results are greatly affected by a number of external variables (e.g., high winds or topography). Straight regular bases and irregular bases, when surveyed, are considered deliberate installations.

The crossed base (fig 9-9) consists of two bases that cross each other to provide greater sound ranging coverage from one sound/-flash platoon. This specialized base employs up to 12 microphones and is normally not suited for situations other than static. The time required to emplace a crossed base combined with the possibility of losing all microphones should a rapid withdrawal be necessary denies the platoon the flexibility necessary to operate this kind of base in a moving situation. Further information on this base as well as the other bases is found in FM 6-122.

FIGURE 9-9. CROSSED SOUND BASE



The Survey Platoon. The survey platoon consists of a platoon headquarters and two survey sections. The platoon provides the survey necessary to locate and orient battery installations that require control (flash, sound, and radar) and to provide other survey control when directed. The survey party's activities and all other survey activities in the division zone should be incorporated into the division's survey plan. The primary mission of the TA battery's

survey sections is to provide survey control to the elements of the TA battery in general support of the division.

9-4. Reconnaissance, Selection, and Occupation of Position (RSOP)

The nature of the TA battery and its normal employment over large frontages precludes conducting battery level RSOP. RSOP is performed at platoon or section level depending on the mission of the individual element of the battery. The battery commander, acting as a special staff officer, advises and assists the assistant S3 for plans on the selection of position areas for elements held under div arty control. RSOP procedures for each element of the TA battery are in the FM for that particular piece of equipment (FM 6-122, *Sound and Flash Ranging,* for sound/flash platoon RSOP; FM 6-161, *Field Artillery Radar Systems,* for radar section RSOP.

Chapter 10
Target Acquisition in the Direct Support Battalion

WHY
The DS battalion provides close support to the maneuver brigades, and timely TA is essential to responsiveness in fire support.

WHAT
This chapter describes:
S2
FIST
battalion OP's
weapon locating radar
TA support for the separate brigade

10-1. The DS FA Battalion Commander

The DS FA battalion commander is the fire support coordinator for the brigade. Since fire support cannot be effective without effective TA, it follows that the DS FA battalion commander is also responsible for TA at brigade level. This responsibility is particularly important when the DS battalion is supporting a separate brigade and no TA support can be expected from division.

10-2. The Field Artillery Direct Support Battalion S2

The DS battalion S2 has the staff responsibility for planning, coordinating, and supervising the battalion TA effort. He must be completely familiar with the scheme of maneuver, friendly and enemy organizations' equipment, tactics, and techniques to be able to determine what targets will most severely affect the accomplishment of the force mission; and know where, how, and when to look for those targets. The S2 duties are:

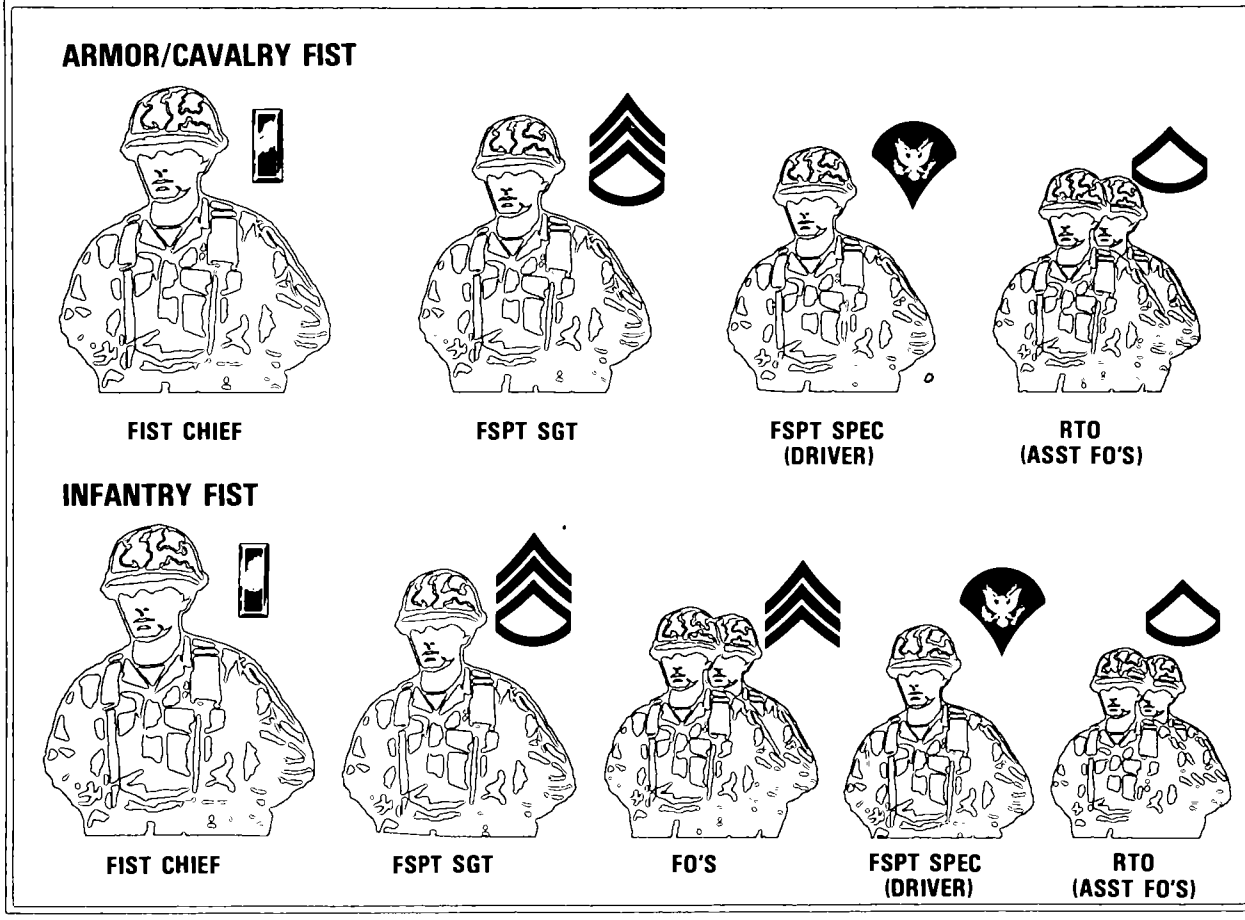
- Coordinating battalion TA plans with the div arty assistant S3 for plans to insure a fully integrated division TA capability.
- Determining the general position and, in keeping with instructions from the div arty TOC, the sector of search for the TA

radars attached or under the operational control of the battalion.
- Directing the general position and area coverage of battalion OP's.
- Briefing battalion observers concerning the situation, mission, and TA priorities.
- Planning and coordinating the use of aerial observers.
- Preparing the battalion TA capabilities chart from observer and radar visibility diagrams.

10-3. Fire Support Teams (FIST)

The fire support teams organic to the DS battalion but physically located with the supported maneuver companies are an important part of the TA effort. They are the major source of direct visual TA for the battalion, and have direct access to targeting information from personnel in the maneuver company. The FIST reports information directly to the FA battalion FDC (through a firing battery FDC if working directly with a particular firing battery) and to the maneuver battalion fire support officer (FSO). The battalion FSO puts the appropriate information into intelligence channels by giving it to the maneuver battalion S2 and insures that the information gets to the supporting DS battalion brigade FSO who, in turn, passes it to the DS battalion FDC. A close working relationship between intelligence, maneuver, and fire support personnel at all levels is absolutely essential to effective TA at brigade level.

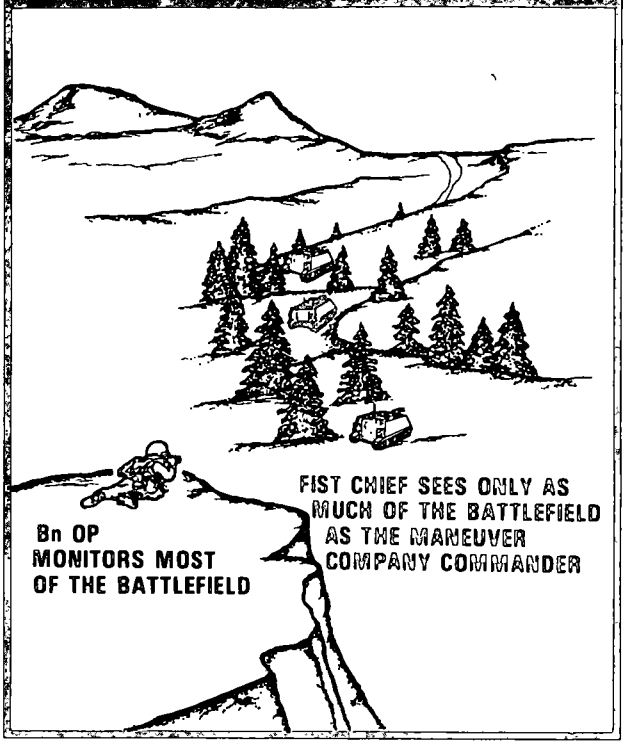
FIGURE 10-1. ORGANIZATION OF THE FIRE SUPPORT TEAM



10-4. Battalion Observation Posts

When the situation allows, battalion observation posts (OP) will be established. A battalion OP provides more observers and therefore more area coverage. The battalion OP also has the advantage of more freedom of movement than the FIST. The battalion OP does not have to accompany the maneuver unit and so can occupy more favorable terrain. From the battalion OP, observers can monitor friendly and enemy movement that would be difficult for the FIST members to see from their locations with the maneuver unit. In a defensive situation, the FIST will have more flexibility because a good defensive position usually has a good field of vision; in the offense, the FIST will be moving with the maneuver unit and in many cases will be deliberately in defilade to prevent direct enemy observation of the movement. This severely restricts the FIST's TA capability.

FIGURE 10-2. BN OP IN THE OFFENSE



The battalion OP will usually be manned by personnel from the battalion survey parties, or other available trained personnel. When the survey parties have completed their survey requirements, they may be directed to occupy battalion OP's and begin a target area survey and perform observation duties, including HB/MPI registrations. The location of the OP will be designated by the battalion S2 who will also provide special instructions such as particular areas of interest and what enemy activities are expected in the observed areas. Battalion observers will prepare visibility diagrams for their OP and submit these to the battalion S2.

10-5. Weapon Locating Radar

Although division artillery has the overall responsibility for counterfire, a weapon locating radar from the TAB will frequently be attached or placed under the operational control of the DS FA battalion. The battalion S2, after coordinating with the div arty to insure target coverage across the entire division zone, will recommend to the battalion S3 the general position area. The radar technician or chief of section then selects the exact position based upon maximizing effectiveness and minimizing vulnerability (see chap 9). The radars remain organic to the TAB so that div arty has the flexibility to allocate and reallocate these assets across the division front as dictated by the immediate situation. The radar reports targets to the DS battalion FDC, whereupon the FDC acts upon the information and/or passes it to the div arty TOC. This will usually occur only when the DS battalion is too involved with close support to handle a counterfire mission.

To decrease the radar's vulnerability to enemy direction finding and subsequent attack, the radar should be turned on only when enemy mortars and artillery are active. The battalion FDC can cue the radar if personnel, particularly FIST members, are trained to immediately notify the FDC of all incoming rounds.

10-6. TA Support for the Separate Brigade

The FA direct support battalion of the separate brigade has a target acquisition platoon. This platoon's capabilities include weapon locating and moving target locating radars. In addition to the TA platoon, the DS battalion is organized to provide FIST's to maneuver companies and FSO's to their battalions and brigade.

Chapter 11
Targets

WHY
We must understand the enemy—his tactics and capabilities—if we are to find and engage him.

WHAT
This chapter describes:

considerations of TA
nuclear capable delivery systems
air defense systems
artillery
command and control
installations
maneuver forces
radars
front attack profile

11-1. Definition of a Target

A target can be personnel, materiel, or a piece of terrain that is designated and numbered for reference and/or firing.

11-2. Considerations of Target Acquisition

The complex problem of acquiring targets can be simplified to a large extent by developing an intimate knowledge of the enemy. There is no substitute for understanding your enemy. Knowing when and where to expect certain types of targets and how to look for them greatly enhances the TA effort. This chapter is devoted to a discussion of some of the targets that can be expected to have a relatively high priority for attack.

No effort is made to establish a formal target prioritizing system. Clearly, the relative importance of a target is a function of a number of variables, such as the commander's guidance, the situation, and the mission. When large volumes of target information are being developed concerning numerically superior opposition, the careful assessment of target precedence becomes important in directing the application of limited fire support resources. As resource imbalance grows, so does the importance of target prioritization.

There is one type of target that merits special considerations—nuclear capable delivery systems. These systems can unquestionably affect our chances for success; therefore, they deserve a commensurate priority for attack.

The Soviet Union is our strongest potential adversary; consequently, the targets that are discussed in this chapter are associated with the Soviet Ground Forces (SGF) or their allies. The equipment and tactics of other possible adversaries are likely to be similar. The Soviets possess a more varied and complete structure and therefore provide the best possible example for teaching purposes. The objective is to expose the reader to pertinent characteristics of typical targets, certain aspects of their use by the Soviets, and where to search for them on the battlefield. Regardless of who the potential threat is, the key is to know comparable items of equipment and tactics or techniques as discussed in this chapter.

11-3. Soviet Materiel and Tactics

Nuclear Capable Delivery Systems. A weapon system must be within its maximum range capability of a target before it can be used. This helps TA personnel to know where not to look for enemy targets that represent an immediate threat. The maximum range capabilities of a number of Soviet weapons are found in table 11-1. Those which are known to be or may be nuclear capable are designated with an "N." SCALEBOARD and SCUD would probably not be employed below front level, although SCUD could be. Any of the other weapons shown in the table could be seen with the army and division.

FROG. Soviet tactics for the FROG are similar to those of the US Honest John and Lance systems. The FROG firing battery with its two launchers remains in a hide position until a fire mission is received. A launcher is sent to one of several preestablished firing positions to fire its rocket. The launcher leaves the firing position as quickly as possible after launch because the signature of the ignited rocket motor can make detection likely, particularly during darkness. The launcher returns to the hide position or may move to a new location for

FIGURE 11-1. SCALEBOARD

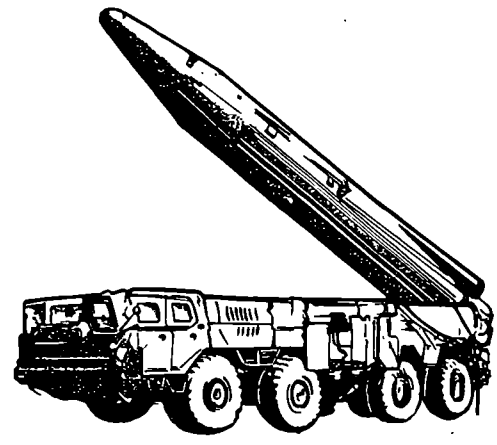


FIGURE 11-2. SCUD

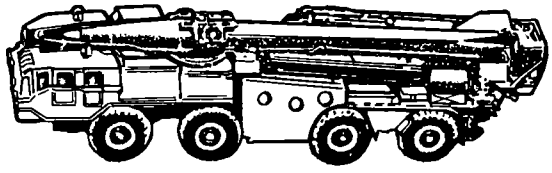
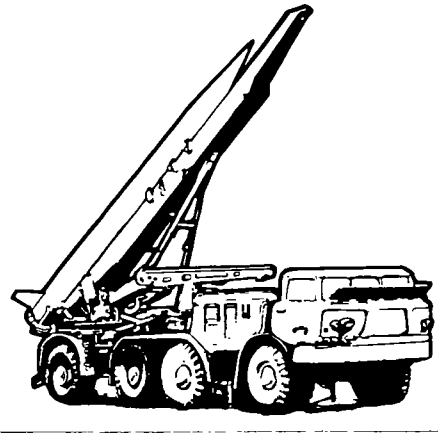


FIGURE 11-3. FROG



further missions. It would not remain in the firing position.

One FROG battalion is organic to each Soviet tank and motorized rifle division. The battalion has two firing batteries and a headquarters and service battery. The latest version of FROG is the FROG-7. Although it has a range of 11-60 km, it normally deploys well forward during offensive operations to support the forward movement of the division. In such operations it is likely to be found approximately 8 to 15 kilometers from the FEBA. The weapon does have a minimum range of 11 kilometers. In the defense, FROG-7 may be found farther to the rear but within the division's zone; i.e., not more than 30 km from the FEBA. The FROG-7 is a wheeled system. Although it has good cross-country mobility, it is primarily designed for road travel and will probably be found on or near the roads leading into or out of an operational area. Because of the threat it represents, FROG-7 should be considered a prime target.

Cannon. It is technically feasible to produce a nuclear weapon in a package as small as 150-mm, and table 11-1 shows the likely delivery systems. These systems are primarily conventional fire support weapons. In accomplishing their missions they are subject to detection by the TA system. The Soviets can be expected to position their artillery out of direct view from the vicinity of the line of contact, and so that about three-fourths of their range capability extends into enemy territory. A belt extending 3 to 7 kilometers beyond the line of contact should contain much of the Soviet artillery. All-source intelligence would be the most productive means of locating them until firing is opened.

TABLE 11-1. SOVIET WEAPON SYSTEM MAXIMUM RANGES[1]

Weapon [2]	Range (km)	Weapon	Range (km)
N SCALEBOARD	800	240-mm MRL	10.2
N SCUD B	280	N 240-mm M	10
A	150	140-mm MRL	9.8
N FROG	70	160-mm M	8
250-mm MRL	56	120-mm M	5.7
N 180-mm G/H	30	82-mm M	3
N 203-mm G/H	28	SAGGER ATGM	3
130-mm G	27	SWATTER ATGM	3+
122-mm MRL	20.5	SNAPPER ATGM	2.3
200-mm MRL	20	115-mm T	1.5[3]
N 152-mm G/H	18.8	100-mm AT	1[3]
122-mm H	15.3		

[1] Conventional propellant is the basis of the range data. Such enhancements as rocket assisted projectiles are not included.
[2] SCALEBOARD and SCUD are ballistic guided missiles. FROG—free rocket over ground; MRL—multiple rocket launcher; G/H—gun-howitzer; G—gun; H—howitzer; M—mortar; ATGM—antitank guided missile; T—tank; and AT—antitank gun.
[3] Maximum effective direct fire range.

Air Defense Systems. The Soviets rely heavily upon their air defenders. They have an extensive and complementary network of surface-to-air missiles (SAM) and antiaircraft (AA) cannon weapons positioned in depth to provide a most respectable umbrella over the ground forces. While many of these weapons may be used to deliver direct fire, their principal mission is to prevent the intrusion of hostile aircraft into the airspace above and short of the FEBA. It is in this regard that the Soviet's air defense system takes on its greatest significance. The suppression of appropriate elements of this system is important to our air forces as they carry out tactical air support responsibilities. Tactical Soviet air defense weapons are shown in table 11-2.

The SA-3 is used to defend fixed sites and is usually not found below front level. All other weapons may be present in the tactical area. SA-2 and SA-4 are not usually found below army level. S-60, ZSU-57-2, and ZSU-23-4 are normally employed in the tank and motorized rifle divisions along with the SA-6, 7, and 9. These weapons have good mobility and SA-6 and ZSU-23-4 can fire while moving.

As stated earlier, the Soviet air defense weapons are positioned throughout the zone, and the ZSU-23-4 and SA-9 can be expected to be integrated throughout the tactical zone. The density of system elements may be somewhat greater nearer the FEBA. As with their artillery, we must rely upon all-source intelligence for detection until the Soviet air defenders open fire.

TABLE 11-2. SOVIET TACTICAL AIR DEFENSE SYSTEMS

Weapon	AD Range (km)	Signature
SAM:		
SA-4	70	Flash, EW
SA-2	40	Flash, EW
SA-6	30	Flash, Sound, EW
SA-3	24	Flash, Sound, EW
SA-9	7	Flash, Sound
SA-7	3.5	Flash, Smoke
AAA:		
S-60 (47-mm)	6	Flash, Sound, EW
ZSU-57-2 (57-mm)	4	Flash, Sound
ZSU-23-4 (23-mm)	3	Flash, Sound, EW
ZSU-23 (23-mm)	2.5	Flash, Sound
ZPU (14.5-mm)	1.4	Flash, Sound

Field Artillery. Field artillery systems are particularly lucrative targets because they exert significant influence on the battle, are found in plentiful numbers, and are relatively easy to locate when firing. The Soviets have a large numerical advantage over us in all categories of artillery. For the purposes of discussion, this class of targets is developed in three subclasses: cannon artillery, multiple rocket launchers, and mortars. It should be stressed that what is addressed here are artillery systems; i.e., command and control, target acquisition, communications, and ammunition as well as the weapons themselves.

Cannon artillery. Indirect fire guns, gun-howitzers, and howitzers make up this subclass. Organic cannon artillery is found at all levels of command in the Soviet Ground Forces from front down through the motorized rifle regiment (the tank regiment has none). The MRR has one battery of 122-mm howitzers that may accompany assaulting forces to engage close-in targets with direct fire. The MRD has an artillery regiment that includes two 122-mm howitzer and one 152-mm gun-howitzer battalions, while the artillery regiment of the TD has three 122-mm battalions. Self-propelled weapons of these calibers are being introduced into the divisions in growing numbers.

There are a number of artillery divisions and separate brigades that are organic to higher echelons of command (e.g., front). A typical artillery division includes two 130-mm regiments and one 152-mm regiment of three battalions each. Each battalion has three firing batteries with four or six cannon, depending on the caliber. Divisional cannon battalions have six primary weapons in each of their three firing batteries. Front and army commanders frequently augment the fires of the maneuver divisions by attaching artillery to them.

As stated before, the Soviet artillery deploys well forward so that approximately three-fourths of its maximum range capability extends into the enemy's zone. Depending on the terrain, they prefer to position firing

FIGURE 11-4. 122mm HOW, D-30

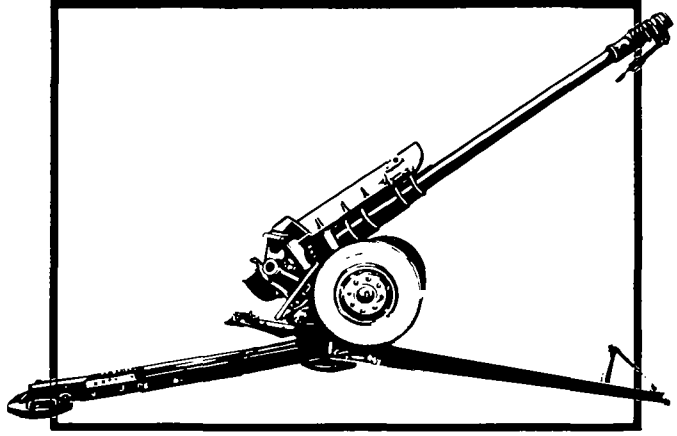


FIGURE 11-5. 152mm GUN-HOW, D-20

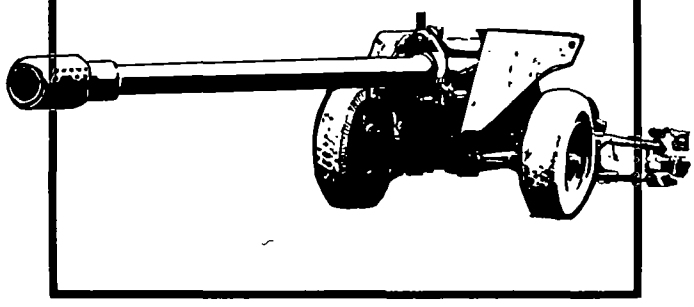
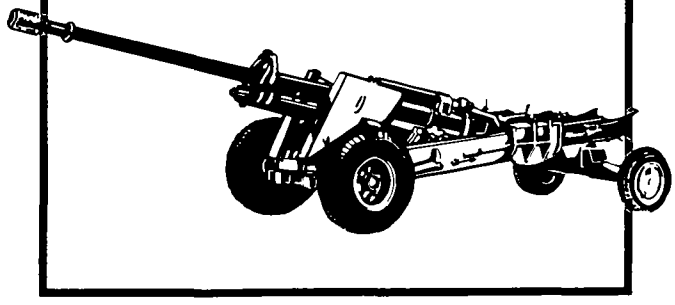


FIGURE 11-6. 130mm GUN, M-46



batteries about 1,000 meters apart.

