

CHAPTER 3

Planning the Jamming Operation

An artillery commander's fire control element performs many geometric calculations prior to executing a fire mission. These calculations are necessary to bring steel effectively on the target. The jamming mission planner must also perform geometric calculations to bring fire effectively on the target receiver through electromagnetic energy (electromagnetic steel).

IMPORTANCE OF JAMMING

The jamming mission planner determines the minimum jammer power output required to jam the target receiver effectively. When an excess amount of jamming power is radiated into the air, it is easier for the enemy's DF equipment to intercept and locate the friendly jammer. For the jamming team to accomplish its mission, the mission planner must determine the distance between the jamming team's location and the target receiver's location. A proposed jamming mission must be carefully evaluated to determine the proper deployment of the jamming team. Distances between the enemy transmitter location and the target receiver location, and

between the friendly jammer location and the target receiver location, are two of the critical considerations for jamming team placement. Each jamming team deployment is different. Therefore, constant evaluation of proposed jamming targets is necessary. Terrain is important because **line of sight** (LOS) is necessary between the jammer's location and the target receiver's location. The enemy can be expected to use terrain to gain an advantage. The type of jammer to be employed is another consideration because some jamming systems have a different power output than others.

PLANNED JAMMING

Planned jamming requires the greatest amount of detail; for example, identifying the unit, the location, and the time window for the mission. It

must be totally synchronized with fire support and maneuver to achieve maximum results. Planned jamming missions can engage a target

simultaneously with fire, or singularly engage lower priority targets simultaneously with fire on higher priority targets. The electronic warfare tasking list (EWTL) can and should list specific targets and times to guide jamming so all targets, regardless of the jamming method used, can be specified in the EWTL. Planned jamming missions could be integrated with fire missions using a field artillery target list work sheet and a scheduling work sheet (Figures 3-1 and 3-2). A planned mission can be used in a direct offensive, a supporting offensive, or a deceptive role. In the direct offensive role, the mission would be targeted against the unit being attacked. A supporting offensive role would consist of jamming those enemy units capable of reinforcing their point of attack. A deceptive jamming

mission can consist of jamming against one enemy unit prior to attacking a different enemy unit. The type of role or mission chosen depends on the tactical situation, the degree of knowledge of the enemy situation, the availability of assets, and the objective of the tactical mission. Planned missions can be further divided into scheduled and on-call missions.

Scheduled Mission

The scheduled mission, on a completed scheduling work sheet, depicts the enemy's unit, target location, and time that jamming is to be conducted. The time of the jamming mission is synchronized with the time of the fire mission to provide the greatest degree of support to the maneuver unit.

TARGET LIST WORK SHEET										
For use of this form, see FM 6-20; the proponent agency is TRADOC.										
Sheet _____ of _____										
Line No	Target No	Description	Location	Altitude	Attitude	Length	Width	Source/ Accuracy	Remarks	
1										
2										
3										
4										

Figure 3-1. Artillery target list work sheet.

PRIORITY		TIME WINDOW	TARGET UNIT	TARGET LOCATION	TARGET ACTIVITY	CONTROL MECHANISM	FEEDBACK/ COORDINATION
ESM	ECM						

Figure 3-2. Scheduling work sheet.

On-Call Jamming

On-call jamming is dependent upon the unit and location; however, time cannot be ascertained because it is situationally dependent. Therefore, on-call jamming missions lend themselves to targeting reinforcing or second echelon units.

On-call jamming missions should be incorporated as necessary into the master fire support (targeting) plan and the fire support execution matrix. Communications interfaces must be adequate to be able to execute the on-call mission at the appropriate time.

ELECTRONIC MASKING

Electronic masking, often called screen jamming, is also a planned mission. The purpose of electronic masking is to protect or mask friendly communications by denying the enemy the ability to intercept and locate them. Electronic masking is used when mission requirements necessitate the immediate transmission of critical information, and there is no other way to convey the information. Just as offensive jamming **captures** the receiver of the enemy, electronic masking **captures** enemy intercept and DF systems by jamming on the friendly frequency

using directional antennas close to the forward line of own troops (FLOT). Electronic masking can best be used to mask the radio signals of friendly reinforcements being moved on line, thus preventing enemy signals intelligence from determining the disposition of the reinforcing unit. Figure 3-3 depicts an electronic masking operation. The enemy's ability to locate a jammer accurately through direction finding is reduced by using two or more jammers for an electronic masking operation.