One vulnerability of the Soviet cannon artillery is their practice of establishing command observation posts well forward with the supported command element. The firing battery command and technical fire direction are concentrated at the COP. Target acquirers should begin their search for these activities in the area shown in table 11-3.

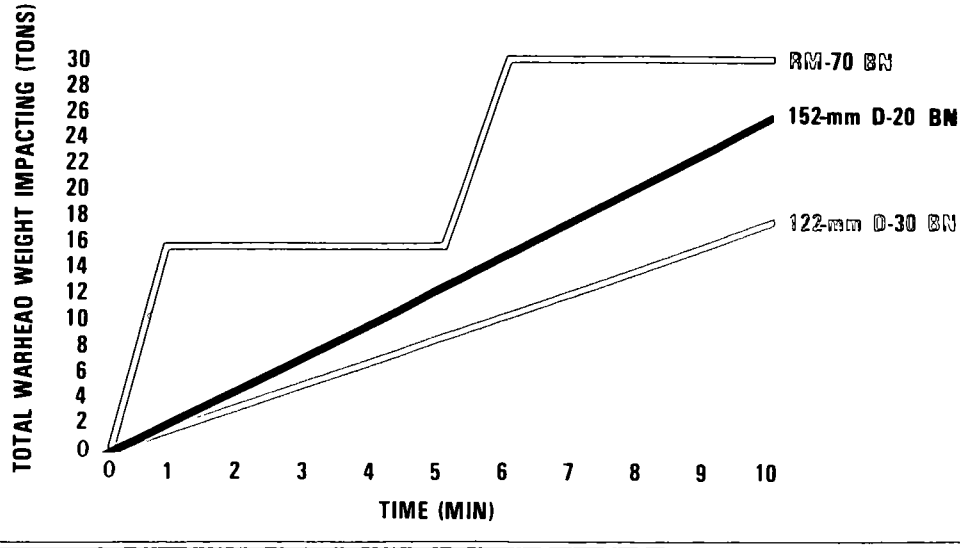
Multiple rocket launchers. The Soviets have a number of these excellent area saturation weapon systems, and they would be used extensively during preparations and the artillery offensive in general. Each MRD and TD has one organic 122-mm MRL battalion. These weapons have a significant sound and flash signature, and because of this can be expected to displace immediately upon firing in order to avoid counterfire. MRL's could be expected to be found in forward areas along with other division artillery; however, their respectable range capability gives the system a generous standoff advantage.

Mortars. The standard Soviet mortar is the 120-mm. There are six of these in the organic mortar battery of the motorized rifle battalion. Tank battalions do not have mortars. Primarily because of their limited range capability, mortars are found close to the line of contact. Their normal employment is from behind the first defilade back from the LC on the reverse slope. This manner of positioning shields them from observation and low trajectory fires. Mortars are highly mobile and must be attacked immediately upon detection to prevent their escape. The use of sound and flash ranging against mortars is not usually effective because they produce little flash or sound.

TABLE 11-3. EXPECTED LOCATIONS (COPs)

Echelon	*Distance from LC (km)*
Battery	0.1
Battalion	0.5—1
Regiment	1—2
Division	2—4

TABLE 11-4. COMPARISON OF MRL BATTALION VS CANNON BATTALIONS



Weapon locating radar is probably the most effective TA system for use against mortars. The mortars' high trajectories and close proximity to the FEBA make them particularly vulnerable to radar detection. Crater analysis can produce sufficiently accurate target information to be of real use in locating artillery. It is important to keep in mind that crater analysis is a target acquisition technique that is not readily fooled and that this is one of the only means of information input from maneuver sources below brigade level. Crater analysis may be of use in some situations; therefore, training and practice of this technique should continue.

Command and Control. Soviet command and control is generally difficult to disrupt. They have great respect for the capabilities of electronic warfare systems and, as a result, emphasize communications security in their training. Wire communication is used wherever practical to eliminate electronic emissions that can be detected. They stress meticulous planning so that operations may be carried out with a minimum of communications during the execution.

As stated before, the field artillery battery COP's are vulnerable. If these can be acquired and destroyed, two benefits accrue: the firing battery is left without command or fire direction capabilities, and the supported maneuver unit must compensate for the lack of accurate fire support.

Front and army headquarters are generally required to have two CP's, a main and an alternate, which are at nuclear safe distances from each other. Both are supposed to be fully manned and operational around the clock. In practice, due to the limited size of division staffs, their alternates are usually manned by a skeleton crew. The alternate is to take control on order or if the main becomes nonfunctional.

Front and army headquarters are generally positioned in depth. As a rule, a forward COP or CP is established at the rear of the next lower commander's first echelon. Division and regimental headquarters are located well forward to maintain control of the battle. The division forward CP, when deployed, usually moves immediately behind first echelon battalions in the same general area as the main regimental CP's. The alternate normally moves behind the main CP.

Installations. These complexes may be the site of a variety of important activities (e.g., supply, maintenance, and POL). While they may be ill-defined in terms of size, location, and purpose, installations have some common characteristics. These sites usually have signatures. These could be shape, physical features, vehicular activity, or electronic emissions. The enemy cannot afford to lose installations; therefore, the precedence of attack of this class of targets should be high. Another characteristic is their location. Installations are not located within their opponents' artillery range, and in most cases are well beyond it. These complexes would be attacked by Lance or air forces. Conventional TA systems cannot locate these targets; this task falls to all-source intelligence resources (e.g., aerial photography).

Maneuver Forces. The Soviet Ground Forces have two principal kinds of maneuver forces—tank and motorized rifle. They also have seven airborne divisions that might reasonably be dropped into our rear areas to expedite an exploitation or to sever lines of communication. Target acquisition against Soviet airborne is not developed here. Although their introduction certainly could be crucial, the limited TA resources that are available to the US commander would probably not allow their diversion from the main threat along the line of contact.

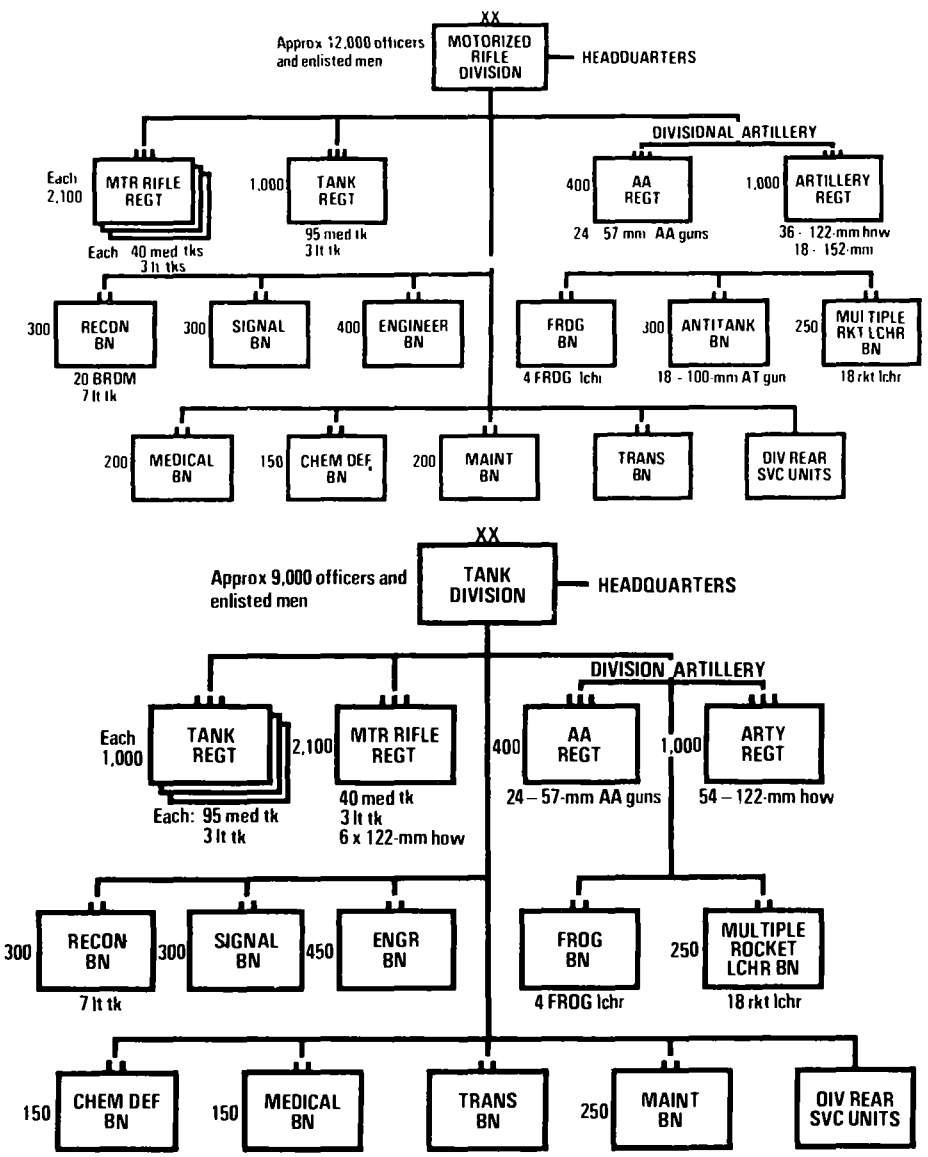
The principal difference between tank and motorized rifle forces is in the proportion of tanks to motorized infantry. The TD has 325 medium tanks and approximately 133 armored infantry combat vehicles (BMP), and

the MRD has 266 medium tanks and over 300 BMP's.

This type of target is unique in that the problem is not necessarily in acquiring them, but how to engage them. These are hard targets. The introduction of precision guided munitions will permit effective engagement out to the maximum range of medium field artillery.

Although these targets may be attacked, the TA system can do more damage to enemy maneuver units by attacking or suppressing hostile fire support systems (counterfire). These weapons systems are sure to attack friendly antiarmor weapons, while masking with smoke the maneuver of the tanks and APC's onto or around the defensive positions. If Soviet fire support is "turned off," our direct fire weapons can strike at their exposed maneuver forces.

FIGURE 11-7. SOVIET MOTORIZED RIFLE DIVISION AND THE TANK DIVISION

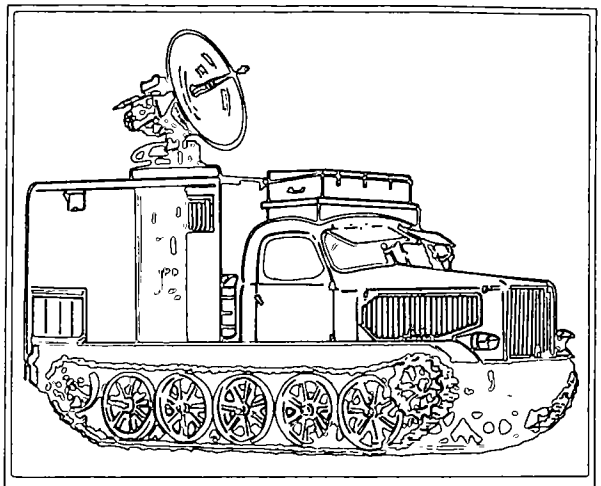


Radars. The Soviets have a variety of radars that may be classified according to their use: weapons locating, moving target locating and ground surveillance, air defense, and meteorological. These instruments are soft targets and can be located when in operation by EW assets of the all-source intelligence system. The conventional TA systems would rarely be able to acquire radar targets, and then only through direct observation.

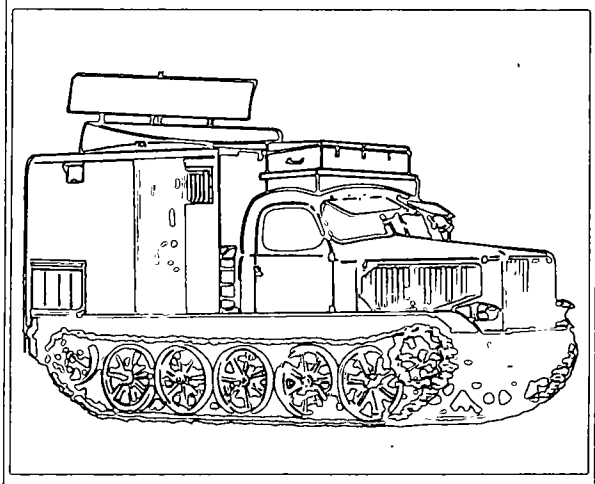
Weapons locating radar. These radars detect hostile indirect fire projectiles in flight and their sources can then be traced. The weapon locating radar is a threat to our artillery systems. Because the range of the set is limited, it can be found close to the FEBA, in defilade, or on a reverse slope 1 to 3 kilometers behind the LC.

Ground surveillance and moving target locating radars. Both of these types of radar detect movement of personnel or materiel. The principal difference between the two is that the MTLR can detect the movement with sufficient accuracy to permit targeting. These sets are more vulnerable to detection than other radars because they must have electronic line of sight to be effective; consequently, they are found on dominant terrain where they can look into critical areas. For example, a Soviet commander who has weak flank security may use one of these radars on a prominent hill near his flank to provide warning against counterattack. They are usually found near the FEBA.

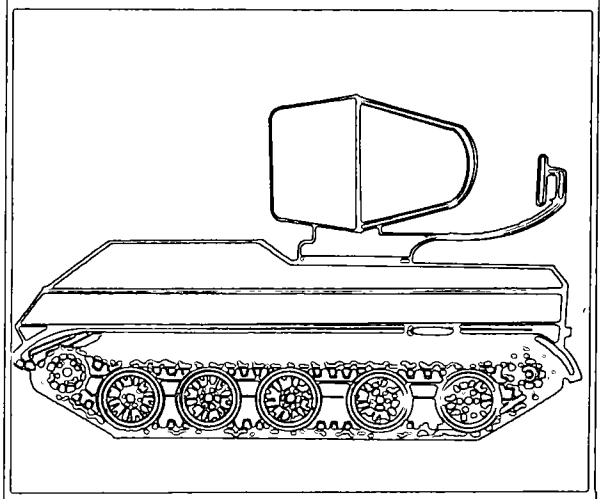
Air defense radars. These sets may provide early warning of approach by hostile aircraft, target tracking, or guidance to a SAM en route to its target. Early warning radars are usually used to provide continuous surveillance of the zone, and this makes them vulnerable to direction finding. Since they are not difficult to locate, the Soviets build powerful energy output capacities into them and position them beyond the reach of our



WEAPONS LOCATING RADAR



GS/MTL RADAR



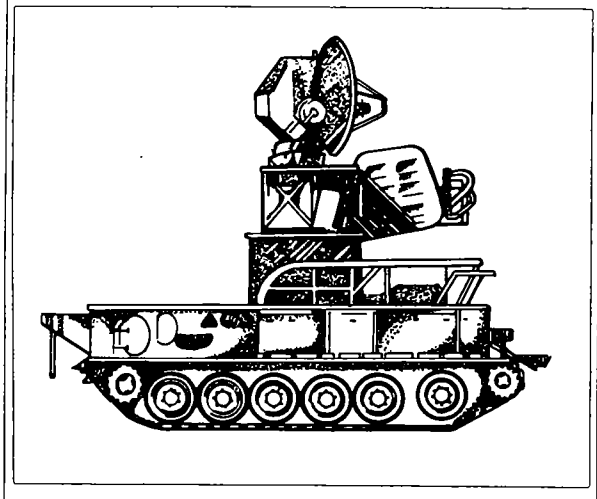
AD SURVEILLANCE RADAR

artillery. Likewise, the larger SAM's with their radars and other system components can be expected to be positioned deep in the enemy's rear areas. The ZSU-23-4 self-propelled and the S-60 towed AA weapons have optical and radar fire control capabilities, and they can be detected by direction finding when using their radar. The tank and motorized rifle regiments normally have a battery of four ZSU-23-4's and a battery of four SA-9 SP missile launchers. The MRR has an antiaircraft battery with four ZSU-23-4's or their equivalent. There are normally 24 S-60's in the antiaircraft regiment of the TD and MRD; however, in some cases SA-6 units may have replaced the S-60. While all of the weapon systems discussed in this paragraph can be found throughout the zone of action, they are particularly plentiful near the FEBA.

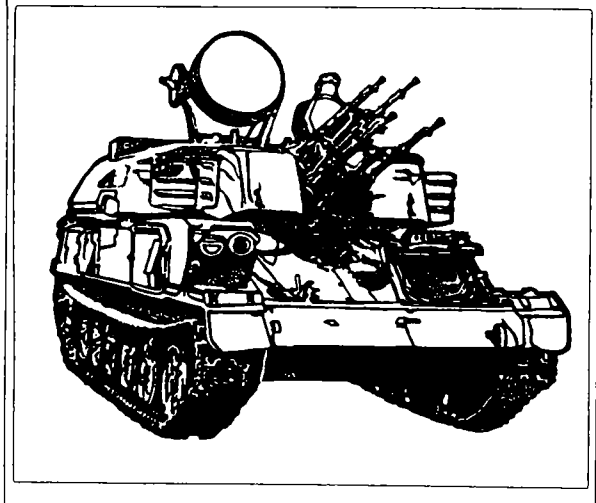
Meteorological radar. These systems are used in measuring meteorological conditions by tracking the ascension of balloons from a launch site. Although it is not directly involved in combat, the met section is a valuable target because its product, the measured effects of weather upon projectiles, rockets, and missiles in flight, is fundamental to the delivery of accurate indirect fires. The radar is left on during the flight of the slow-rising balloon, and it is vulnerable to direction finding during that period.

One met section is organic to the TD and MRD artillery and sections are also found at higher levels, wherever the need for their services exists. Because the corrections that are produced are applied across the zone, it is likely that the divisional met section would be found roughly centered laterally and deep in the zone near a headquarters. A source of water is required to produce the hydrogen that fills the balloons; therefore, the section might locate near a stream, pond, etc., or within easy hauling distance of one. A principal consideration in the positioning of met sections at any echelon is that the site not be far removed from the weapons that are going to use their product.

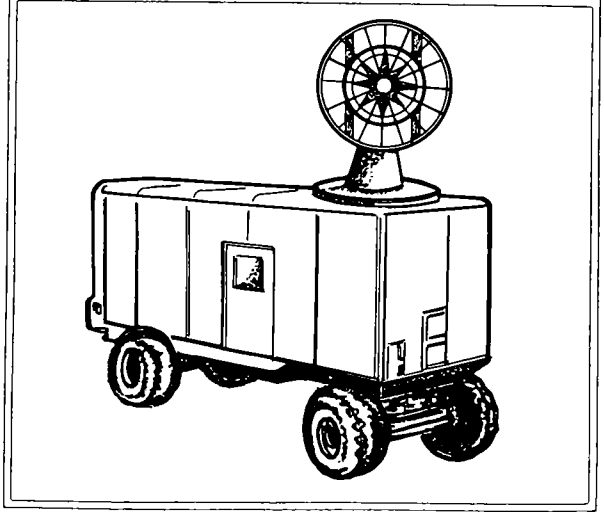
SA 6 GUIDANCE RADAR



ZSU-23-4 W/GUN DISH RADAR



MET RADAR



11-4. Front Attack Profile

The purpose of including this profile is threefold: to show how the Soviets could integrate the elements of the combined arms team; to foster understanding of a flow of tactical events that might typify Soviet operations; and to show how important targets can be detected by the TA system. The reader should keep in mind that this is *a* profile, not *the* profile.

Front units that are designated to be in the first echelon and are not in contact are concentrated at night, several days before the offensive in assembly areas 60 to 75 kilometers from the FEBA. The leading elements of the first echelon armies move to forward assembly areas 20 to 30 kilometers from the FEBA 3 or 4 days prior to the offensive.

During the night preceding the start of the offensive, these units move forward to attack positions in either regimental or battalion columns. The attack positions are near the FEBA; for example, one for a tank division may be 3 to 5 kilometers from its line of departure. During this movement the Soviet units are vulnerable to detection by radar, and because the sounds of armor carry great distances at night, they may even be detected by OP's. These movements are timed so that units reach the attack positions just prior to the firing of the artillery preparation.

Concerning the preparation, nuclear weapons, if they are used, would normally be delivered immediately prior to the conventional phase. In this case the conventional preparation, including air-to-ground fires, would last about 20 minutes. When nuclear weapons are not employed, the preparation can be expected to last longer, 30 to 60 minutes or more, depending on the magnitude of the offensive. The target acquisition system can expect to be very busy during a Soviet preparation. Short, intense preparation frequently precedes the commitment of the second echelon.

Second echelon units normally move forward into assembly areas that have been vacated by the first echelon. Tank and motorized infantry move from these assemblies to attack positions during preparatory fires so that the noise of their movement is hidden by the firing. The artillery units usually try to occupy firing positions for the attack early, up to 24 hours prior to the attack, so that they can provide fire support in unanticipated situations.

The location of assembly areas is dependent upon a number of factors, including terrain, time, tactical situation, and type of operation. Cities and communication centers would probably be avoided. The Soviet commanders like to keep battalion-sized elements separated by at least 2 kilometers.

The force that is assembled is expected to have a high probability of success, having an overall superiority in numbers of at least 3:1. At the point of the main effort, this may result in imbalances on the order of 3:1 in infantry, 4 or 5:1 in tanks, and up to 10:1 in artillery.

When the attack begins, the standard tactical procedure is to bypass or envelop strongly held points or areas. These bypassed strongpoints are reduced by follow-on echelons to which this mission has been assigned. *Only* when such areas have no readily assailable flanks do the Soviets use breakthrough tactics that are designed to destroy the resistance.

In situations where massed defensive forces require a concentration of attacking forces, the presentation of a major target is kept to a minimum by rapid assembly from dispersal areas for a surprise assault at the point of main effort. The overriding concern is to insure that the pace of the offensive is not slowed. Divisions can conduct hasty coordinated attacks from the march in 5 or 6 hours. Concentrated artillery fire may precede the assaulting forces from one objective to the next. Maneuver elements stay within 100 meters of the rolling barrage, taking advantage of limited visibility and surprise to close with the defenders. In mounted assaults,

tanks and motorized infantry are kept within about 400 meters of each other to provide mutual support; and in dismounted assaults the distance between tanks and infantry is reduced to 100 meters. The second echelons of the divisions usually follow the first by 6 to 8 kilometers and are often committed directly from the march. The advance is continued after their enemy's defenses are breached. Speed is emphasized in overcoming obstacles such as rivers, built-up areas, or minefields.

During the attack, the SGF would probably present a predictable target array to our TA system. Table 11-4 describes such an array. The listed distances are recommended areas where the search for particular types of targets should start.

All of the material presented in this chapter is based upon studies of the SGF. Observations and conclusions concern how they *could* deploy and operate, and there is no intent to imply how they *would*.

TABLE 11-4. TARGET ARRAY

Distance Behind Line of Contact (km)	Typical Targets
0-1	a. ATGM b. Tanks c. Armored troop carriers d. 122-mm towed or self-propelled arty e. 82-mm and 120-mm mortars f. 100-mm AT guns g. Arty btry COP's h. HQ
1-3	a. ZSU-23-4 and SA-9 ADA wpns b. ATGM c. Tanks d. Armored troop carriers e. TA system elements (e.g. S/F ranging and GSR) f. Certain EW assets (e.g. jammers and DF stations) g. HQ
3-7	a. Most of the committed arty of various calibers b. ADA systems positioned in depth c. 122-mm and 152-mm towed or self-propelled and 130-mm towed artillery
3-12	a. Practically all of the committed arty b. ADA systems c. EW systems d. HQ e. FROG
12-30[1]	a. FROG b. HQ c. ADA systems d. Follow-on maneuver forces

[1] Obviously e target void does not exist beyond 30 km from the FEBA; however, the present TA systems are not capable of detecting these targets. This task must fall upon the all-source intelligence system.

Chapter 12
Training the Target Acquisition Battery

WHY
Good training is the key to competence and combat effectiveness.

WHAT
This chapter diescribes:
- planning
- miniature training area
- employment and operation
- survey
- communication

12-1. General

Maintaining an adequate level of training in the TAB presents many and varied problems. The most significant are insufficient funds and time and inadequate training areas. This chapter discusses how the use of a miniature training area can assist in solving these problems. Also discussed will be the use of TAB assets during full-scale field exercises as hostile TA assets thereby providing training for the TAB, field artillery batteries, and mortar platoons.

12-2. Planning

The first consideration in planning is to obtain a suitable training site. The ideal site would be close to garrison (to save on travel time), an area in which live mortar fire could be conducted (preferred but not essential), where tactical occupation of position would be permitted (digging in outposts and other positions), and where the terrain lends itself to the establishment of good sites for cover and concealment and the employment of sound, flash, and radar. At other-than-ideal sites, training can still be conducted even though some of the features may have to be omitted (live fire, tactical occupation, etc.).

Time is the next consideration. How much time will be required in traveling to and from the training site? Will there be adequate time for survey and the laying of wire and still time for sound, flash, and radar personnel to conduct their training, or should the survey

and communication work be done prior to employing the rest of the battery?

Other considerations are:

Determine the number of targets to be marked by the demolition team for sound and flash and, if at all possible, have the targets surveyed and marked prior to the exercise.

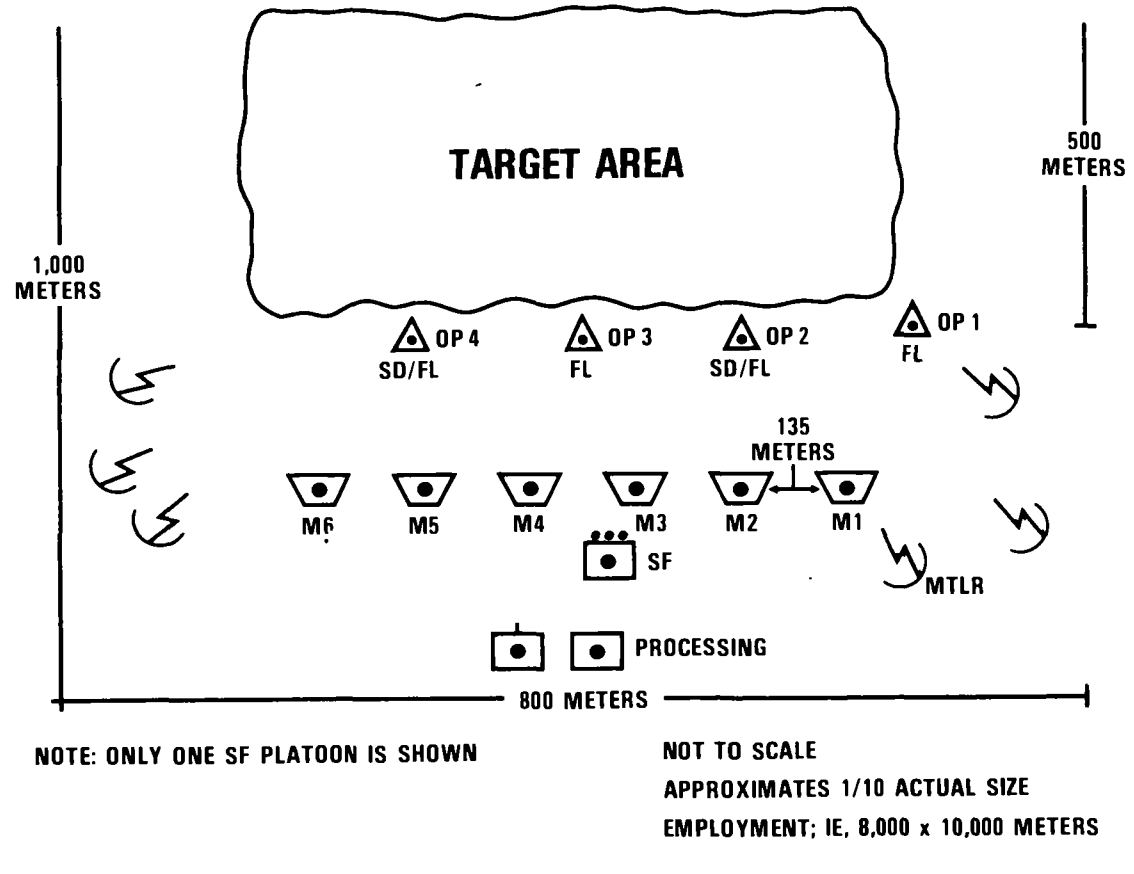
Conduct a normal map and ground reconnaissance prior to the exercise.

12-3. Miniature Training Area

A training area approximately 800 meters wide by 1,000 meters deep (fig 12-1) should be adequate for conducting battery training. Included in this area is a target area approximately 600 meters wide by 500 meters deep in which TNT, M80 firecrackers, artillery simulators, or other sound simulators could be used to simulate artillery firing. Smoke puffs for flash locations could also be fired in this target area. If the training is conducted where live firing is permitted, the target area could also serve as the impact area for mortar firing. Mortar firing can be used to train the weapon locating radar sections.

In addition to saving time and money, the miniature-scale exercise allows the commander to observe the entire battery in operation with a minimum of time lost in getting from one position to another. This also facilitates control and supervison.

FIGURE 12-1. MINIATURE TRAINING AREA



12-4. Employment and Operation of the Miniature Training Area

Sound/Flash Platoon. With the combining of sound and flash into a single platoon, the varied skills in these two techniques must be mastered by every man in the platoon. In addition to operating a sound and flash base, the platoon must lay and maintain its own wire lines and produce sound ranging met messages when necessary.

Sound Ranging Section. The sound ranging section should employ the six microphones in one-tenth of a normal 4-second sound base (i.e., the sound base will be 1/10 normal length). The distance between microphones would be 135 meters; overall length of the base would be 675 meters. With this base, the section will be able to range on TNT (one-fourth pound), the M80 firecracker, or any other sound simulator at ranges of 300 to 900 meters (depending on the positioning of the base with respect to the target area). Because of the short ranges involved, sound observation posts could not start the sound set in time for the sound wave to be picked up at all microphones; however, they could receive training in all other aspects of their job (to include flash ranging). The sound set will have to be activated by the set operator upon receiving a countdown (over radio or wire) from the demolition team.

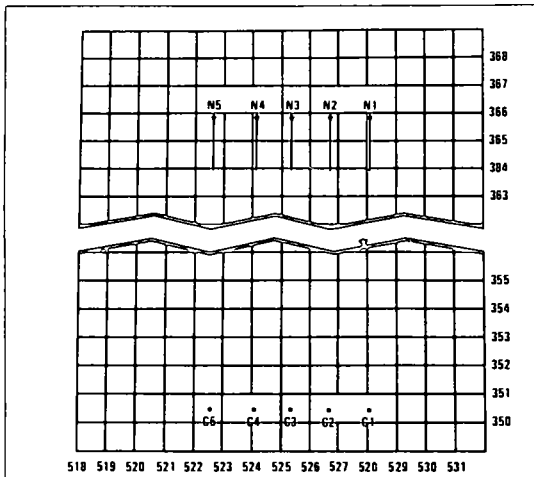
With the use of FADAC, no special techniques are involved. The microphone coordinate, the met data, and the times of arrival are entered into FADAC in the normal manner. Whenever FADAC is used, a check chart must be set up to verify the accuracy of the record reading, to assist in determining the accuracy of the location, and to aid in difficult record reading. Set up the chart by plotting uncorrected time intervals and checking the polygon of error. To plot from this miniature base (one-tenth of a 4-second base), you must multiply the time intervals by 10 and plot them on a chart with the center points 4 seconds (1,350.4 meters) apart. The check chart does not have to be a final plot chart (gridded); it may be a preliminary chart if so desired.

When FADAC is not available and the calculator is being used, determine the factor in the normal way, but remember to use 135 meters as the length of the subbase. For example:

Subbase length 135 meters
Effective temperature +29°C
Conversion number 1395.0
Factor - $\frac{\text{Conversion number}}{\text{Length of subbase}} = \frac{1395}{135} = 10.333$

When the weather-corrected time intervals have been determined from the calculator, they are plotted on the preliminary plot chart.This chart is at a scale of 1:25,000 meters and the center points are 4 seconds apart. The curvature correction is applied in the normal manner. The final time intervals are then plotted on the final plot chart. This chart is at a scale of 1:2,500 meters (100 meters between grid lines) (fig 12-2). Do not be alarmed if you obtain large polygons of error; remember that they are blown up 10 times.

FIGURE 12-2. FINAL PLOT CHART



GRID SCALE 1:2,500

NOTE. THE DISTANCE BETWEEN GRID LINES REPRESENTS 100 METERS

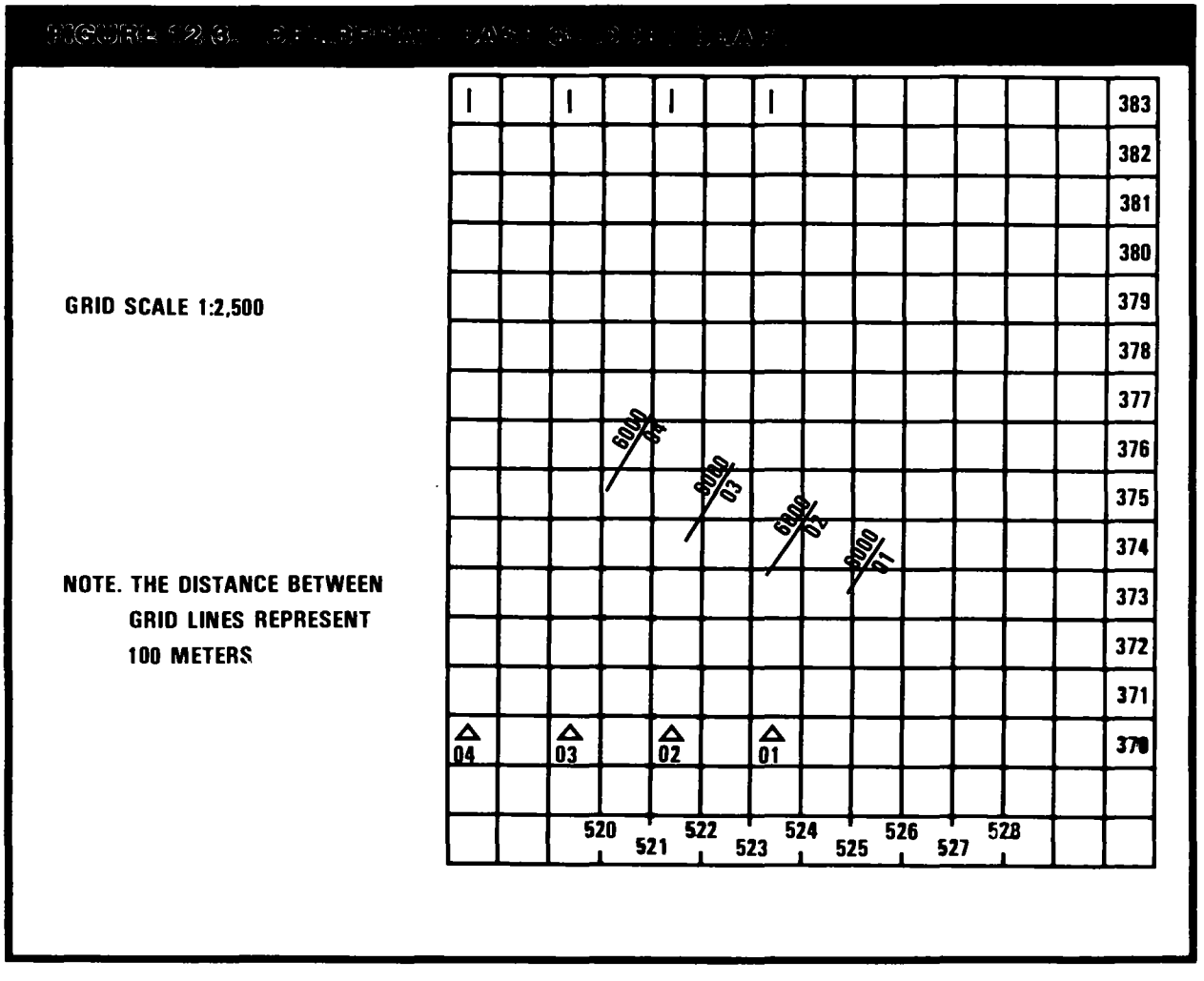
If FADAC and the calculator are not available, multiply the time intervals by 10 and proceed as if you were working with a 4-second base except be sure to set the final plot chart up at a scale of 1:2,500. The survey of the base and record reading must be accurate, as any error could be multiplied 10 times. The microphones must be emplaced directly beneath the point marked by the survey stake. If live fire is permitted, the sound section could make locations, conduct sound-on-sound adjustments, and register.

Flash Ranging Section. Flash ranging on a miniature base is conducted in the same manner as on a normal size base except that when FADAC is not available, the hasty base charts and the deliberate base gridded chart are prepared at a scale of 1:2,500 meters (see figure 12-3).

If live fire is conducted, the flash section could make locations, conduct adjustments, and register. If live fire is not conducted, the section could make locations on the demolitions used for sound ranging or on smoke puffs (primer percussion cap (smoke puff) if available). Use discharger, smoke puff, FSN 6920-714-9756, mounted on a 12-foot pole to fire the smoke puffs.

Projector signal ground M1A1, FSN 1095-731-2570, may be used with simulator projectile airburst for high-burst registrations.

Training can be conducted with the flash deliberate base or with two hasty bases.



AN/MPQ-4A Radar Section. The Q-4 radar sections can receive just as effective training by detecting training rounds as by detecting rounds fired at normal ranges.

The 81-mm mortar firing a teardrop round or the M203 grenade launcher firing training projectile M407 will produce a trajectory high enough for the radar to detect at ranges between 225 and 2,000 meters. The elevation setting on the radar should not exceed 40 mils when trying to detect the M203 projectile or 30 mils when trying to detect the 81-mm mortar shell. The maximum ranges for these weapons firing training projectiles are 400 meters for the M203 and 275 meters for the 81-mm mortar.

Costwise, use of the 81-mm mortar (if available to the unit through infantry support) would be preferable to use of the M203. The teardrop round is made of solid steel and is reusable. A tailfin might become bent or broken; however, it is replaceable at small cost. The price of each round is $2.70 and of ignition cartridge training, M68, is 9 cents. Data concerning the M203, 81-mm mortar, and cartridge M68 are listed to the right (also see figure 12-4).

TABLE 12-1. TRAINING PROJECTILE DATA

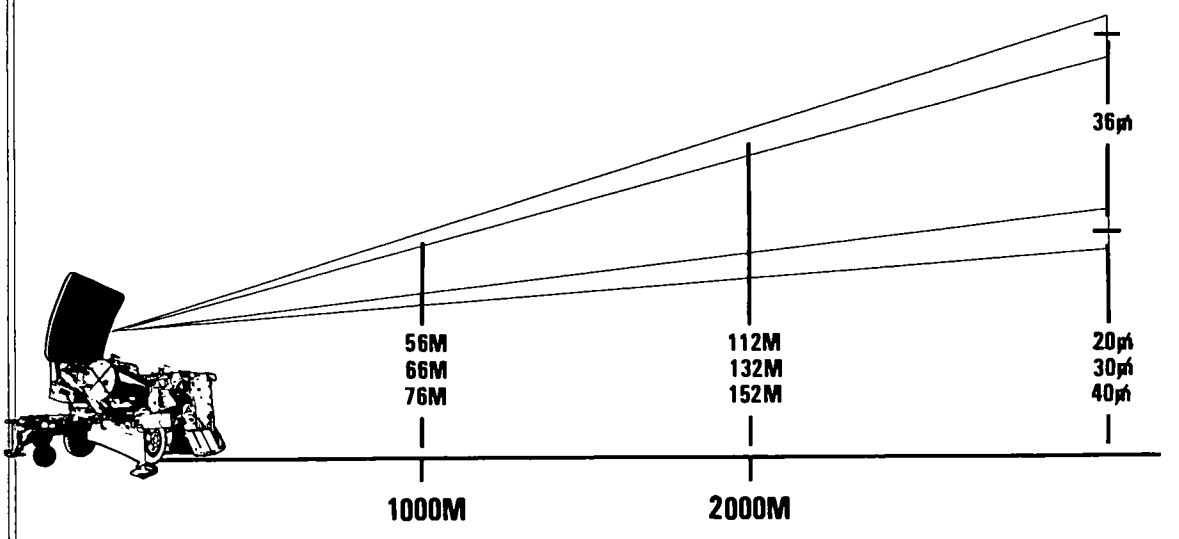
	M203 grenade launcher	81-mm mortar
Projectile	40-mm M407A1	Teardrop—nonexplosive
FSN	1310-965-0738	1315-028-4972 projectile 1315-028-4954 igniter
Cost	$3.07	$2.70—recoverable .09—cartridge igniter
Max ordinate	150-210 meters (approx)	139 meters
Range at max ordinate	200 meters	25 meters
Max range	400 meters	275 meters
Availability	Available in supply channels	Available in supply channels

Cartridge, training, M88

Range (meters)	Elevation (mils)	Max ordinate (meters)
25	1553	139
50	1508	138
75	1459	137
100	1409	135
125	1358	132
150	1304	128
175	1248	123
200	1181	117
225	1107	109
250	1011	98
275	800	70

FIGURE 12-4. RADAR BEAM WEIGHT AT VARIOUS ELEVATIONS

Use this figure in planning the AN/MPQ-4A radar positions during training. TABLE above gives max ordinates of projectiles.



AN/TPS-25A and AN/TPS-58 Radar Sections. Moving target location and identification should be the primary training objectives for TPS-25A and TPS-58 radar sections. These objectives make it possible for effective training to be accomplished in almost any position area. If a unit is unable to move to the field, the radar section can set up the radar antenna so as to monitor any nearby road. The only limitations would be line-of-sight and minimum range (300 meters for the TPS-58 and 450 meters for the TPS-25A).

If traffic flow is inadequate in the area of search, vehicles from the unit motor pool can be used. These should be varied in size if possible (1/4-ton, 5/4-ton, 2 1/4-ton, and tracked vehicles).

Each time a vehicle passes through the target area the speed should be changed. Walking and running personnel should also be included (vary the number from one to five). When the radar operator identifies a target, an assistant, using binoculars, should verify the type of target and the number of vehicles or personnel.

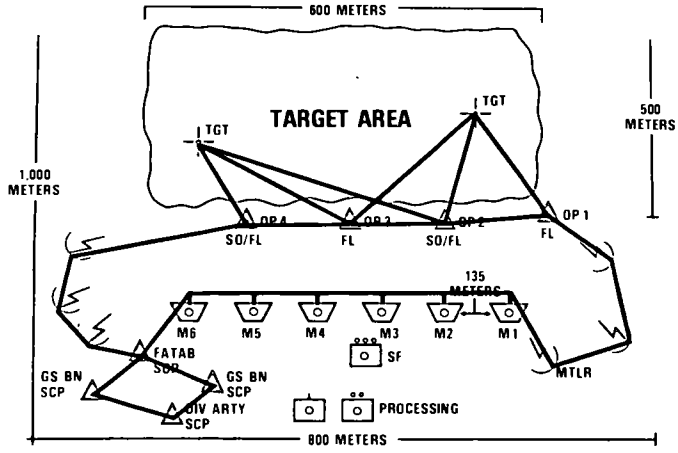
Survey Platoon. Prior to the start of the exercise, the survey officer should draw up the survey plan (fig 12-5). The survey of the targets, sound and flash bases, and radar sites should be completed before the exercise begins. The survey platoon may be employed during the exercise either in surveying normal length installations (if the area is available) or in setting up miniature triangulation schemes and establishing survey control points (SCP) for division and corps field artillery battalions.

Because of the short distances involved in the miniature exercise, the distance-measuring equipment (DME) would not be exercised adequately; however, survey control could be brought in from a distant point by DME traverse.

For the purposes of this exercise, true or assumed control may be used.

If survey cannot be performed prior to the start of the exercise, priority should be given to establishing the essential survey in the fastest manner possible. After this survey is completed, the platoon could receive additional training as mentioned earlier (miniature triangulation schemes and SCP).

FIGURE 12-5. EXAMPLE SURVEY PLAN



NOTE ONLY ONE SF PLATOON IS SHOWN

NOT TO SCALE
APPROXIMATES 1/10 ACTUAL SIZE
EMPLOYMENT: IE, 8,000 x 10,000 METERS

The survey of the targets, sound and flash bases, and radar sites must be to an accuracy of at least 1:3,000 (any error in the survey location of the sound microphones could be magnified 10 times because of the miniature sound base).

Communication. This exercise, on a reduced scale, enables all battery elements to train in establishing the same wire and radio nets as in a full-scale operation. The first priority for the sound/flash platoon is the laying of wire to the microphones. The sound/flash OP's can operate initially over radio, and as time permits, wire lines should be laid from their positions to the sound and flash command post (CP). In this exercise a wire line should be laid from the sound/flash CP to the processing center or battery switchboard (depending on unit SOP). The radar sections can operate on radio until they get wire laid. Because of the relatively small amount of wire laid, the sections should have adequate time to improve the wire lines and to practice wire splicing, overhead crossing, staking, tagging and cabling of multiple lines, and emplacing and servicing the sound microphones. As the laying and maintaining of wire is an additional duty for section personnel, all members of the sections should be cross trained in wire laying and rotated between their normal duties and the laying and maintaining of wire nets.

Processing Section. The div arty target acquisition battery processing section forms the target production element of the div arty tactical operations center (TOC). In this role it receives reports from the radars (via the unit to which they are attached) and sound/flash platoons.

During the miniature-scale exercise, the processing section must maintain a target production map and an enemy order-of-battle (OB) map as they would in the div arty TOC (for this exercise assume friendly and enemy data for realism and post to a 1:2,500 scale). As an overlay to the target production map, maintain a target acquisition capability overlay, and include visibility diagrams for flash OP's and radars, coverage for the sound bases, and radar clutter diagrams.

All acquired locations must be plotted on the target production map for evaluation. A ray overlay must also be maintained on the target production map and all crater analysis rays, rays from single flash OP's, and other directional information must be plotted. The OB map should be maintained by the intelligence officer or NCO who normally maintains it in the div arty TOC. If they are not available, then the processing section personnel must be cross-trained and perform their duties. The order-of-battle map is posted with the entire enemy situation, including known and suspect hostile weapons; standard military symbols are used. Both the order-of-battle map and the target indicators map are overprinted with counterfire reference grid squares for map organization and quick orientation of target acquisition systems.

Maintenance of the OB and TI maps along with posting targets reported by sound and flash and radar platoons will permit the processing section to coordinate the activities of these platoons and to evaluate the information obtained as to reliability and accuracy.

To aid in recording information, a staff journal (DA Form 1594) should be maintained along with mandatory files of Artillery Counterfire Information Forms (DA Form 2185-R), target file cards, and DA Forms 4111.

12-5. The TAB as an Adversary

During live fire field exercise, the hostile weapon locating elements of the TAB (radars, sound and flash) can receive excellent training in detecting firing weapons, and at the same time the firing units can get practice in avoiding detection if the TAB assets are used to simulate aggressor TAB elements.