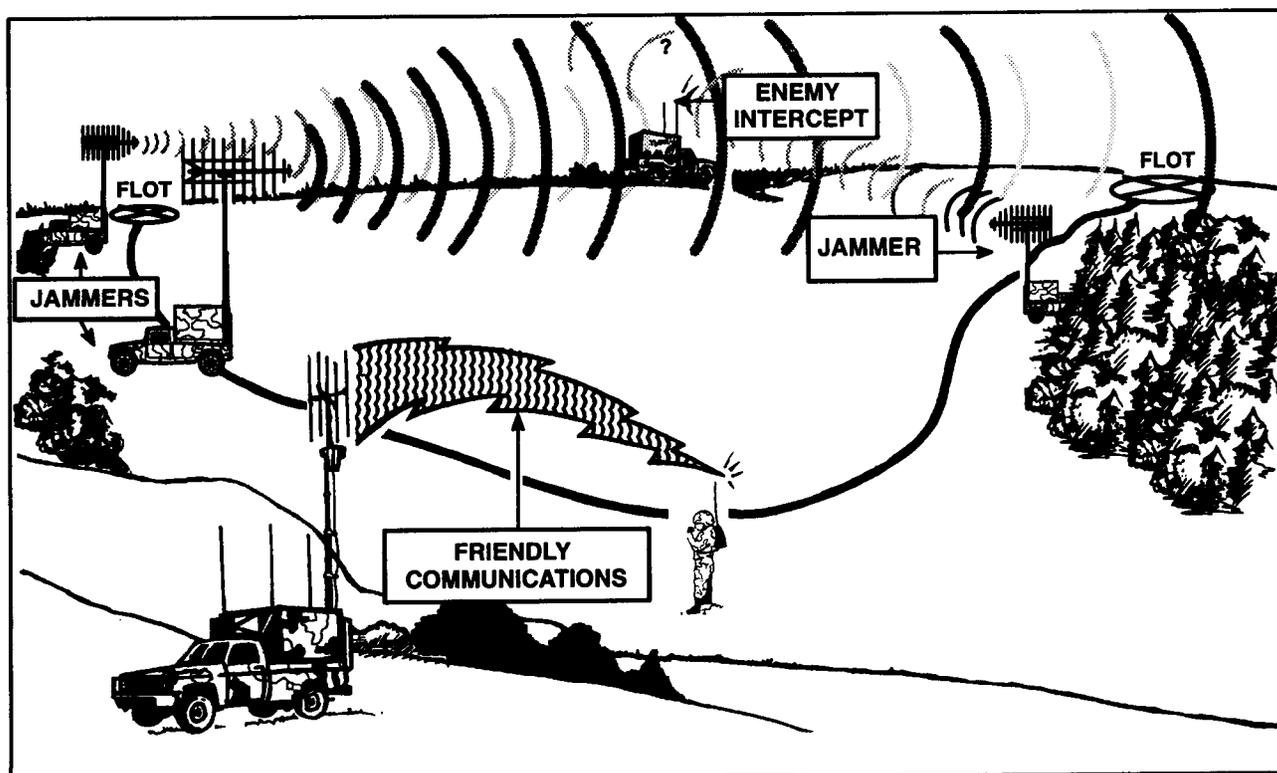


Figure 3-3. Electronic masking operation.

SOP JAMMING

Standing operating procedures (SOP) jamming means allowing the jamming operator to jam targets upon recognition. The SOP jamming technique is used when it is impossible to compute the jamming-to-signal ratio for effective jamming. The SOP jamming technique requires that the jammer's maximum power output **must** be used to ensure mission effectiveness; therefore, the jammer's power output cannot be reduced during SOP jamming. In certain situations, even the least amount of power reduction could render the jamming ineffective. Our jamming operations must be able to ensure success when the decision to jam is made. SOP jamming has the following disadvantages, which should be considered prior to its implementation:

- It does not allow for step-by-step coordination with frequency managers, intelligence collectors, or friendly forces in the jamming mission area of operations.
- The operator will not know if the jamming equipment location is close enough for the jamming signal to overcome the enemy transmitter signal at the target (enemy) receiver's location, without prior planning.
- Uncontrolled, high-powered jammers can have a disastrous effect on unwarned and unprepared friendly communications.
- Maximum jammer power output means maximum electronic visibility and vulnerability to the enemy electronic warfare forces, which could result in the destruction of the friendly jamming asset.