The action should be as realistic as possible on both sides. The TAB commander should be provided a "hostile force" scenario and then be required to recommend positions for the

TAB sections to the div arty assistant S3 for plans. For training purposes, the direct support battalion should select positions for attached weapon locating radars even though the positions will not be occupied. If possible the positions should be on the opposite side of the impact area from the "friendly force" in order to achieve realistic aspect angles. The TAB element(s) must be required to occupy their positions in a tactically sound manner using cover and concealment to their best advantage. The mission of the TAB must not be allowed to disintegrate into one of being an "administrative" aggressor force. The flash OP's not being used to cue the sound microphones can be used to cue the weapon locating radars when the live firing begins. Target locations will be given to the exercise umpires. If the location is sufficiently accurate for attack of the target, the umpire can then cause the firing battery to take action against incoming hostile fire and assess the appropriate amount of damage and casualties.

To provide further realism, CEWI battalion direction finding elements, if available, should be used on the "friendly force" side to attempt to locate the TAB radars and radios. If they are located, the umpires should take the same actions as specified above for located firing units. This will tend to make the TAB personnel more aware of the potential EW threat and it will provide training for CEWI units.

12-6. Training Complements

This chapter has addressed various means by which TAB field training may be conducted. It is appropriate to note that while this kind of training is essential, other kinds and methods of training are important. A complete training program develops unit, section, and individual proficiency; and the ARTEP, Soldier's Manuals, and SQT's should be integral parts of the program.

Chapter 13
The Future

WHY
Superior systems improvements are the lifeblood of qualitative advantage.

WHAT
This chapter describes:
TACFIRE
radars
sound ranging
IR flash
TV shell
SOTAS
RPV
laser devices

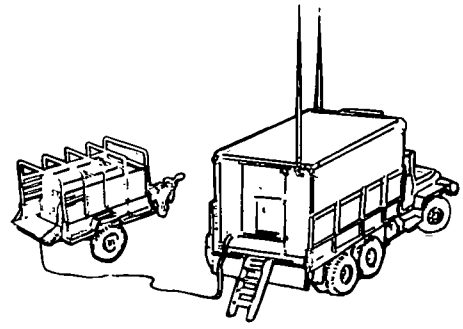
The imperative to see the battlefield is fundamental to both offense and defense. The full value of long range fire support means is degraded if we cannot find and locate targets for them. This pressing need for seeing the battlefield has made target acquisition devices high priority developmental items.

13-1. Tactical Fire Direction System (TACFIRE)

TACFIRE will expedite both the collection and processing of target information and targets. Field artillery target acquisition assets will have a direct communications link to TACFIRE. The sound/flash platoons and radar section of the TAB will be able to send targets to the div arty TOC of the unit they are supporting. Fire support teams and aerial observers will have digital message devices to send targets directly to their supporting FDC's. When a call for fire is received, the battalion or div arty computer will automatically determine the best unit(s) to fire and the optimum number of rounds and ammunition/fuze combinations. Upon approval of the battalion FDO or the div arty counterfire officer, TACFIRE will send the fire mission to the designated firing units. This eliminates or reduces many problems. The use of digital communications reduces radio and telephone transmission times; the computer eliminates the many manual steps involved with target processing and target analysis.

13-2. Mortar and Artillery Locating Radars

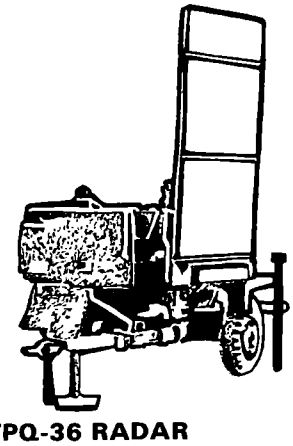
The mortar locating radar, AN/TPQ-36, and the artillery locating radar, AN/TPQ-37, emphasize single round target detection and location and processing of multiple targets. The Q-36 locates mortars out to 15 km and the Q-37 locates artillery out to 35 km. Both radars digitally transmit locations to TACFIRE so that counterfire can be fired in less than a minute. The division target acquisition battery will have two Q-37's and three Q-36's. The Q-37's will normally work under the direct control of the div arty TOC and will forward target locations to the div arty TACFIRE. The Q-36's will usually be attached to or under the operational control of a direct support field artillery battalion and will provide targets to the battalion TACFIRE.



TACFIRE

13-3. Moving Target Locating Radar

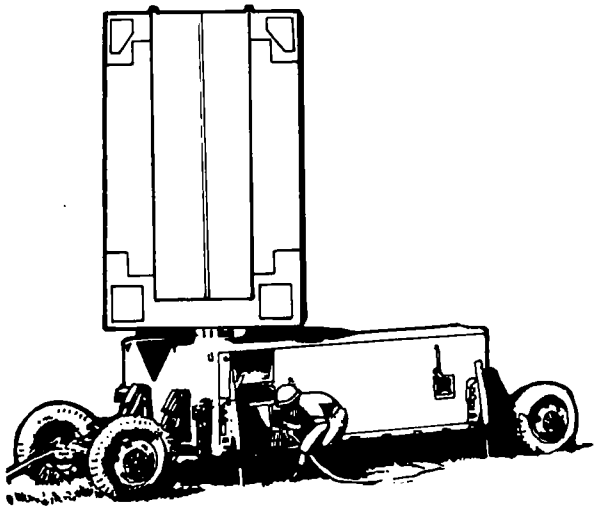
A moving target locating radar that can locate targets to ranges of 30 km is being developed to replace the AN/TPS-25 or AN/TPS-58 now with the target acquisition battery. This radar features better ECCM capabilities, and will mount in an M113 armored personnel carrier. Three radars will be assigned to each target acquisition battery. It is planned for fielding between 1982 and 1986.



AN/TPQ-36 RADAR

13-4. Sound Ranging Equipment

The AN/GR-8 sound ranging set is being replaced by the transistorized AN/TNS-10 sound ranging set. In addition, the AN/GRA-114 radio data link is being developed to eliminate the requirement for the time-consuming wire laying between OP's, the sound microphones, and the sound/flash control units. There is a requirement for a follow-on sound ranging system. An example of one likely type would use



AN/TPQ-37 RADAR

artillery-delivered, air-delivered, or hand-emplaced microphones located in a relatively close proximity to the firing weapons. This increases the probability of detection and reduces both meteorological errors and the probability of deception.

13-5. IR Flash

An IR flash system is in the conceptual state. If fielded it will provide an accurate direction to infrared signatures. It will be entirely passive and therefore immune to hostile EW efforts, and will not be saturated by volume fires.

13-6. TV Shell

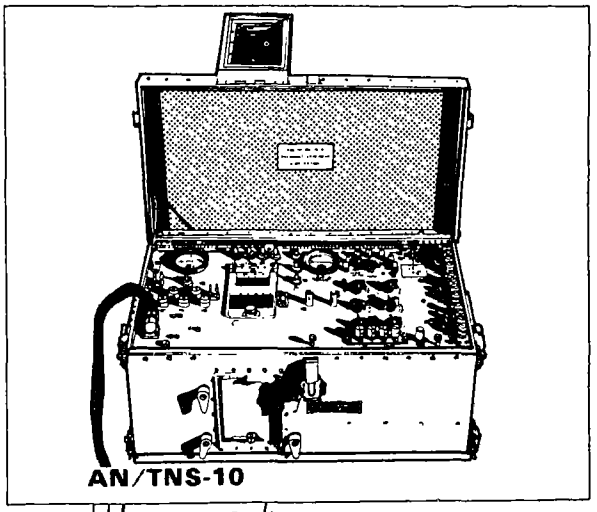
A projectile has been designed to deliver a TV camera into an area that needs to be inspected. When over the designated area, the camera is ejected from the projectile casing and parachuted slowly to the ground taking pictures all the way and transmitting them to a ground station via a radio data link.

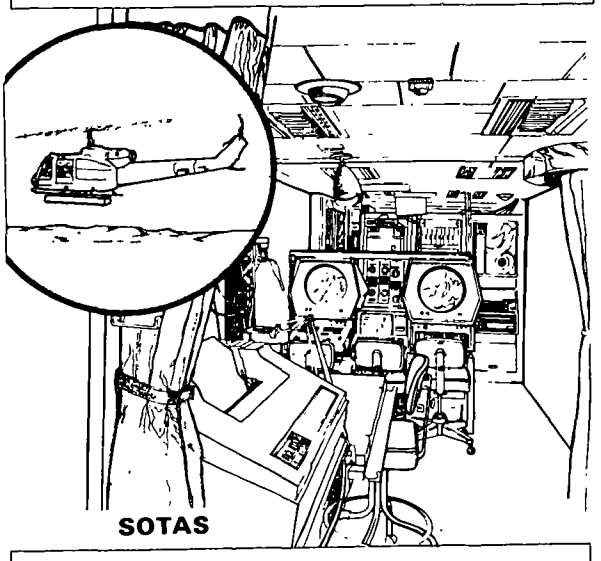
13-7. Stand Off Target Acquisition System (SOTAS)

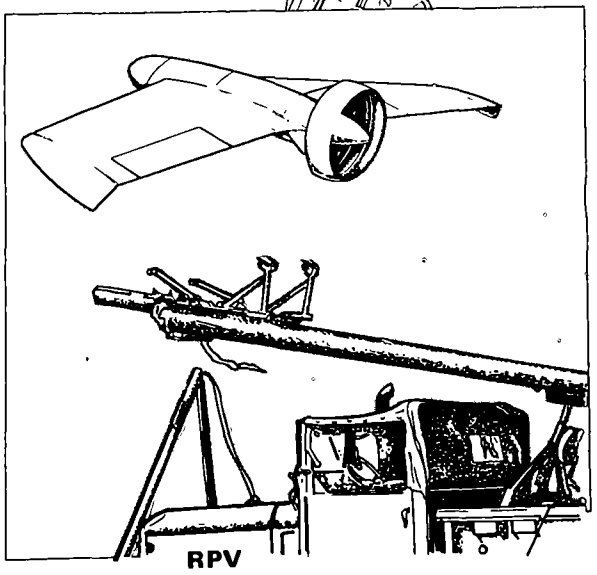
SOTAS is a moving target locating radar mounted on an aerial platform with a data link to a ground station. The system will detect and locate a moving target and predict a straight line future location. Currently, it cannot identify or classify the type of moving targets. Although it can make a definite contribution to the target acquisition effort, its real value is as a surveillance system.

13-8. Remotely Piloted Vehicle (RPV)

The RPV is a remotely controlled miniature aircraft with an on-board laser designator and rangefinder and TV camera. The ground station controls the flight (programable) and has a real time TV display with instant replay. The RPV system will be useful to


AN/TNS-10

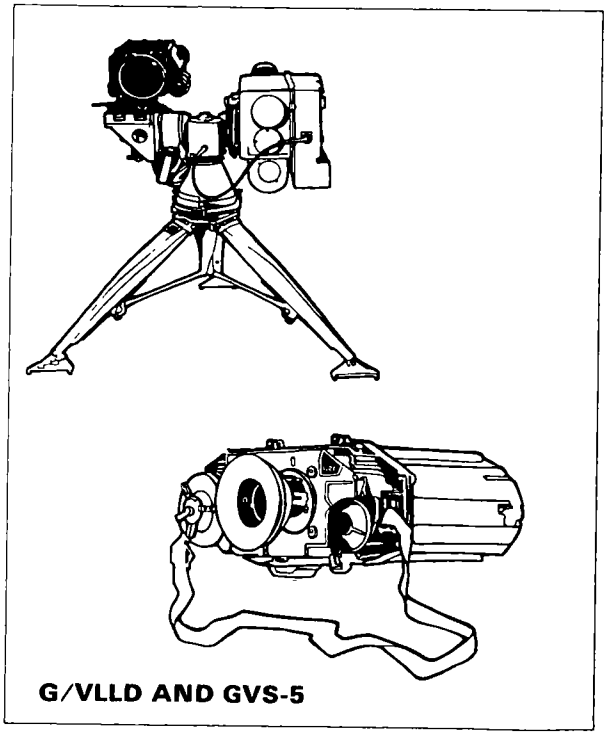

SOTAS


RPV

maneuver commanders, military intelligence, and the field artillery for reconnaissance, surveillance, target acquisition, and laser designation missions.

13-9. G/VLLD and GVS-5

The ground laser locator designator and the GVS-5 laser rangefinder will greatly improve the observer's ability to detect and locate targets. These two devices will have built-in night observation devices that will assist in the detection of targets during the hours of darkness, and both can provide the forward observer an accurate direction and range to the target.



G/VLLD AND GVS-5

Appendix A
REFERENCES

A-1. Army Regulations

AR 310-25	Dictionary of United States Army Terms
AR 310-50	Authorized Abbreviations and Brevity Codes

A-2. Army Training Evaluation Programs

ARTEP 6-307	FA Target Acquisition Battery

A-3. Field Manuals

FM 1-80	Aerial Observer Techniques and Procedures
FM 6-2	Field Artillery Survey
FM 6-10	Field Artillery Communications
FM 6-15	Artillery Meteorology
FM 6-20	Fire Support in Combined Arms Operations
FM 6-40	Field Artillery Cannon Gunnery
FM 6-115	Field Artillery Searchlight Battery
FM 6-122	Artillery Sound Ranging and Flash Ranging
FM 6-141-1	Field Artillery Target Analysis and Weapons Employment: Nonnuclear
FM 6-141-2	Field Artillery Target Analysis and Weapons Employment: Nonnuclear (U)

FM 6-161	Field Artillery Radar Systems
FM 7-10	The Rifle Company, Platoon, and Squads
FM 7-20	The Infantry Battalion
FM 7-30	The Infantry Brigade
FM 17-30	The Armored Brigade
FM 17-95	Cavalry
FM 19-40	Enemy Prisoners of War and Civilian Internees
FM 21-26	Map Reading
FM 21-30	Military Symbols
FM 21-31	Topographic Symbols
FM 21-75	Combat Training of the Individual Soldier and Patrolling
FM 24-1	Combat Communications
FM 24-18	Field Radio Techniques
FM 30-5	Combat Intelligence
FM 30-9	Military Intelligence Organizations
FM 30-10	Military Geographic Intelligence
FM 30-15	Intelligence Interrogation
FM 30-16	Technical Intelligence
FM 30-40	Handbook on Soviet Ground Forces
FM 30-102	Opposing Forces, Europe
FM 31-1	Employment of Unattended Ground Sensors
FM 31-100	Surveillance, Target Acquisition, and Night Observation (STANO) Operations
(C) FM 31-40	Tactical Cover and Deception (U)
(C) FM 32-6	Signal Security (SIG SEC) (U)
(C) FM 32-20	Electronic Warfare (U)
FM 32-30	Electronic Warfare, Tactics and Defense
FM 100-5	Operations
FM 101-5	Staff Officers Field Manual: Staff Organization and Procedures

A-4. Standardization Aggreements

STANAG 2002	Contamination Markers
STANAG 2008	Bombing, Shelling and Mortaring Location Reports
STANAG 2022	Intelligence Reports
STANAG 2029	Method of Describing Ground Locations, Areas and Boundaries
STANAG 2097	Nomenclature for Soviet Bloc Army Weapons and Equipment
STANAG 2103	Reporting Nuclear Detonations, Radioactive Fallout and Biological and Chemical Attacks
STANAG 3377	Air Reconnaissance Intelligence Report Forms

A-5. Training Circulars

TC 6-4-1	The Threat
TC 6-20-10	The Fire Support Team
TC 6-121-2	FA and USA Units—A Targeting Team
TC 30-11	Army Tactical Weather
TC 30-19	Division Intelligence System
TC 30-20	Signal Intelligence
TC 30-23	Ground Surveillance Radar
TC 30-25	Ground Reconnaissance and Surveillance and the Tactical Survey Officer
TC 30-26	Remote Sensors
TC 30-29	MI and FA—A Targeting Team
TC 101-5	Control and Coordination of Division Operations

A-6. Technical Manuals

TM 9-1900	Ammunition, General
TM 11-1290-387 (-10, -20, etc.)	Sound Recorder Radio Set AN/TNS-10
TM 11-5516	Flash Ranging Set, AN/GM-1

A-7. Tables of Organization and Equipment

TOE 6-302H	AIM Div Arty HHB
TOE 6-307H	Target Acquisition Battery
TOE 6-375H	FA Battalion, Separate Armored or Mech Inf Bde
TOE 6-376H	HHB FA Battalion, Separate Armored or Mech Inf Bde
TOE 6-701H	Airborne Div Arty HHB
TOE 6-797H	Airmobile Div Arty TAB

A-8. Department of Army Forms

DA Form 2185-R	Artillery Counterfire Information (Availability: Reproduce locally on 8x10½ inch paper as shown on page D-7, this publication.)
DA Form 4695	Target Card (Availability: Available through normal AG supply channels.)

Appendix B
GLOSSARY AND ABBREVIATIONS

In compiling this appendix, every effort has been made to include the peculiar and not-so-common terms that the reader would encounter. The *Dictionary of United States Army Terms*, AR 310-25, and the *Glossary and Abbreviations of Field Artillery Terms*, published by the Field Artillery School, complement this appendix.

AA Antiaircraft

Agency An individual or organization that exploits a source to collect or process information

AGTELIS An EW system

AIO Assistant intelligence officer, corps field artillery section

CEWI Combat electronic warfare and intelligence

COMINT Communications intelligence

Counterfire Activities of the fire support system that are directed against the enemy's indirect fire systems (i.e., weapons, command and control, communications, ammunition, and target acquisition)

ECM Electronic countermeasures

ELINT Electronics intelligence

EW Electronic warfare

EWIOC Electronics Warfare and Intelligence Operations Center

FAAO Field artillery aerial observer

FAIO Field artillery intelligence officer

FIST Fire support team

Front A Soviet tactical command consisting of a number (usually three to five) of armies, each army normally having four or five divisions

G/VLLD Ground vehicular laser locator designator

II Imagery interpretation

IR Infrared

LC Line of contact

LD Line of departure

MRD Motorized rifle division

MRR Motorized rifle regiment

MTLR Moving target locating radar

OBS Order-of-battle section

Observation The examination or study made of such things as terrain, artillery fire, or atmospheric conditions to obtain information of military value

OPSEC Operations security

QUICK FIX An EW system

RDF Radio direction finding

RECCE Tactical reconnaissance (USAF)

REMS Remote sensors

RPV Remotely piloted vehicle

SAM Surface-to-air guided missile

SEAD Suppression of enemy air defense

SGF Soviet ground forces

SIGINT Signal intelligence

SLAR Side-looking airborne radar

SOTAS Stand-off target acquisition system

Source A person, thing, or activity from which information is originally obtained

TA Target acquisition The *timely* detection, identification, and location of a target in sufficient detail to permit the effective employment of weapons

TAB Target acquisition battery

TACFIRE Tactical fire direction computer system

TACELIS An EW system

Target Personnel, materiel, or terrain that has been designated and numbered for reference and/or firing

Target information Unevaluated data of every description concerning targets which when processed, may produce target intelligence

Target intelligence The product resulting from the collection, evaluation, and interpretation of target information

TD Tank division

TPS Target processing section

TRS Tactical reconnaissance squadron (USAF)

Appendix C
Typical Target Acquisition Plan

C-1. General

The plan for target acquisition may be disseminated in the division OPORD and/or the FA support plan. Examples are at tabs A and B, respectively.

TAB A

ILLUSTRATIVE EXTRACT OF DIVISION OPORD

(Classification)

Copy No ____ of ____ copies
3d Mech Div
FULDA (LO8835), Ger
CW 330

Appendix 3 Artillery Target Acquisition Support to ANNEX J (SURVEILLANCE AND TARGET ACQUISITION) to OPORD 25 (3d Mech Div)

Reference: Map GERMANY, FULDA - HERSFELD, sheets 249, 250, 279, 280, edition CGSC 50-124; 1:50,000.

Time Zone Used Throughout the Order: ZULU

1. THREAT

a. The artillery threat remains fluid; however, current order of battle and the targets on the target indicators map show the main enemy threat oriented on the 2d and 3d Bdes in that order.

b. All calibers of artillery have been identified within the past 24 hours to include MRL and mortars. The 122-mm howitzer is the most common caliber located thus far.

c. The threat is using sound and flash simulators.

d. The threat has been unable to jam noncommunication emitters. Location and attack of friendly radars through ground-based DF has been successful where screening has been inadequate or when radars have been used excessively.

2. PROCESSING

a. Targets and targeting information concerning the threat indirect fire system will be passed to the div arty TOC (via FA bn or bde FSO as appropriate) and the action, if any, taken. Crater analysis data should

(Classification)

C-A-1

(Classification)

also be inputed to artillery channels.

b. The div arty TOC is located at grid 239213.

3. VISUAL OBSERVATION

a. Ground visual observation. See attached divisional capability overlay (incl 1 to this tab).

b. Air observation.

(1) Six aerial observers will fly nap of the earth to acquire targets presenting themselves within 10 km of the FEBA within the division's zone.

(2) Two aerial observers will maintain a 24-hour aerisl surveillance on the division's right flank.

4. RADAR AND SOUND/FLASH

a. Radar.

(1) The AN/TPS-25 is attached to the 1-82 FA (GS). Primary sector of search will be the road network from grid 492241 to 497238. Use of radar restricted to times of darkness or during other periods where direct observation is denied.

(2) AN/MPQ-4A radars are assigned as follows:

(a) 2-3 FA (DS 1st Bde) one section. Primary sector of search: Counterfire reference grids (CRG) QN and northern half of QM.

(b) 2-6 FA (DS 2d Bde) one section. Primary sector of search: CRG RL.

(c) 2-27 FA (DS 3d Bde) one section. Primary sector of search: CRG QO.

(d) 2-38 FA (nondivisional GS bn) one section. Primsry sector of search: CRG QL and southern half of QM.

(Classification)

(Classificstion)

(e) Sound/Flssh Platoon Alpha, one section. Sector of search: CRG QK or as directed.

b. Sound/Flash.

(1) Sound/Flash Plstoon Alpha: Primary sectors of search, threat artillery in CRG QL, QK, RL. 2-38 FA will respond to cslls for fire.

(2) Sound/Flash Platoon Bravo: Primary sector of search, threat artillery in CRG QN and RN. Estsblish additional base to provide detection of mortars in CRG QO. 2-27 FA will respond to calls for fire.

5. COORDINATION

a. Changes to counterfire reference grid designstion contained in division CEOI.

b. Direct coordination for short distance survey between any artillery unit (to include sound/flash and radar) snd CEWI elements is encouraged.

ACKNOWLEDGE

GUNN

MG

OFFICIAL

/s/ GREENWELL

GREENWELL

G3

Incl 1. Division capabilities overlay.

(Classification)

C-A-3

TAB B

ILLUSTRATIVE FA SUPPORT PLAN

(Clssaification)

ANNEX A (TARGET ACQUISITION) to FA SUPPORT Plan 20

Reference: Map Series M745 (GERMANY), Sheets L6322-L633Ø, L6522-L653Ø, L6722-L673Ø, edition ___, 1:50,000.

Time Zone Uaed: ALFA

1. PROCESSING

Counterfire targeting information will be paased directly between the 42d FA Brigade and the Div Arty TOC.

2. VISUAL OBSERVATION

a. Ground Observation. See capsbilities overlay at Incl 1 (omitted).

b. Air Observation.

(1) Six aerial observers will be OPCON to 42d FA Bde. Upon c/c OPCON terminated.

(2) Two aerial observers will maintsin on-call 24-hour aurveillsnce on the division's right flank.

(3) Upon c/c, four serial observers, 42d FA Bde, OPCON div arty, primary emphasis on bde zone receiving main attsck.

3. RADAR, SOUND/FLASH

a. Rsdar.

(1) AN/TPS-25A.

Section 61 A/1-26 FA (TA): Attached to 2-997 FA until c/c. Primary aector of search: road network from grid PV 316931 to PV 250908. Use of

(Classification)

C-B-1

(Classification)

radar restricted to times of darkness or during period when direct observation denied.

(2) AN/MPQ-4A.

(a) Section 1, A/1-26 FA (TA): Attached 2-977 FA until c/c. Primary sector of search counterfire reference grid (CRG) MM.

(b) Section 2, A/1-26 FA (TA): Attached 3-997 FA until c/c. Primary sector of search CRG PJ.

(c) Section 3, A/1-26 FA (TA): Attached 2-3 FA until c/c. Primary sector of search CRG JM.

(d) Section 4, A/1-26 FA (TA): Attached 2-6 FA until c/c. Primary sector of search CRG KL.

(e) Section 5, A/1-26 FA (TA): Attached 2-27 FA until c/c. Primary sector of search CRG LJ.

b. Sound/Flash.

(1) 1st Platoon (S/F), A/1-26 FA (TA): Attached to 1-40 FA until c/c. Primary sector of search, enemy artillery in CRG ML, NK, and NJ. On order, occupy supplemental bases previously established vicinity grid PV035740 to PV093693.

(2) 2d Platoon (S/F), A/1-26 FA (TA): Establish bases in 2d Bde zone. Emphasis on location enemy artillery that is supporting maneuver penetration along axis NEUSTADT (PV1693) to BAD WINDSHEIM (PV0385).

4. COORDINATION

Direct support battalions provide survey for radar/sound and flash/CEWI detachments in their zone of operation.

Incl 1: Capabilities Overlay (omitted).

(Classification)

C-B-2

Appendix D
Crater Analysis and Reporting

Section I. Location of Hostile Guns and Howitzers by Crater Analysis

D-1. General

All personnel should know how to analyze craters and make the proper report, although greater reliance should be placed on reports from trained teams. Since no teams are authorized by TOE, each unit (including units normally located in rear areas) should select and train at least one team of two or three members. To adequately support their maneuver unit, fire support personnel must know crater analysis and reporting.

D-2. Gun and Howitzer Shell Crater Analysis

The projectile's direction of flight can be determined with reasonable accuracy from its crater or ricochet furrow. By accurately locating the crater and measuring the direction of flight, it is possible to obtain the azimuth of a ray that will pass through or near the enemy position. An enemy battery may be located by plotting the intersection of the average back-azimuths from two or more widely separated groups of craters. It is also possible to determine the direction to a battery with fair accuracy from the back-azimuth obtained from one crater or ricochet furrow.

In crater analysis, differences in slopes of fall, projectile burst patterns, directions of flight, and time fuze settings will help to distinguish between enemy batteries firing on a given area.

Refer to FM 21-40 for guidance on friendly troop safety from the effects of craters contaminated with chemical agents.

Refer to STANAG 2002, *Contamination Markers*, contained in FM 21-40, for guidance in marking craters containing chemical, biological, or radiological contamination.

D-3. Value of Analysis

By analyzing shell craters, it is possible to:

Verify, as confirmed locations, suspected locations that have been obtained by other means.

Confirm the presence of enemy artillery, and obtain an approximate direction to it.

Detect the presence of new types of enemy weapons, new calibers, or new ammunition manufacturing methods.

D-4. Inspection of Shelled Areas

Inspections of shelled areas are made as soon as possible after the shelling. Craters that are exposed to the elements and are abused by personnel deteriorate rapidly, thereby losing their value as a source of information.

D-5. Survey of Crater Location

Areas must be located with sufficient accuracy for plotting on charts, maps, or aerial photographs. Deliberate survey is not essential; hasty survey techniques described in TC 6-2-1 or map spotting will usually suffice. Direction can be determined using an aiming circle or compass.

D-6. Determination of Direction

Pattern. A clear pattern produced on the ground by the detonating shell indicates the direction from which the shell came.

Factors Affecting Pattern. Due to terrain irregularities and soil conditions, typical shell crater patterns are the exception, not the rule. Side spray marks compose a principal part of the pattern caused by fragmentation. There is much less effect from nose spray. Base spray is negligible from gun and howitzer projectiles, but is appreciable from mortars. The width, angle, and density of the side spray pattern vary with the projectile, the angle of impact, the type of fuze, and the terminal velocity of the projectile.

In determining direction, the effect of stones, vegetation, stumps,roots in the path of the projectiles; variations in density and type of soil; and the slope of the terrain at the point of impact are considered. From any group, only the most clearly defined and typical craters are used.

Marks on Vegetation and Other Objects. The direction from which a round was fired is often indicated by the marks made as it passes through trees, snow, and walls. The possible deflection of the shell upon impact with these objects must be considered and evidence of such deflection should not be overlooked.

Drift and Wind Effects. Drift and lateral wind effects do not materially change the direction of the shell's axis during flight. The ricochet furrow will be an extension of the plane of fire.

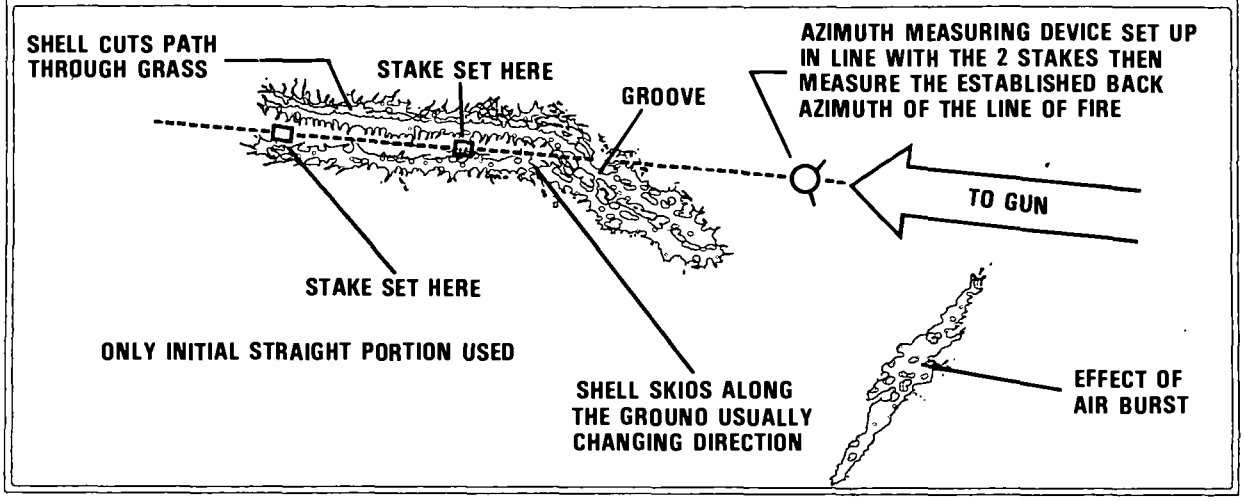
Ricochet Furrows. When an artillery round with a fuze delay is fired at low angle, it will often bounce or ricochet from the surface of the earth. In doing so, it creates a groove which is called a ricochet furrow. Ricochet furrows usually furnish the most accurate information regarding the projectile's direction of flight. The average direction of a few good furrows from the same battery will give a line that passes close to the battery position. Care must be taken, however, to determine that the shell was not deflected before or while making the furrow. After ricochet, shells often change direction at the point where they start back into the air.

Loose dirt should be carefully removed from the furrow by hand, leaving the smooth, hard channel intact. A stake or survey pin should be driven into the ground at each end of the usable straight part of the furrow. The stakes must be driven straight and just touching the center line of the channel on the same side. The line between these stakes represents the line of fire. The azimuth of this line can be measured with an aiming circle or compass (fig D-1).

Fuze-Quick Craters. At small angles of fall, fuze-quick craters furnish information that is nearly as accurate as that from ricochet. Determining the direction of the trajectory becomes more difficult with an increase in the angle of impact; as a result, the analysis of more than one crater is required. When the angle of impact is small or moderate, the crater may appear somewhat pear-shaped. When the angle of impact is larger, the crater is generally oval with the smallest diameter in the direction of flight.

The direction of flight can be determined by

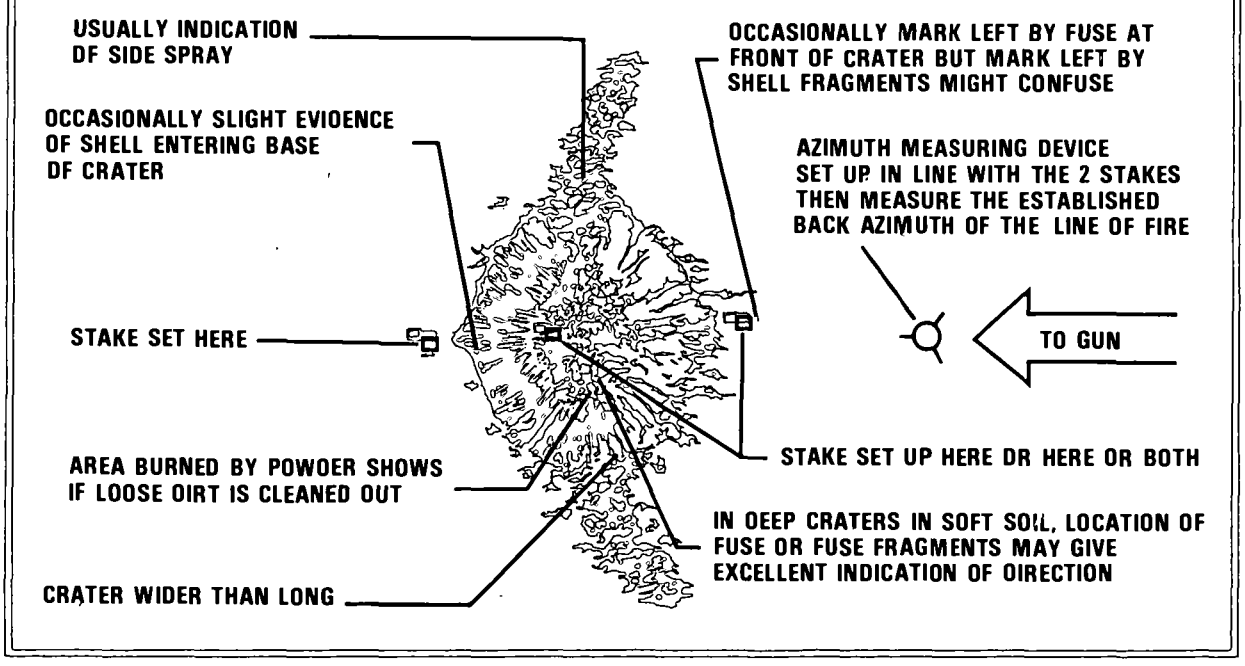
FIGURE D-1. TYPICAL RICOCHET MARKINGS



examining certain properties of the crater, such as:

The groove in the ground where the shell enters (fig D-1). To determine the direction, place a stake in the center of the channel. Place a second stake in the fuze exit groove on the opposite side of the crater (if distinguishable) or in the center of the crater. Sight along these stakes to obtain the back-azimuth. Fuze tunnels or grooves usually indicate the direction of fire.

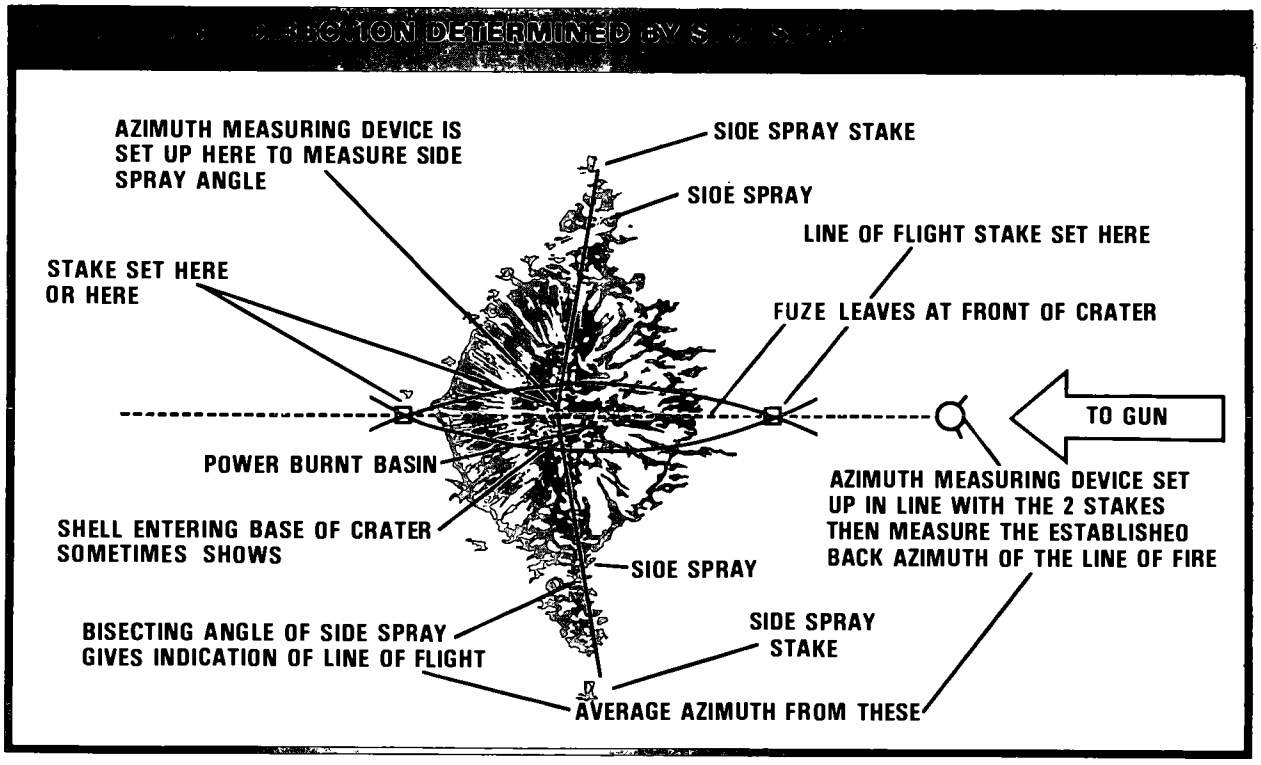
FIGURE D-2. SCHEMATIC SHELL CRATER, FUZE-QUICK



Side spray effects are created by dirt and cut grass. First, place a stake in the center of the crater, then place stakes at the apex of the side spray equidistant from the center stake (fig D-3). From each of these side stakes, strike an equidistant arc to create a bisector of the smaller angle, then drive a stake at that point. The line from the center stake to this stake is the approximate line of fire. If an azimuth measuring device is available, it may be placed over the center of the crater, and the angle between the two stakes measured and bisected.

The mean of the back-azimuths obtained from the operations described above is more dependable than the back-azimuth obtained from either method alone.

Deep Craters. The analysis of deep craters, which are caused by delay type fuzes, is the least reliable method in determining direction of flight. In soft soil, good direction can be obtained if a nose fuze has been used. A nose fuze may form a tunnel prolonging the shell's line of flight, and the line of fire can be determined from this tunnel and other characteristics. Crater patterns are usually oval with the smaller diameter indicating the direction of fire.



Section II. Location of Hostile Mortars by Crater Analysis

D-7. Mortar Shell Crater Analysis

Mortar shell crater analysis is similar to the analysis of gun and howitzer craters. In fact, it is sometimes difficult to differentiate between craters of light howitzer and mortar projectiles.

D-8. Appearance of Craters

Mortar craters are characterized by the following:

At the front edge (one farthest from the mortar position) of the crater, the turf is undercut (fig D-4) while the back edge is shorn of growth and grooved or streaked by splinters.

When fresh, the crater is covered with loose earth that must be removed carefully to disclose the firm, burnt, inner crater (fig D-4).

The fuze is buried in the bottom of the inner crater in front of the point of detonation (fig D-4). In soft ground, the fuze will be buried deeply along the line of trajectory.

The ground above the crater is streaked by splinter grooves radiating from the detonation point (fig D-4). The groove pattern depends on the angle of fall and the type of soil. Frequently, the tips of the splinter grooves on the rear side of the crater will be points on a straight line. This line is perpendicular to the line of flight on level ground or on slopes with contours perpendicular to the plane of fire (fig D-4).

D-9. Determining Direction to Mortars

Three methods may be used to determine the line of flight from a mortar crater. They are as follows:

Carefully remove loose dirt from the crater. If a deep, well defined fuze tunnel has been created, a stick placed in this tunnel will point back along the trajectory ((1) fig D-5).

Lay one stick along the tips of the splinter grooves on the side of the crater toward the enemy mortar, and place another stick at right angles to the first ((2) fig D-5). Measure the azimuth of the second stick.

When a definite and regular crater is formed, a stick can be laid across the crater along its main axis, dividing the crater into halves. The stick points in the direction of the mortar ((3) fig D-5).

FIGURE D-4. SCHEMATIC MORTAR CRATER

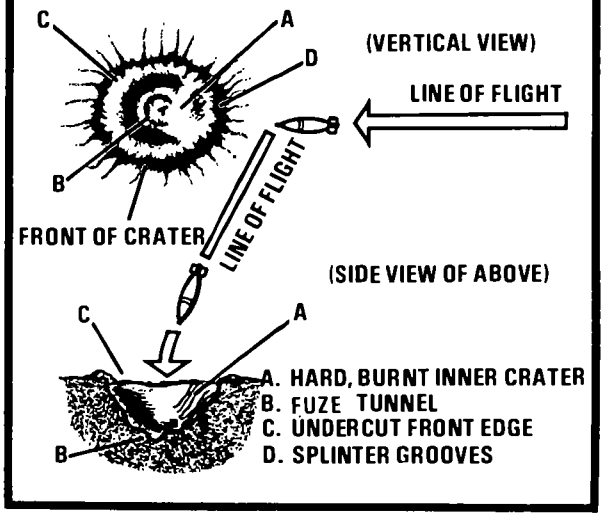
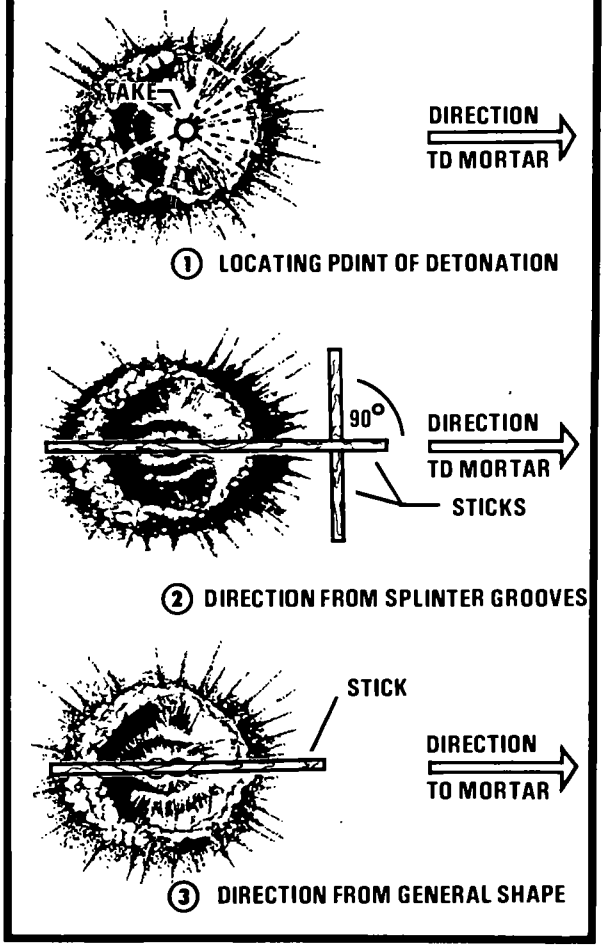


FIGURE D-5. DIRECTION OF FIRE



The value of each method described above depends on soil type and ground form. Usually, direction is best determined by a combination of the three methods.

Section III. Bombing, Shelling, and Mortaring Reports

D-10. General

The div arty is responsible for counterfire; therefore, BOMREP's, SHELREP's, and MORTREP's should be forwarded as quickly as possible to the div arty TOC through either FDC or fire support channels. If a report is received by a direct support battalion and that battalion decides to attack, the report of action taken and a damage assessment if available should be forwarded to the div arty TOC when the action is completed.

D-11. Content

To provide a standard method of rendering reports on enemy bombing, shelling, and mortaring within the NATO Forces operating on land, the United States Armed Forces, together with certain other NATO Armed Forces, have concurred in the provisions of STANAG No. 2008, *Bombing, Shelling, and Mortaring Reports.* Details of STANAG No. 2008 are contained in appendix E.

Refer to STANAG 2103, *Reporting of Enemy Chemical, Biological, or Nuclear Attack,* as implemented in FM 21-40, for guidance in reporting type of attack in conjunction with STANAG 2008.

D-12. Artillery Counterfire Information Form (DA Form 2185-R)

Artillery Counterfire Information Form (DA Form 2185-R) (fig D-6) is designed to assist both the sender and receiver of SHELREP's, BOMREP's, and MORTREP's by insuring that all needed and available information is forwarded. Information should not be withheld merely because the sender is not familiar with the format or has no forms. The information obtained from a crater should be forwarded by the most rapid available means in the format of DA Form 2185-R (STANAG 2008) regardless of how little information has been obtained. Do not hesitate to forward this information. Fragmentary or incomplete information is often of value in supplementing or confirming other information. Section I of the form contains information from an observer. It is used to record only direction to the hostile weapon and does not contain information concerning the actual location (grid coordinates). Section II is a separate section used by those agencies capable of providing the grid coordinates of a hostile weapon. Section III is provided for those agencies responsible for the attack of the located target to record the action taken. Close support battalions completing sections II and III should forward the information to the div arty TOC. The information in each section of DA Form 2185-R can be reported in abbreviated form. The transmission is preceded by the word SHELREP, MORTREP, or BOMREP followed by a lettered column heading and the information for that column. The information for each subsequent column is provided after the letter for that column has been announced. If the information to complete a column is not available, that letter is omitted. Information in columns A, B, and K *must* be encoded when sent via unsecure means.

FIGURE D-6. ARTILLERY COUNTERFIRE INFORMATION FORM

For use of this form, see FM 6-121 The proponent agency is the US Army Training and Doctrine Command.	ARTILLERY COUNTERFIRE INFORMATION		
RECEIVED BY	FROM	TIME	NUMBER

SECTION I - BOMBREP, SHELREP OR MORTREP (Cross out items not applicable.)

UNIT OF ORGIN (Current call sign address group or code name)	POSITION OF OBSERVER (Encode if Hq or important OP or Sec F gives info on location)	DIRECTION (Grid bearing of FLASH, SOUND or GROOVE of SHELL (state which) in mils unless otherwise stated) (Omit for aircraft)	TIME FROM	TIME TO	AREA BOMBED SHELLED OR MORTARED (Grid ref--in Clear) or (Grid bearing to impact in mils and dis from observer in meters--ENCODED) (Dimensions of the area in meters) by (the radius) or (length and width)	NO. AND NATURE OF GUNS (Mortars, rocket launchers, aircraft or other methods of delivery)	NATURE OF FIRE (Adjustment, fire for effect, harassing ETC.) (May be omitted for aircraft.	NO., TYPE, AND CAL. (State whether measured or assumed) of SHELLS ROCKETS (or MISSILES) BOMBS ETC.)	TIME TO FLASH TO BANG (Omit for aircraft)	DAMAGE (Encode if required)
A	B	C	D	E	F	G	H	I	J	K

SECTION II - LOCATION REPORT

SECTION III COUNTERFIRE ACTION

REMARKS	SERIAL NUMBER (Each location which is produced by a locating unit is given a serial number)	TARGET NUMBER (If the weapon/activity has previously been given a target number it will be entered here)	POSITION OF TARGET (The grid reference or grid bearing and distance of the located weapon/activity)	ACCURACY (The accuracy to which the weapon/activity was located. CEP in meters and the means of location if possible)	TIME OF LOCATION (The actual time the location was made)	TARGET DESCRIPTION (Dimensions if possible): 1. radius of target in meters 2. target length and width in meters.	TIME FIRED (Against hostile target)	FIRED BY	NUMBER OF ROUNDS - TYPE OF FUZE AND PROJECTILES
L	M	N	P	Q	R	S	T	U	V

DA FORM 2185-R, 1 May 78 (Conforms with STANAG NO. 2008) Edition of 1 Nov 67, is obsolete.