The two methods for employing the SOP jamming technique are called *jam upon recognition* and *targets of opportunity*.

In the *jam upon recognition* method, the operator is tasked to search for enemy targets. As soon as the target is identified, it is jammed. The operator is not tasked to jam specific targets at specific times. Under emergency conditions there is no time to plan and coordinate the jamming effort.

The *targets of opportunity* method is used against specific enemy units placed in priority. This method occurs after the targeting process is completed. The G3 or S3 organizes specific enemy targets in a priority order based on the input from the EWS and the fire support coordinator. The TCAE's ECM planning section determines when to jam each target based on the distinguishing traits of the target's communications. Each communications jamming team receives the SOP target jamming list. The list contains target call signs, type of traffic, and frequencies. The communications jamming teams are authorized to jam each target according to the instructions on the SOP target jamming list.

The SOP jamming schedule is neither time nor location oriented. Jamming can be performed as *jam upon recognition* based on tasking requirements and target activity or *targets of opportunity*, which requires no tasking and is based solely on target activity. Remember, the jammer's maximum power output is used, and commanders must be made aware of the disadvantages of SOP jamming.

SURGICAL VERSUS SIGNAL INITIATED JAMMING

Planned, on-call, and SOP jamming are the forms of jamming referred to as **surgical jamming**. The surgical jamming technique interrupts the target signal using a continuous wave jamming

signal which makes it difficult for the enemy operator to know if he is being jammed. Signal initiated jamming (SIJ) is the jamming of frequencies programmed into the jammer and

they are automatically jammed as they become active. As a result, a communications check could be jammed and tip off the jamming effort. SIJ increases the chance of fratricide, since the programmed frequency would be jammed regardless of whether it is friendly or enemy. In addition, SIJ bypasses the decision process to jam

or listen. SIJ is effective only when the operator can verify that the transmission should be jammed. Surgical jamming is the most effective and is desired over SIJ. Also, the jammer's maximum power output is very important to the success of surgical jamming, when the jamming-to-signal ratio cannot be computed.

HIGH POWERED COMMUNICATIONS

High powered communications consist of using the jammer as the communications equipment to increase the power output for friendly communications. At critical points of the battle,

when communications are mandatory, high powered communications will overcome either natural (static) or intentional (enemy ECM) interference.

FUNCTIONS OF MISSION PLANNING

Planning the jamming mission in response to specific tactical operations consists of many functions. These functions include—

- Target isolation.
- Resource selection.
- Mission analysis.
- Effective jamming.
- Terrain analysis.

Target Isolation

Upon receipt of a jamming mission requirement, the jamming mission planner obtains target data by searching the enemy electronic order of battle, electronic warfare support measures, and other files. As information on the potential target is checked, frequency parameters are reviewed to determine if they conflict with restricted frequencies. Conflicts are identified and reported to the command establishing the restriction, who is responsible for resolving the conflicts. Unresolved restrictions are noted and added to the target files as restricted frequencies until they are resolved.

Resource Selection

The next step is to compare the jamming mission with available resources. Information on the type, number, location, and status of friendly jammers is required to effectively assign the mission. The multiple asset status report provides the status of the major assets to the asset manager. Jamming mission requirements that cannot be satisfied by organic direct support capabilities require support from a higher echelon.

Mission Analysis

The mission planner conducts a detailed analysis of the actual target network based on his geometric calculations, which indicates that the mission has a high probability of success. Analysis isolates the expected pattern of activity and structure for the various jamming operation phases being planned and establishes the engagement methods and timing for maximum target degradation. The multiple asset effectiveness report provides mission effectiveness data from the jammer to the asset mission manager.

The type and number of jamming resources required are examined to ensure that those selected are capable of accomplishing the planned mission. If required, any additional jamming resources needed are identified and requested from the supporting MI unit. Coordination, logistics, and communication problems are identified and procedures for their resolution are established. The multiple asset tasking message is then prepared and passed to the appropriate jamming team.