Appendix E
Standardization Agreement (STANAG) 2008

Standardization Agreements (STANAG) are international (NATO) agreements designed to facilitate inter-Allied operations. Upon ratification by the United States, a STANAG is binding upon US Armed Forces (entirely or with exceptions as noted). This appendix contains STANAG No. 2008 in its entirety.

NATO UNCLASSIFIED

STANAG NO. 2008 (Edition No. 3)—Bombing, Shelling, and Mortaring Reports

DETAILS OF AGREEMENT. (DofA)

Bombing, Shelling, and Mortaring Reports Annex A: (ADofA). Format for Bombing, Shelling, and Mortaring Reports.

AGREEMENT

1. It is agreed that the NATO Armed Forces are to use the format shown at Annex A (DofA) when rendering enemy bombing, shelling, and mortaring reports. (Additional reporting required when NBC weapons are involved is covered in STANAG 2103.)

2. It is further agreed that this format is to be completed as detailed in the following paragraphs of this Agreement.

CLASSIFICATION OF REPORTS

3. Completed reports are to be classified in accordance with current security regulations.

METHOD OF RENDERING AND TRANSMISSION

4. Reports are rendered as normal messages and are to be transmitted by the fastest means available.

CODE WORDS

5. Each transmission is to be preceded by one of the following code words:

a. SHELREP (in the case of enemy artillery fire).
b. MORTREP (in the case of enemy mortar or rocket fire).
c. BOMREP (in the case of enemy air attack).

SECURITY OF MESSAGES

6. The message is always transmitted in clear except as follows:

a. Unit of Origin—Paragraph A of Annex A (DofA). The current call sign, address group, or equivalent is to be used.

b. Position of Observer—Paragraph B of Annex A (DofA). This is to be encoded if it discloses the location of a headquarters or an important observer post.

c. When the originator considers that the conditions prevailing warrant a higher classification (e.g., paragraph K, if required).

PARAGRAPHS

7. Each paragraph of the report has a letter and a heading. The heading may be included for easy reference to facilitate completion, but only the letters are to be transmitted if the report is sent by radio or telephone.

8. Paragraphs that cannot be completed or are not applicable are omitted from the report.

IMPLEMENTATION OF THE AGREEMENT

9. This STANAG will be considered to have been implemented when the necessary orders/instructions to adopt the method described in this agreement have been issued to the forces concerned.

ANNEX A (DofA) to STANAG 2008 (Edition No. 3)

FORMAT FOR BOMBING, SHELLING, AND MORTARING REPORTS

(SECURITY CLASSIFICATION)

BOMREP, SHELREP, OR MORTREP
(indicate which)

A. UNIT OR ORIGIN. Use current call sign, address group, or code name.

B. POSITION OF OBSERVER. (Grid reference preferred—encode if this disclosed the location of a headquarters or important observation post.

C. DIRECTION (FLASH, SOUND OR GROOVE) AND ANGLE OF FALL/DESCENT. (Omit for aircraft.) Grid bearing of flash, sound or groove of shell (state which) in mils, unless otherwise specified. The angle of fall or descent may be determined by placing a stick/rod in the fuze tunnel and measuring in mils, unless otherwise specified, the angle formed by the stick/rod in relation to the horizontal plane.

D. TIME FROM.

E. TIME TO.

F. AREA BOMBED, SHELLED OR MORTARED.

1. Location to be sent as:
   a. grid reference (clear reference is to be used)

   OR

   b. grid bearing to impact points in mils, unless otherwise specified, and distance in metres from observer. This information must be encoded if paragraph B is encoded. (When this method is used, maximum accuracy possible is essential.)
2. Dimensions of the area bombed, shelled or mortared to be given by:
   a. the radius (in metres)

   OR

   b. the length and the width (in metres).

G. NUMBER AND NATURE OF GUNS, MORTARS, ROCKET LAUNCHERS, AIRCRAFT, OR OTHER METHODS OF DELIVERY.

H. NATURE OF FIRE. (Registration, bombardment, harassing, etc.) (May be omitted for aircraft.)

I. NUMBER, TYPE AND CALIBER. (State whether measured or assumed) of SHELLS, ROCKETS (or MISSILES), BOMBS, etc.

J. TIME OF FLASH TO BANG. (Omit for aircraft.)

K. DAMAGE. (Encode if required.)

L. REMARKS.

M. SERIAL NUMBER (each location which is produced by a locating unit is given a serial number).

N. TARGET NUMBER. (If the weapon/activity has previously been given a target number it will be entered in this column by the locating units.)

P. POSITION OF TARGET. (The grid reference or grid bearing and distance of the located weapon/activity.)

Q. ACCURACY. (The accuracy to which the weapon/activity located. CEP in metres and the means of location if possible.)

R. TIME OF LOCATION. (The actual time the location was made.)

S. TARGET DESCRIPTION. (Dimensions if possible):

1.radius of target in metres

OR

2. target length and width in metres.

T. TIME FIRED. (Against hostile target.)

U. FIRED BY.

V. NUMBER OF ROUNDS - TYPE OF FUZE AND PROJECTILES.

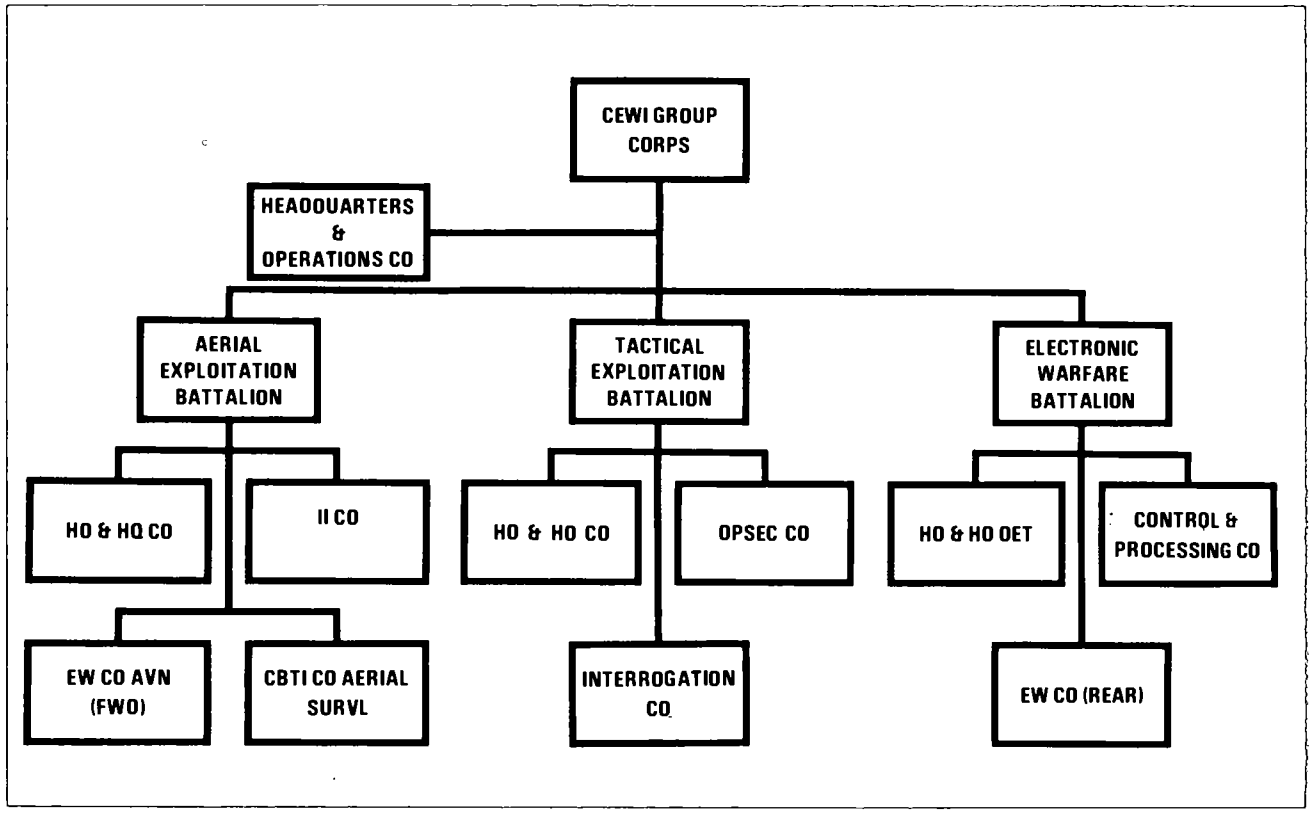
(SECURITY CLASSIFICATION)

Appendix F
Military Intelligence Organizational Charts

The military intelligence community is organized into the combat electronic warfare intelligence (CEWI) concept. CEWI integrates all aspects of military intelligence to include electronic warfare into one organization.

Combat electronic warfare intelligence begins at corps level with the CEWI group. The organizational charts (fig F-1 thru F-20) in this appendix break down the CEWI group at corps into various CEWI battalions and companies. A brief discussion of each battalion and company mission and their capabilities is included with each chart.

FIGURE F-1. COMBAT ELECTRONIC WARFARE AND INTELLIGENCE (CEWI) GROUP (CORPS) AND BATTALION (DIVISION)



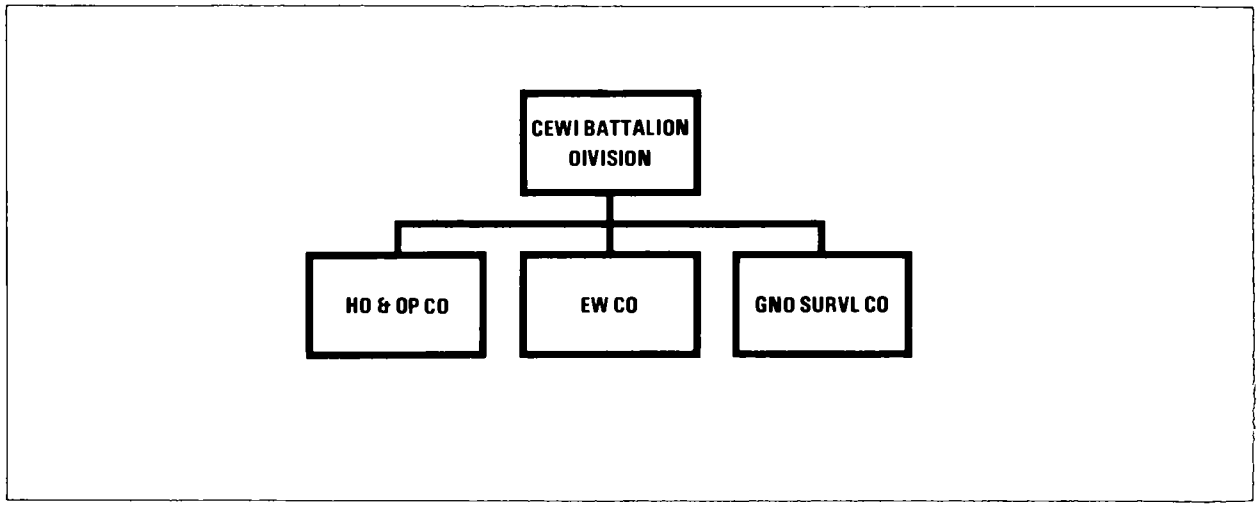
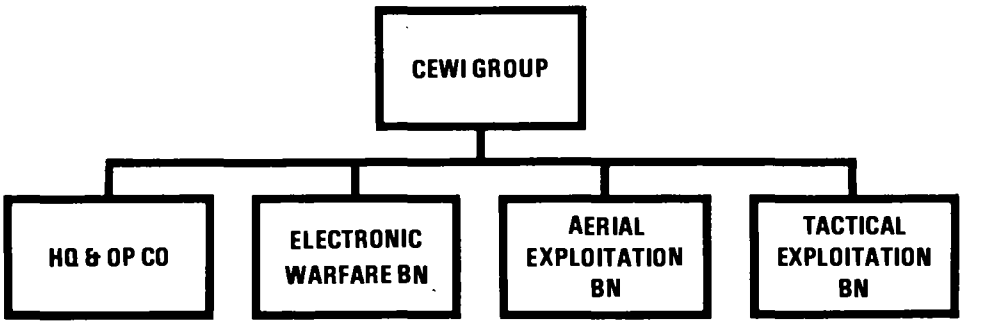


FIGURE F-2. COMBAT ELECTRONIC WARFARE INTELLIGENCE GROUP, CORPS



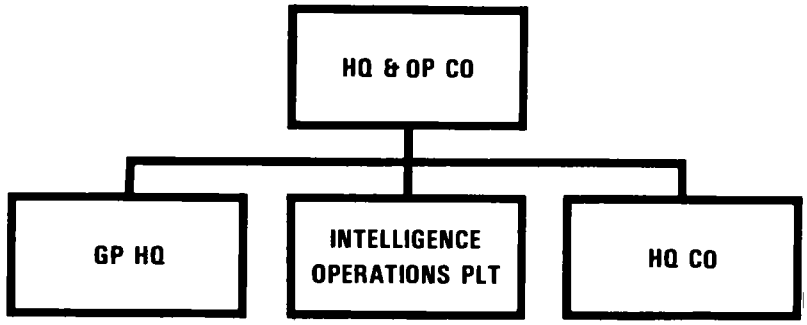
MISSION: Performs combat intelligence, electronic warfare functions, and operational security functions in support of a corps.

ASSIGNMENT: One per corps.

DEPLOYMENT: HQ & OP Co vicinity corps headquarters. EW and tactical exploitation battalions throughout corps area of operation and aerial exploitation battalion at corps airfield.

CAPABILITIES: Integrated all-source intelligence analysis, production and dissemination; signal intelligence and electronic warfare functions; aerial reconnaissance and surveillance; imagery interpretation; operational security (counterintelligence and signal security); interrogation (including document exploitation); long range surveillance outposts; and technical intelligence. Supports USAF weather team and interfaces with national systems.

FIGURE F-3. HEADQUARTERS AND OPERATIONS CO. COMBAT ELECTRONIC WARFARE INTELLIGENCE GROUP, CORPS



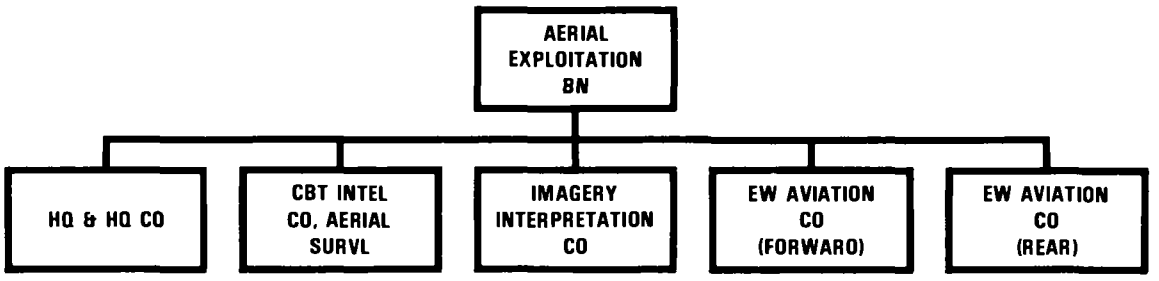
MISSION: Provides commend and control for units of the group, provides centralized management for EW and intelligence operations of the corps, and provides management of intelligence to elements subordinete to the corps.

ASSIGNMENT: One per corps CEWI gp.

DEPLOYMENT: Command and control elements at gp CP, intelligence operations et corps main.

CAPABILITIES: Provide personnel for and operate corps all-source EW and intelligence center, provide all-source intelligence operations centers to corps support command, rear area operations center, and air defense artillery end support attached USAF weather team.

FIGURE F-4. AERIAL EXPLOITATION BATTALION COMBAT ELECTRONIC WARFARE INTELLIGENCE GROUP, CORPS



MISSION: Provida aarial reconnaissanca and surveillance, SIGINT and EW, and imagary interpretation in support of corps.

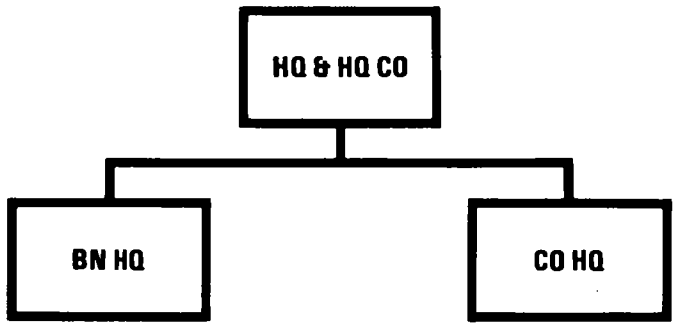
ASSIGNMENT: Ona par CEWI group, corps.

DEPLOYMENT: Corps airfiald(s).

CAPABILITIES: Collects, interprats, and disseminatas Army, othar sarvica, and national lavel imagary; collacts, analyzas information; idantifias and locates communications/noncommunications amittars; and reports to TCAC. Conducts jamming operations. Technical SIGINT link with control and procassing co, EW battalion.

*May support mora than ona corps

FIGURE F-5. HEADQUARTERS AND HEADQUARTERS COMPANY AERIAL EXPLOITATION BATTALION



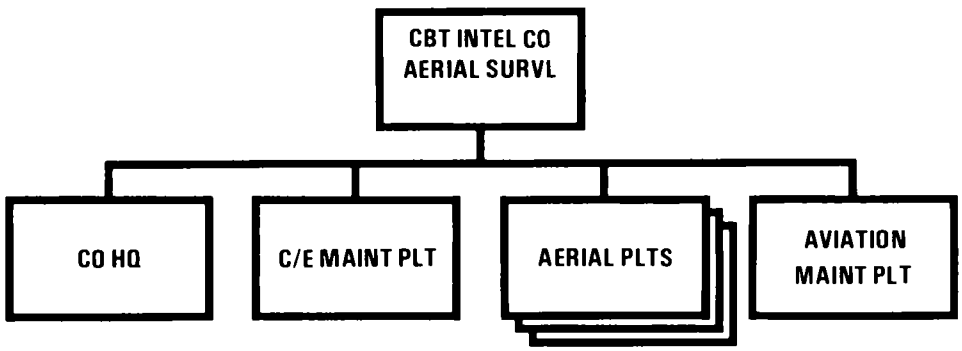
MISSION: Provides command and control and common airfield services for assigned and attached units.

ASSIGNMENT: One per aerial exploitation bn, Corps.

DEPLOYMENT: Corps airfield(s).

CAPABILITIES: Command and control, air traffic control and airfield services, automotive and generator maintenance support, and limited medical services.

FIGURE F-6. COMBAT INTELLIGENCE COMPANY, AERIAL SURVEILLANCE AERIAL EXPLOITATION BATTALION



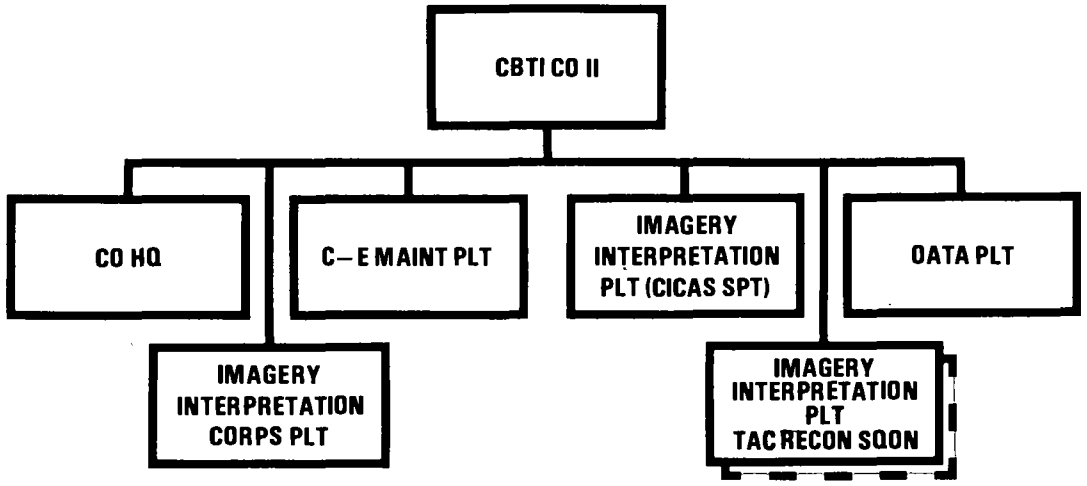
MISSION: Provides aerial surveillance, reconnaissance, and target acquisition in support of a corps.

ASSIGNMENT: One per aerial exploitation bn, Corps.

DEPLOYMENT: Corps airfield(s).

CAPABILITIES: Near all-weather, day or night, radar, infrared, photographic and visual aerial reconnaissance, and surveillance.

FIGURE F-7. COMBAT INTELLIGENCE COMPANY, IMAGERY INTERPRETATION AERIAL EXPLOITATION BATTALION



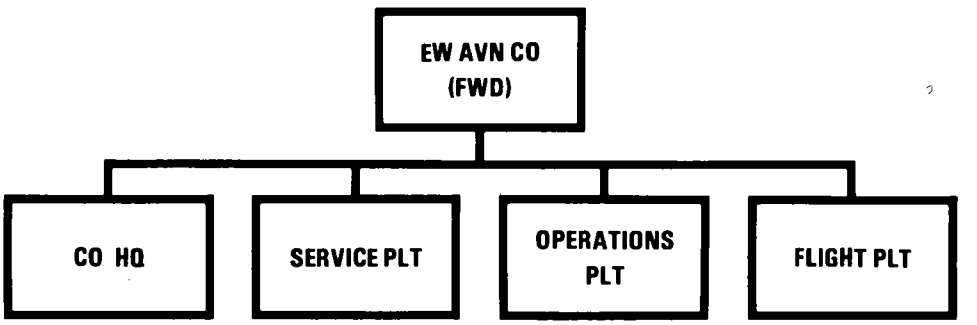
MISSION: Provides interpretation of Army, other service, and national level imagery and dissemination of results. (Provides support to OPSEC co as required.)

ASSIGNMENT: One per aerial exploitation battalion (corps).

DEPLOYMENT: HQ and II platoon (CICAS), vicinity corps airfield(s), II platoon (TRS) at USAF TRS airfield, II platoon (corps) vicinity corps main CP.

CAPABILITIES: Interpretation of SLAR, IR, and photo imagery production and electrical dissemination of derived information and intelligence; when augmented provides ground data terminals for receipt of real time imagery from in-flight surveillance aircraft. Interface with national assets.

FIGURE F-8. ELECTRONIC WARFARE AVIATION COMPANY (FORWARD) AERIAL EXPLOITATION BATTALION



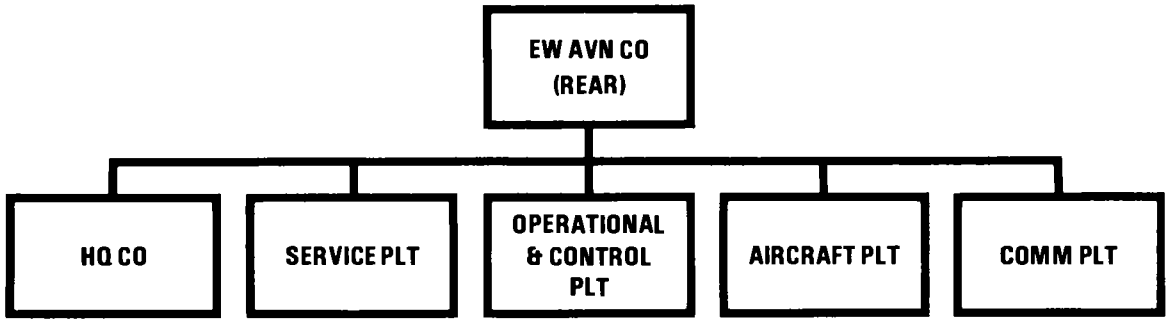
MISSION: Provides SIGINT and EW support to a corps.

ASSIGNMENT: One per aerial exploitation bn, CEWI gp, corps.

DEPLOYMENT: Corps airfield(s)

CAPABILITIES: SIGINT collection and limited SIGINT processing, analysis and reporting; provides product for integration by the EW bn corps (technical control and analysis center).

FIGURE F-9. ELECTRONIC WARFARE AVIATION COMPANY (REAR) AERIAL EXPLOITATION BATTALION



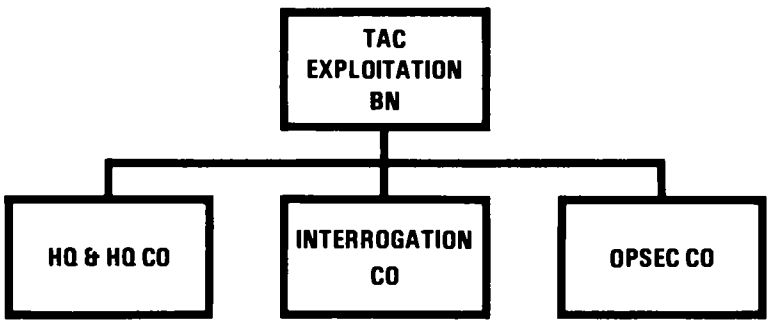
MISSION: Provide SIGINT collection and EW support to corps.

ASSIGNMENT: Normally supports more than one corps and assigned to echelon above corps; may be assigned one per aerial exploitation bn, CEWI gp, corps.

DEPLOYMENT: Corps airfield(s).

CAPABILITIES: Performs COMINT collection and emitter location; conducts jamming operations, and reports information for integration to EW bn, corps (TCAC).

FIGURE F-10. TACTICAL EXPLOITATION BATTALION, COMBAT ELECTRONIC WARFARE INTELLIGENCE GROUP, CORPS



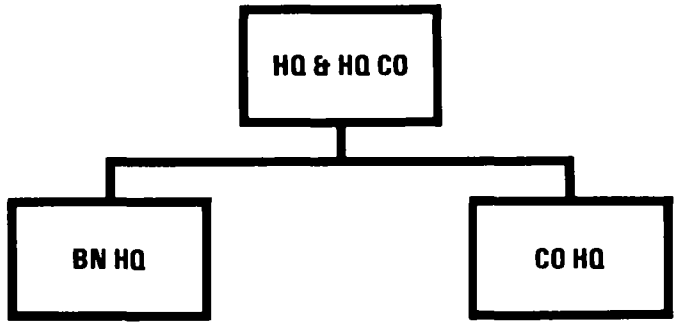
MISSION: Provides combat intelligence and operational security functions, technical intelligence, and long range surveillance outposts operations in support of a corps.

ASSIGNMENT: One per combat electronic warfare intelligence group, corps.

DEPLOYMENT: HQ and HQ Co vicinity of COSCOM; interrogation co at corps PW facilities; OPSEC co HQ vicinity corps HQ; and OPSEC assets throughout corps area of operation.

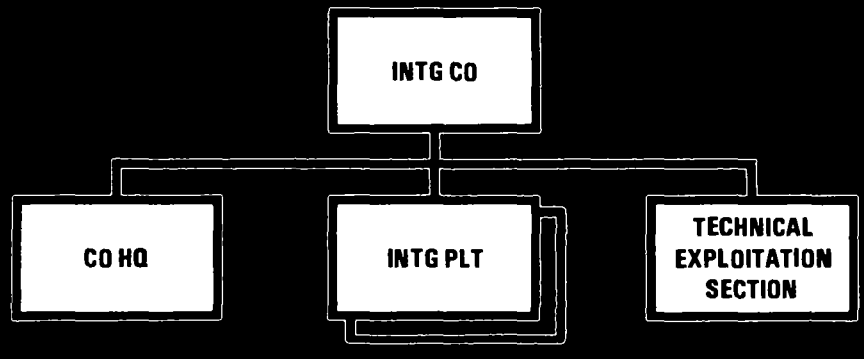
CAPABILITIES: Interrogation and document exploitation; OPSEC (multidiscipline counterintelligence, communication and electronic security); long range surveillance operations; technical intelligence.

FIGURE F-11. HEADQUARTERS AND HEADQUARTERS COMPANY, TACTICAL EXPLOITATION BATTALION



MISSION:	Provides command, control, logistical support to the battalion and technical intelligence support for the corps.
ASSIGNMENT:	Organic to tactical exploitation battalion, corps.
DEPLOYMENT:	Vicinity COSCOM.
CAPABILITIES:	Command and control of assigned units, administration, logistical, communications support, and technical intelligence support to corps.

FIGURE F-12. INTERROGATION COMPANY, TACTICAL EXPLOITATION BATTALION



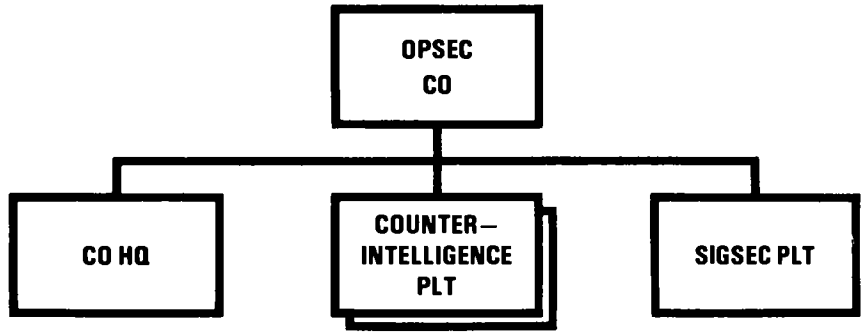
MISSION: Provides interrogation and document exploitation (to include signal intelligence related documents) support for the corps.

ASSIGNMENT: Organic to the tactical exploitation battalion.

DEPLOYMENT: Co HQ and one platoon located at one corps prisoner of war (PW) facility; second platoon at second PW facility; other assets at division and separate brigades.

CAPABILITIES: Interrogation support at two corps PW facilities; interrogation general support and direct support to division and corps area of operation; technical exploitation of enemy signal documents and equipment; translates and exploits enemy documents.

FIGURE F-13. OPERATIONS SECURITY COMPANY, TACTICAL EXPLOITATION BATTALION



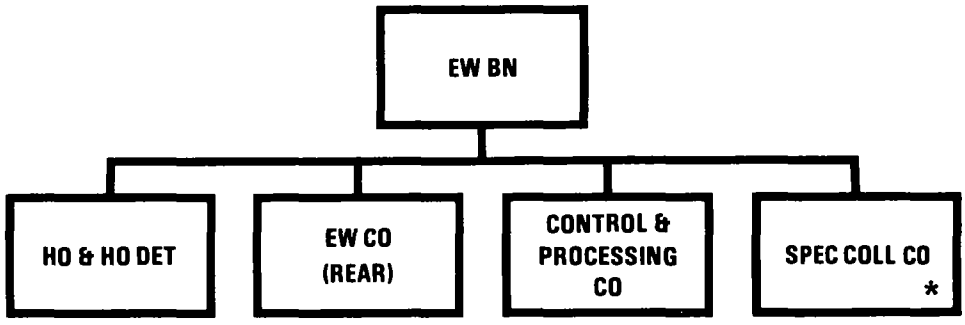
MISSION: Provides counterintelligence, communications and electronic security, and operational security support for the corps.

ASSIGNMENT: Organic to the tactical exploitation battalion, corps.

DEPLOYMENT: Co HQ vicinity corps HQ and OPSEC assets throughout corps area of operation.

CAPABILITIES: Supports division and separate brigades with counterintelligence (CI) teams; provides CI teams for area coverage of corps AO, CRYPTO facilities inspection, and SIGSEC surveys; monitors and analyzes corps communications systems; and provides OPSEC posture of corps.

FIGURE F-14. ELECTRONIC WARFARE BATTALION, COMBAT ELECTRONIC WARFARE INTELLIGENCE GROUP, CORPS



MISSION: Provides signal intelligence (SIGINT) and electronic warfare (EW) support to a corps.

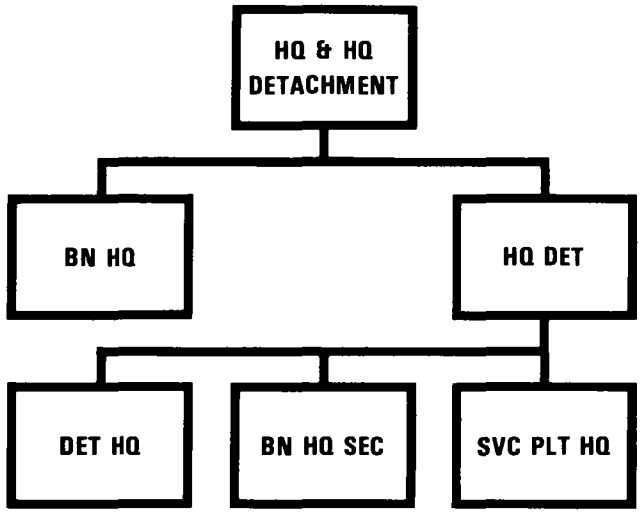
ASSIGNMENT: One per CEWI group, corps.

DEPLOYMENT: Control and processing co with bn HQ; SIGINT collection and EW assets throughout the corps area and beyond rear/lateral boundaries as necessary.

CAPABILITIES: Technical control of corps and division level ground and airborne SIGINT collection and EW assets; processing, analysis, integration, and reporting of the product of these assets; SIGINT collection and EW support.

* Bn may assume command and control of new SIGINT/EW systems that may be deployed on an area support basis.

FIGURE F-15. HEADQUARTERS AND HEADQUARTERS DETACHMENT (TOE 30-156T) ELECTRONIC WARFARE BATTALION



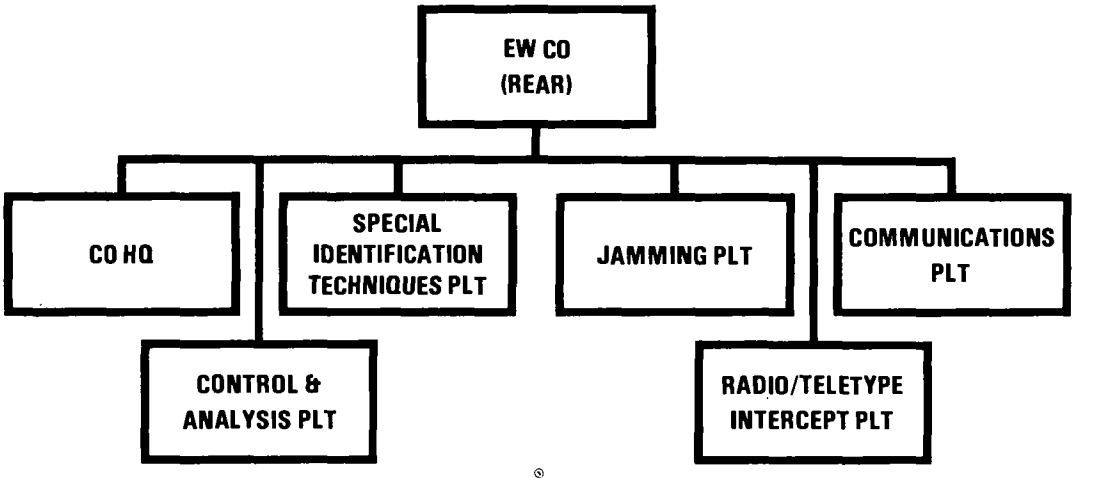
MISSION: Provides command and control of units assigned and attached to EW bn; provides support to bn HQ.

ASSIGNMENT: One per electronic warfare bn, CEWI gp.

DEPLOYMENT: With bn HQ.

CAPABILITIES: Command, staff planning, administration, and training for assigned and attached units; food service supply, maintenance, communications, and security support for bn HQ.

FIGURE F-16. ELECTRONIC WARFARE COMPANY, (REAR) ELECTRONIC WARFARE BATTALION



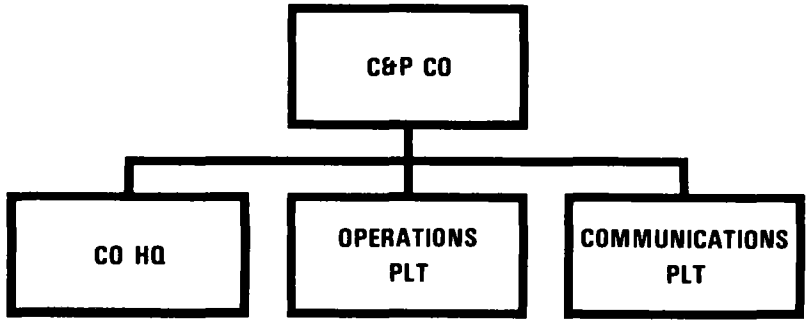
MISSION: Provide communications intelligence and EW (ECM) support to corps.

ASSIGNMENT: One per EW bn, CEWI gp, corps.

DEPLOYMENT: Control and analysis with TCAC at bn HQ; collection and EW assets in forward corps area of operation.

CAPABILITIES: Collects and produces COMINT information; locates emitters; conducts communication jamming; provides control of operations; and performs analysis of information.

FIGURE F-17. CONTROL AND PROCESSING COMPANY (TOE 30-173T) ELECTRONIC WARFARE BATTALION



MISSION: Provides SIGINT and EW technical control processing, analysis, product integration, and reporting support to a corps.

ASSIGNMENT: One per electronic warfere bn, CEWI gp, corps.

DEPLOYMENT: With bn HQ (technical control and analysis center).

CAPABILITIES: Technical control of corps and division level ground and airborne SIGINT collection and EW assets; processing, analysis, and integration of products; interface with national data bases.

FIGURE F-18. SPECIAL COLLECTION COMPANY, ELECTRONIC WARFARE BATTALION

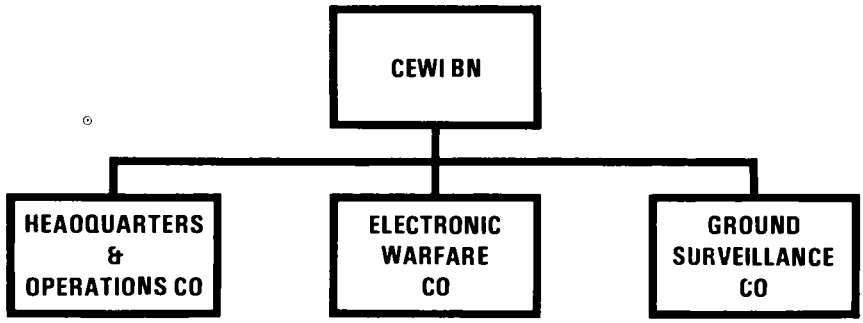
MISSION: Provides SIGINT support to a corps.

ASSIGNMENT: One per electronic warfare bn, CEWI gp, corps.

DEPLOYMENT: Ground and airborne collection elements in the forward area of the corps; control and processing elements with the bn HQ (technical control and analysis center).

CAPABILITIES: SIGINT collection, processing, analysis, and reporting.

FIGURE F-19. COMBAT ELECTRONIC WARFARE INTELLIGENCE BATTALION, DIVISION



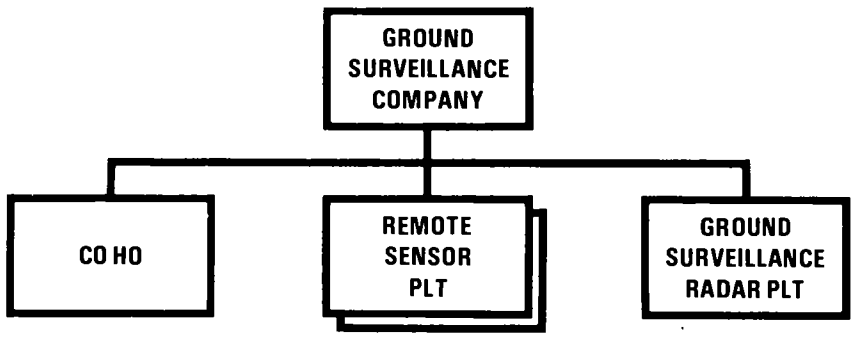
MISSION: Provides combat intelligence, electronic warfare, and operational security support to a division.

ASSIGNMENT: Organic to division.

DEPLOYMENT: EWI operations center with division main CP; technical control and analysis center with bn HQ; collection and EW assets throughout the division area of operations.

CAPABILITIES: SIGINT; imagery interpretations; interrogation; remote sensors and ground surveillance radars; integrated intelligence analysis, production and dissemination; electronic warfare support; and OPSEC.

FIGURE F-20. GROUND SURVEILLANCE COMPANY, COMBAT ELECTRONIC WARFARE BATTALION, DIVISION



MISSION: Provides remote sensor and ground surveillance radar support to division.

ASSIGNMENT: One per CEWI bn, division.

DEPLOYMENT: Co HQ with CEWI bn, div; sensor and GSR teams with maneuver battalions of division's brigades.

CAPABILITIES: Operates remote ground sensors; operates ground surveillance radar; communicates information obtained to maneuver battalion, brigade, or division.

Appendix G
Communications

G-1. General

Since the TA system is composed of widely scattered, diverse elements, no single means of communication is primary. All feasible methods are used including some that may frequently be overlooked (e.g., messenger). There are three principal considerations in target acquisition communications: reliability, responsiveness, and security.

Reliability. Obviously, it is pointless to assemble a network of detection activities if they cannot pass on their target reports. The extended distances involved complicate the problem. The task of making communications work ultimately falls upon the local TA managers and operators, and the best methods are those that provide dependable communications in a responsive and reasonably secure manner.

Responsiveness. TA communications must insure that target information is capable of flowing the route from detection to reaction at a faster rate than the targets are repositioned; consequently, as the mobility of targets increases, so do the demands for responsiveness in TA communications. While there may be physical limitations of the system that are imposed by equipment or organization, responsiveness can be enhanced by personnel performance. Everyone involved has to understand the indispensable need for timeliness, and expeditious communicating should be emphasized in training and operations.

Security. The Soviets have an impressive EW capacity. Their capability to exploit our communications through such techniques as direction finding, interception, and jamming must be reckoned with in planning and conducting communications operations. The Intelligence and Security Command (INSCOM) is the DA proponent for communications security matters. Within INSCOM, the signal security (SIGSEC) activity in Warrenton, VA, may be contacted for SIGSEC support, material, and procedures, to counter the Soviet radioelectronic combat capability. As with other important activities, preparedness to meet this threat begins in the training environment.

G-2. Div Arty TOC

Wire. The TOC is authorized nine telephones (TA-312) and two switchboards (SB-22). All telephones are connected to the TOC switchboard. The telephones belong to the S3, operations officer, operations element, fire control element, target production section, and OB section.

Radio. The TOC has sufficient radios to operate in all required AM and FM nets* and to operate effectively when moving by echelon. Reasonable care must be taken when installing and operating TOC radios to reduce the vulnerability to EW. Radios for the TOC include:

Six AN/GRC-142 (AM-Secure-RATT) radios† to operate in the following nets:

Div arty CF 1	Div - Intel
Div arty CF 2	Div - Ops

Corps (FAS) fire direction net
Div - admin/log

One AN/GRC-196 (AM-nonsecure voice only) to operate in the division tactical operations net.

*Detailed descriptions of communications nets, circuits, and methods of operations can be found in the appropriate TOE, TC 6-10-1, and FM 6-10.

†Two additional AN/GRC-142 radios are authorized by the div arty HHB TOE; however, they are located with the FSE at the div main CP and with the div arty meteorological section.

Seven AN/VRC-46 (6 with FM secure devices) radios to operate in the following four nets:

Div comd operations
Div intel

Div arty CF
TAB CI

FIGURE G-1. COUNTERFIRE COMMUNICATIONS CHANNELS

FROM \ TO	MVR BN FSCC	BDE FSCC	OS BN FDC	OTHER BN FDC	DIV G STAFF MAIN	DIV G STAFF TAC
MVR BN FSCC		WIRE OS BN C F FM OS BN C F ALT FM • BDE CMD FM BDE RATT	WIRE OS BN C F FM OS BN C F ALT FM • OS BN RETRAN • OS BN F FM THRU BDE FSCC	THRU SPT OS BN		
BDE FSCL	WIRE OS BN C F FM OS BN F FM • BDE CMD FM BDE RATT		WIRE OS BN C F FM OS BN C F ALT • OS BN RETRAN •	THRU SPT OS BN	THRU FSE MAIN DTOC SSB V DIV INTEL FM DIV OP RATT DIV INTEL RATT	THRU FSE MAIN THRU FSE TAC
OS BN FDC	WIRE OS BN C F FM OS BN F FM THRU BDE FSCC	WIRE OS BN C F FM THRU D A TOC		WIRE OS BN C F FM THRU D A TOC		
OTHER BN FDC	THRU SPT OS BN	THRU SPT OS BN	WIRE OS BN C F FM OS BN C F ALT • THRU D A TOC			
DIV G STAFF MAIN		DIV CMD M C THRU FSE MAIN DIV CMD OP FM DTOC SSB V DIV OP RATT DIV INTEL FM DIV INTEL RATT	THRU D A TOC THRU FSE MAIN THRU BDE	THRU D A TOC THRU FSE DIV AREA SYS M C		DIV CMD M C (SU) DTOC SSB V DIV CMD OP FM DIV INTEL FM DIV INTEL RATT DIV OP RATT
DIV G STAFF TAC		DIV CMD OP FM DIV INTEL FM DTOC SSB V DIV OP RATT DIV INTEL RATT SELECTED BDE NETS •	THRU BDE FSCC THRU DIV MAIN BN C F FM • BN C F ALT •		DIV CMD M C (SU) DTOC SSB V DIV CMD OP FM DIV INTEL FM DIV INTEL RATT DIV OP RATT	
DIV FSE MAIN	THRU BDE FSCC	DIV CMD M C (SU) DIV CMD OP FM DTOC SSB V DIV INTEL FM DIV INTEL RATT DIV OP RATT	THRU D A TOC D A C F FM THRU BDE FSCC	THRU D A TOC D A C F FM	COLLOCATED	THRU DIV MAIN
DIV FSE	THRU BDE FSCC	DIV CMD OP FM DTOC SSB V DIV INTEL FM DIV OP RATT DIV INTEL RATT THRU DIV MAIN V A M C SELECTED BDE OS BN NET •	THRU D A TOC THRU BDE FSCC D A C F FM BN C F M • BN C F ALT •	THRU D A TOC D A C F FM D A C F 2 RATT	THRU FSE MAIN THRU DIV TAC	COLLOCATED
DIV ARTY TOC	THRU OS BN THRU BDE FSCC	DIV CMD M C (SU) THRU FSE DTOC SSB V DIV CMD OP FM DIV INTEL FM DIV OP RATT DIV INTEL RATT	WIRE DIV CMD M C THRU BDE D A C F FM D A C F 1 RATT	WIRE b INTERFACE INTO DIV M C SYS D S C F FM D A C F 2 RATT	DIV CMD M C DTOC SSB V DIV CMD OP FM DIV INTEL FM DIV OP RATT DIV INTEL RATT THRU FSE MAIN	DIV CMD M C DTOC SSB V DIV CMD OP FM DIV INTEL FM DIV OP RATT DIV INTEL RATT THRU FSE TAC
REINF ATTACHED FA GROUP • •				SUBORDINATE BN S FA GP C F FM FA GP C F RATT WIRE M C ACCESS	THRU D A TOC DIV CMD M C	THRU D A TOC THRU DIV MAIN
FA BTRY			WIRE OS BN C F FM OS BN C F ALT (ASSOCIATED TGT ACQ ELEM)	WIRE BN C F FM (ASSOCIATED TGT ACQ ELEM)	THRU D A TOC	THRU D A TOC
CORPS FA ESE					THRU FSE DIV MAIN THRU D A TOC THRU CTOC	THRU FSE DIV MAIN THRU D A TOC THRU CTOC

NOTES • REQUIRES RADIO SET FREQUENCY CHANGE • • PRIMARY COUNTERFIRE CHANNELS

If possible, the FM radios should be located away from the TOC and remoted. They should be mounted in more than one vehicle to facilitate split operations. Recommended communication channels for handling counterfire operations are depicted in figure G-1.

FIGURE G-1. COUNTERFIRE COMMUNICATIONS CHANNELS

FROM \ TO	DIV FSE MAIN	DIV FSE TAC	DIV ARTY TOC	REINF ATTACHED * FA GROUP	TA BTRY	CORPS FAS FSE
MVR BN FSCC			THRU DS BN THRU BDE FSCC			
BDE FSCC	DIV CMD M C (SU) O AC F FM * DTOC SSB V DIV INTEL FM DIV OP RATT DIV INTEL RATT THRU DS BN	DIV CMD M C THRU FSE MAIN O AC F FM *	DIV CMD M C (SU) THRU FSE MAIN O AC F FM * DTOC SSB V DIV INTEL FM DIV OP RATT DIV INTEL RATT THRU DS BN			
DS BN FDC	THRU O A TOC O AC F FM DIV CMD M C AT BDE	DIV CMD M C O AC F FM	WIRE DIV CMD M C (SU) THRU BDE O AC F FM O AC F RATT		WIRE BN CF FM BN CF ALT (WITH ASSOCIATED TGT ACQ ELEM)	
OTHER BN FDC	THRU O A TOC O AC F FM O AC F 2 RATT DIV AREA SYS M C		WIRE & INTERFACE INTO DIV M C SYS O AC F FM O AC F 2 RATT	SUBORDINATE BNS FA GP CF FM FA GP CF RATT WIRE M C ACCESS	WIRE BN CF FM (WITH ASSOCIATED TGT ACQ ELEM)	
DIV G STAFF — MAIN	COLLOCATED	THRU TAC THRU FSE MAIN	DIV CMD M C DIV CMD OP FM DTOC SSB V DIV INTEL FM DIV OP RATT DIV INTEL RATT THRU FSE MAIN	THRU O A TOC DIV CMD M C	THRU O A TOC	THRU FSE (DIV) THRU CTOC THRU O A TOC
DIV G STAFF — TAC	THRU DIV MAIN THRU TAC FSE	COLLOCATED	DIV CMD M C DIV CMD OP FM DTOC SSB V DIV INTEL FM DIV OP RATT DIV INTEL RATT THRU FSE TAC	THRU O A TOC (THRU DIV MAIN	THRU O A TOC	THRU DIV MAIN
DIV FST — MAIN		DIV CMD M C O AC F FM THRU DIV MAIN	DIV CMD M C (SU) O AC F FM O AC F 2 RATT THRU DIV MAIN	DIV CMD M C O AC F FM O AC F 2 RATT THRU O A TOC	THRU O A TOC	CORPS CMD M C (SU) THRU DIV MAIN THRU O A TOC
DIV FST — FST	DIV CMD M C O AC F FM THRU DIV TAC		O AC F FM THRU FSE MAIN (THRU DIV MAIN THRU DIV TAC	THRU O A TOC THRU DIV TAC	THRU O A TOC	THRU DIV TAC THRU DIV MAIN THRU O A TOC THRU FSE MAIN
DIV ARTY TOC	DIV CMD M C (SU) O AC F FM O AC F 2 RATT (THRU DIV MAIN	O AC F FM DIV CMD M C THRU FSE MAIN THRU FSE MAIN		DIV CMD M C (SU) O AC F FM O AC F 2 RATT	O A TAB C I FM COLLOCATED (PROCESSING ELEMENT)	CORPS CMD M C (SU) C A F RATT THRU DIV MAIN
REINF ATTACHED FA GROUP * *	ROUTED M C THRU O A TOC O AC F FM O AC F 2 RATT THRU O A TOC	THRU O A TOC THRU DIV MAIN	DIV CMD M C (SU) O AC F FM O AC F 2 RATT		THRU O A TOC (SUBORDINATE TAB ELEM AS DESIGNATED)	CORPS CMD M C INTERFACE AT DIV MAIN C A C O SSB V C AC F RATT THRU O A TOC
TA BTRY	THRU O A TOC	THRU O A TOC	O A TAB C I FM COLLOCATED (PROCESSING ELEM)	THRU O A TOC (SUBORDINATE TAB ELEM AS DESIGNATED)		
CORPS FAS FSE	CORPS CMD M C (SU) THRU O A TOC THRU CTOC	THRU DIV FSE MAIN THRU O A TOC THRU CTOC	CORPS CMD M C (SU) C A F RATT THRU CTOC	CORPS CMD M C INTERFACE AT DIV MAIN C A C O SSB V C AC F RATT THRU O A TOC		

NOTES * REQUIRES RADIO SET FREQUENCY CHANGE * * PRIMARY COUNTERFIRE CHANNELS

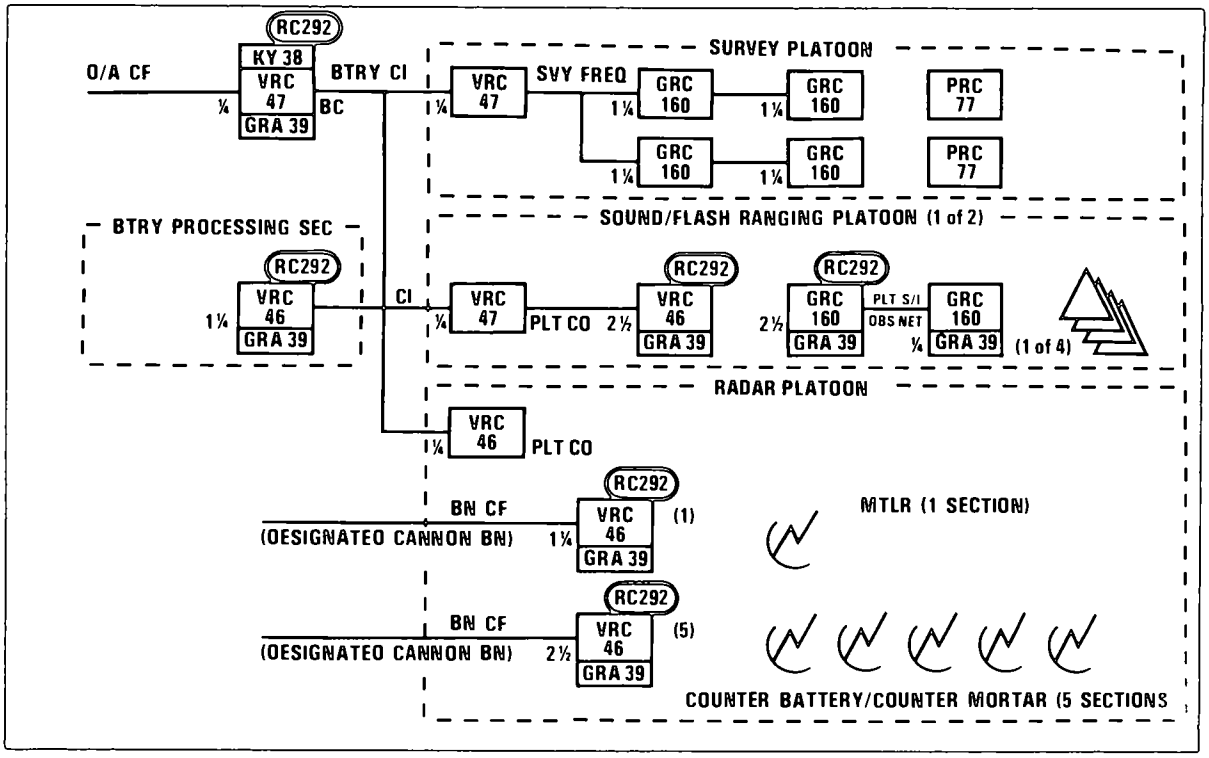
G-3. Target Acquisition Battery

Wire. The normal use of wire within the TAB elements is to:

Connect the sound/flash OP's to the sound/flash platoon control center.
Connect the sound/flash control center to the support unit (usually the div arty TOC).
Connect the weapon locating radar section to the supported unit FDC.
Connect the moving target locating radar to the supported unit.

Radio. TAB radios operate in the following FM voice nets (fig G-2):

The battery commander monitors the div arty CF (command/fire) (secure).
All elements are in the TAB CI (command/intelligence) net. This is the primary link between the target acquisition battery elements, the div arty TOC, and the battery commander.
The survey parties operate in the TAB S (survey) net.
The two sound/flash platoons operate in independent TAB R (sound /flash ranging) nets.



Appendix H
Duties of TA Battery Personnel

H-1. Battery Headquarters

Battery Commander. Commands the battery and supervises all its activities. Acts as special staff officer to provide target acquisition expertise and advice during planning and execution of the battle.

First Sergeant. Assists the battery commander in command and control of the battery. Senior enlisted man and adviser to the battery commander.

Light Vehicle Driver. Drives and maintains the battery commander's vehicle. Operates radio.

H-2. Survey Platoon Headquarters

Survey Officer. The survey officer is the platoon leader of the survey platoon and is responsible for the supervision of the survey platoon to insure adequate survey control is provided to those elements of the TA battery requiring it, and to other elements as directed by the div arty S3.

Chief Surveyor. The chief surveyor is the platoon sergeant of the survey platoon.

H-3. Two Survey Sections

The survey sections are responsible for establishing survey control for the sound microphone bases, the sound/flash observation posts, and when possible, the battery's six radars. Normally, priority for survey control will go to the sound/flash base (FM 6-2, appendix C).

Two Section Chiefs. Each section chief supervises the activities of a survey section (party).

Survey Computer. Calculates the horizontal coordinates, altitude, and azimuth from raw field distance measurements and angles (FM 6-2, appendix C).

Survey Computer/Recorder. Records angles and distances determined by instrument operator. Performs survey calculations to determine horizontal coordinates, altitude, and azimuth (FM 6-2, appendix C).

Instrument Operator. Operates survey instrument to measure horizontal and vertical angles between survey stations (FM 6-2, appendix C).

Survey Recorder. Records angles and distances from instrument operator (FM 6-2, appendix C).

H-4. Two Sound/Flash Platoon Headquarters

Perform target acquisition by sound and/or flash ranging.

Platoon Commander. Commands and controls sound/flash platoon.

Platoon Sergeant. Assists the platoon leader in command and control of the platoon.

Light Vehicle Driver. Drives and maintains the section vehicle. Operates the FM radio.

H-5. Two Sound/Flash Control Centers

Each section contains the personnel and equipment to process raw sound and flash data into targets. The section operates 24 hours a day using two 12-hour shifts. All target acquisition specialists must be prepared to perform all duties listed below (FM 6-122, para 138-165, 57-58, and 62-94).

Section Chief. Supervises the installation and operation of the sound and flash control center. Coordinates the operation of four observer parties. Establishes and maintains communications between the observers and the processing section.

Assistant Section Chief. Assists the section chief in all activities, acts as his relief, and is team leader of a 12-hour shift. Assumes duties of section chief during his absence.

Chief Record Reader (Target Acquisition Specialist, E5). Analyzes sound recording records to determine pattern and time of arrival. Reads the time of arrival at each individual microphone. Two personnel are required to allow two-shift, 24-hour operations.

Sound Recorder (Target Acquisition Specialist, E5). Operates the sound recording set. Maintains continuous communications with the four observers and informs them to release the outpost switch after the sound wave arrival time has been recorded. Requests the observer's report when ready to record and writes data contained in the report on the face of the sound ranging record. Records and forwards battlefield information from the observers to the div arty TOC. Performs operator maintenance as required (FM 6-122, para 100).

Switchboard Operator (Target Acquisition Specialist,E4). Responsible for communications discipline, assists in observer control, records and announces the reports from the observer to the plotting team, and transmits data for orientation and approximate azimuths to the observers.

Two Sound/Flash Computers (Target Acquisition Specialist, E4 and E3). Operate FADAC to determine target locations and perform sound and flash adjustments and registration. When processing data manually, compute the initial time intervals. Compute weather corrected time intervals by using the calculator method or correction devices and recording them on the sound plotting record. Determine the curvature correction, using weather corrected time intervals and the distances from each midpoint to the approximate location of the sound source, together with the proper correction device. Record the corrections on the sound plotting record and compute the final corrected time intervals. Using flash ranging data and the military slide rule, determine the height of the target. Two personnel are required on each shift to perform the sound function (FM 6-122, para 103).

Sound/Flash Plotter (Target Acquisition Specialist, E3). Plots weather corrected time intervals on an ungridded plotting chart with the plotting fan. Examines plot intersections, estimates location, and reads and records the distance from each mid point to this location. Plots final corrected time interval on gridded chart and evaluates the resulting plot of the sound source location. Records the grid on the sound plotting record. Plots azimuths from the OP's to a target using a plotting chart. Evaluates the resulting plot of the flash location. Plots sound and/or flash adjustments and registrations. One sound/flash plotter is required on each shift.

Radio Operator. Operates the sound/flash platoon net control radio.

H-6. Eight Sound/Flash Observation Sections

Four observation sections are in each platoon. The sections have combined flash and sound observers. The four-man section operates continuously when in position to observe. The observer operates the battery commander's periscope (BC scope) and the outpost switch to start the sound equipment. The sound observer records data and searches the target area with binoculars. Four observers are the minimum necessary to operate continuously. The OP's will normally be from 200 to 2,500 meters apart to provide the proper intersection angles. Each observer party operates as a semi-independent team and requires individual communications and mobility (FM 6-122, parts I and II).

Section Chief. Responsible for the overall operation of the OP and for the command and control of the team personnel. Insures that the OP is properly located, surveyed, and oriented. Checks, calibrates, and adjusts all observation equipment.

Senior Sound/Flash Observer. Verifies instrument orientation, sets up instrument, and measures and verifies the angles and distances for initial installation of the OP. Insures that the zone of observation and all reports and records are correct. Continuously improves the OP. Maintains continuous communication with the sound/flash control center. Performs systematic search of the target area and reports target and/or intelligence information to the control center (FM 6-22, para 47-48, 104, and 137).

Sound/Flash Observer. Performs systematic search of the target area and reports targets and/or intelligence.

H-7. Radar Platoon Headquarters

The radar platoon headquarters commands and controls the activities of six radar sections. The radars are normally employed across the division front oriented on enemy artillery/mortars and in the case of the MTLR, likely avenues of approach.

Platoon Commander. Responsible for command, control, administration, and logistical support of one moving target locating radar section and five counter-battery/countermortar radar sections.

Platoon Sergeant. Assists the platoon commander in command, control, and supervision of the radar platoon.

H-8. Moving Target Locating Radar (MTLR) Section

The MTLR is used to monitor preselected key areas on the battlefield to supplement other observation means during hours of darkness or reduced visibility. The sections may operate directly under the control of the div arty TOC or may be attached to or under the operational control of a subordinate artillery headquarters. The MTLR section will establish communications with the TOC or the supported unit as appropriate.

FA Radar Technician. Advises battery commander and platoon leader on technical considerations affecting employment and supervises organizational maintenance and checkout of the MTLR. Coordinates activities of radar operators and maintenance personnel. Observes radar section personnel to detect and correct improper procedures and techniques. Coordinates maintenance standards and techniques with organizational maintenance personnel to insure uniformity. Advises platoon commander on technical and tactical matters related to the radar set. Reviews operating and maintenance records and test equipment to ascertain adequacy of maintenance. Responsible for operation of section radar set. Also responsible for troubleshooting, repair, repair parts, maintenance records, tools, and test equipment. Each radar

section normally operates individually and therefore requires sufficient capabiliy within each section to insure adequate maintenance support.

Section Chief. Assists the FA radar technician in the operation, employment, maintenance, and administration of the radar section.

Senior FA Radar Operator. Emplaces, displaces, operates, moves, and maintains the section radar set. Orients the radar to observe and monitor designated areas of the battlefield. Reports time and predetermined grid of moving targets. Two men normally operate the radar set in shifts of 30 minutes (FM 6-162, para 22).

FA Radar Operator. See paragraph above.

Generator Operator. The generator operator operates and maintains the generator, provides local security, and assists the radar operators during periods of intense enemy activity (FM 6-162, para 2-3d).

H-9. Five Counterbattery/ Countermortar Radar Sections

Each of the sections is equipped with an AN/MPQ-4A radar. It is organized to provide 24-hour support for targeting of the enemy indirect fire systems and adjustment/registration of friendly artillery.

FA Radar Technician. Advises battery commander and platoon leader on technical considerations affecting employment and supervises organizational maintenance and checkout of the radar. Coordinates activities of radar operators and maintenance personnel. Observes radar section personnel to detect and correct improper procedures and techniques. Coordinates maintenance standards and techniques with organizational maintenance personnel to insure uniformity. Advises platoon commander on technical and tactical matters related to the radar set. Reviews operating and maintenance records and tests equipment to ascertain adequacy of maintenance. Responsible for tactical employment and operation of section radar set. Also responsible for troubleshooting, repair, repair parts, maintenance records, tools and test equipment. Each radar section normally operates individually and therefore requires sufficient capability within each section to insure adequate maintenance support. One radar technician with each radar section is the minimum and most appropriate method of providing adequate maintenance support.

Section Chief. Assists the FA radar technician in the operation, employment, maintenance, and administration of the radar section.

Senior FA Radar Operator. Emplaces, displaces, operates, moves, and maintains the section radar set. Orients the radar to observe and monitor priority areas on the battlefield. Reports time and grid coordinates of hostile enemy targets. Adjusts friendly artillery on designated targets. Two men normally operate the radar set in shifts of 30 minutes each (FM 6-161, para 2-2).

FA Radar Operator. Emplaces, displaces, operates, moves, and maintains the section radar set. Orients the radar to observe and monitor priority areas on the battlefield. Reports time and grid coordinates of hostile enemy targets. Adjusts friendly artillery on designated targets. Two men normally operate the radar set in shifts of about 30 minutes each (FM 6-161, para 2-2).

Generator Operator. Operates and maintains the generator, provides local security, and assists the radar operators during periods of intense enemy activity (FM 6-161, para 2-3d).

H-10. Processing Section

The processing section is an integral part of the div arty TOC; therefore, the detailed description of the duties of the section personnel is in chapter 2 with the other elements of the div arty TOC.

Appendix I
Standardization Agreement (STANAG) NO. 2029

Standardization Agreements (STANAG) are international (NATO) agreements to facilitate inter-Allied operations. Upon ratification by the United States, a STANAG is binding upon US Armed Forces (entirely or with exceptions as noted). This appendix contains STANAG 2029 in its entirety.

NATO UNCLASSIFIED

STANAG NO. 2029 (EDITION NO. 4) - METHOD OF DESCRIBING GROUND LOCATIONS, AREAS, AND BOUNDARIES.

Related documents: None.

OBJECT

1. The aim of this Agreement is to standardize, for the use of the NATO forces, the method of describing ground locations, areas, and boundaries for use in orders, instructions, and reports of all types, and in any other circumstances where such descriptions may be required.

AGREEMENT

2. It is agreed that NATO Forces agree to adopt the method of describing ground locations, areas, and boundaries described in the following paragraphs. They further agree that the method defined is to be used in all orders, instructions, and reports and in any other circumstances where such descriptions are required.

DESCRIPTION OF LOCATIONS, AREAS, AND BOUNDARIES

3. *Use of maps.* In order to avoid confusion in the designation of place names when there are various editions of a map relating to the same area, the following is to be shown at the top of the document.

a. Map Series Number (and country of geographic area, if required).
b. Sheet Number (and name, if required).
c. Edition.
d. Scale (if required).

Example: This information can be shown as follows:

Map series number	M 501 EUROPE
Sheet	NM 32-1 "ESSEN"
Edition	1-DMG
Scale	1:250,000

4. *Security.* The location of headquarters, units, dumps, and other installations is mentioned in a communication or document only if this communication or document can be transmitted to the addressee by a method insuring the appropriate security. Locations of headquarters, units, dumps, and other installations are not to be included in addresses unless necessary to insure correct delivery.

5. *Names of Places.* Place names are written in block capitals exactly as spelled on the maps in use. Addition of a grid reference is almost always necessary. The group of six or four figures must always be preceded by the block of two capitals designating the 100 km square; e.g., LB 6448. In this case, six figure grid references must not be used when four figures are sufficient. In certain areas, for which mapping material does not allow the use of coordinates, latitude or longitude designations should be used instead.

When a grid reference code is used, the names of places which it indicates must not be shown in clear in the same message.

6. *Locations and Points on the Ground.* Locations and points on the ground may be described either:

by grid coordinates or,
by giving the distance and direction from a simple reference point; e.g., crossroads 1,000 yards (or 1,000 meters) southwest of church tower of NAPIERVILLE (square LB 6235).

In written orders and reports, grid coordinates always are to be used the first time the designation of a point or location is given. Thereafter, coordinates are given only when such repetition insures greater clarity.

7. *Directions.* A direction can be indicated either by two points or by angular measurement reading clockwise from a reference direction. In the latter case, directions are given as from true, magnetic, or grid north and the type used must always be specified. The unit of angular measurement used; i.e., mils or degrees, is normally specified but may be omitted when there is no probability of misunderstanding.

8. *Roads, Tracks, and Railways.* Roads, tracks, and railways are to be described by the names of places located on them. Care must be taken to name enough places to make sure that the right road can be identified. The word "road," "track," or "railway" is to PRECEDE, not follow, the place names; e.g. "road LAPRAIRIE-DELSON," not "LAPRAIRIE-DELSON road."

When movement is involved, the route must be designated by a sequence of points on the route named in the direction of movement. When no movement is involved, the sequence of points named is to be from left to right or rear to front, assuming that the person designating the route is facing the enemy. Cardinal points may be added if required.

9. *Boundaries.* Boundaries are designated by easily distinguishable terrain features in the sequence in which they occur on the ground. They will be described from rear to front during an advance and from front to rear in defense and withdrawal. If generally parallel to the front; e.g., rear boundaries, they are described from left to right, facing the enemy. Cardinal points may be added if required.

When describing boundaries between units and formations, the words "inclusive" or "exclusive" are to be used. These words should be used BEFORE the place to which they refer. The description of a boundary must state specifically to which unit or formation an area or point is inclusive or exclusive.

Example: 5 Brigade and 6 Brigade are now advancing together. The inter-Brigade boundary is, therefore, described from rear to front. The most concise way of listing the various references comprising the boundary is to link them with one of the units/formations concerned thus:

Boundary(ies) 5 Brigade

exclusive LAPRAIRIE	LB 6134
exclusive Cross Roads	LB 621352
exclusive Wood	LB 624366
exclusive Road, LAPRAIRIE - DELSON	LB 6238

10. *River Banks.* River banks are described as right or left from the point of view of an observer facing downstream or, if this cannot be done, by using cardinal points.

11. *Areas.* An area is normally described by taking the northernmost point first and giving the remaining points in clockwise order.

12. *Positions.* Positions are described from left to right and front to rear facing the enemy. To avoid confusion, cardinal points may be used to describe flanks, rather than "right" or "left."

IMPLEMENTATION OF THE AGREEMENT

13. *This STANAG will be considered to have been implemented when the necessary orders/instructions to adopt the method described in this Agreement have been issued to the forces concerned.*

RESERVATION

PORTUGAL: When describing boundaries, as outlined in paragraph 9 of the STANAG, the words "inclusive" and "exclusive" will be used *after* the name of the place to which they refer.

FM 6-121

1 MAY 1978

By Order of the Secretary of the Army:

BERNARD W. ROGERS
General, United States Army
Chief of Staff

Official:

J. C. PENNINGTON
Brigadier General, United States Army
The Adjutant General

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