Effective Jamming

If the jamming-to-signal ratio for FM signals is large enough (or larger), jamming will be effective. If the jamming-to-signal ratio is too small, then jamming will not be effective (see jamming formulas in the

appendix). Effective jamming disrupts, delays, or prevents the effective use of communications by the enemy. The jammer should, ideally, radiate only the amount of power output necessary (minimum jammer power output required) to interfere with the reception of the enemy transmitter signal in the target receiver. Jamming is most effective when it interferes with the enemy's communications without disclosing its presence. The jammer's power output must electronically **capture** the target receiver (Figure 3-4). **Capture** occurs when the strength of the friendly jammer's signal is stronger than the enemy transmitter's signal in the target receiver. In this situation, the frequency modulated receiver will be **captured** by the friendly jamming signal causing the target receiver to **reject** the weaker enemy transmitter signal.

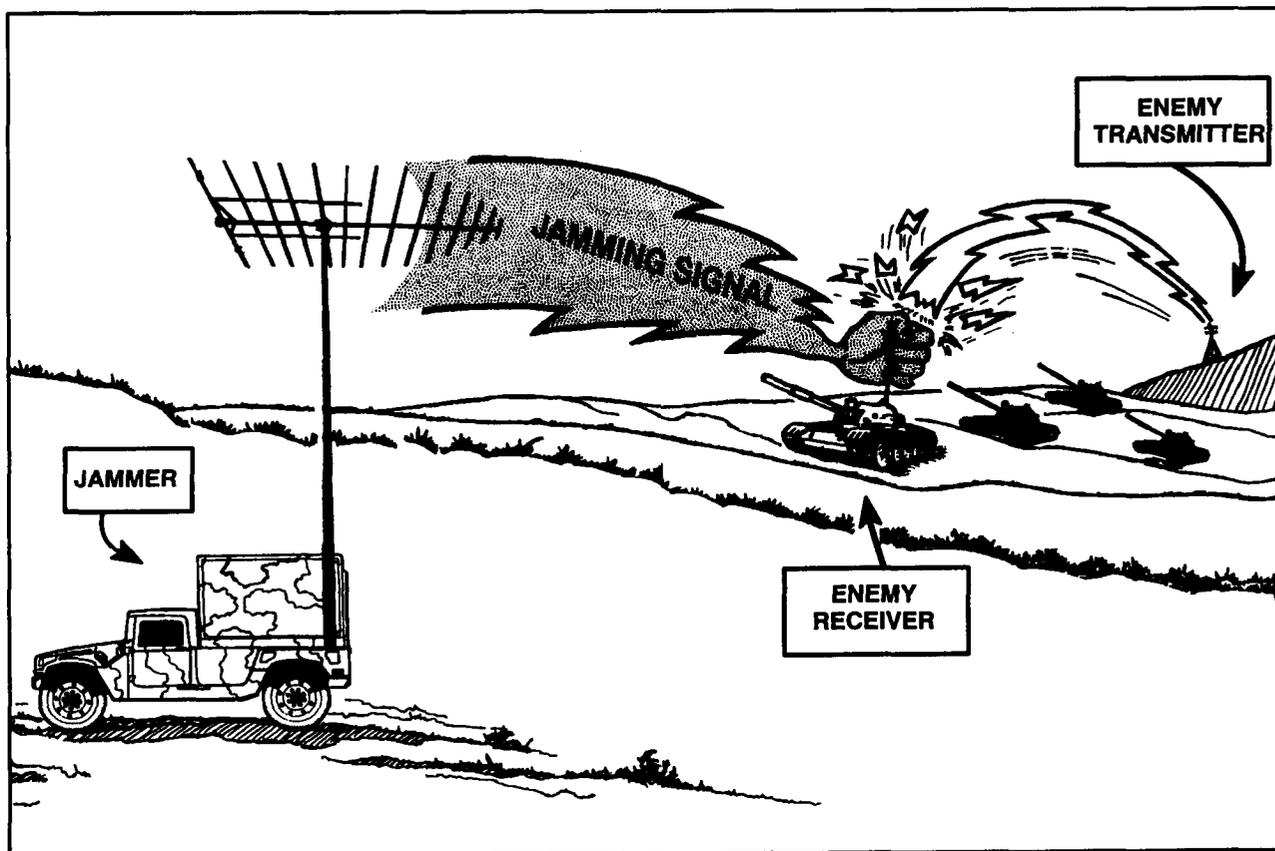


Figure 3-4. Capturing the targeted receiver system.

Terrain Analysis

An analysis of the terrain features between the jammers' location and friendly units is necessary to prevent inadvertent jamming of friendly communications. Jamming sites should be located

where they can take advantage of any terrain features that could reduce or block the jamming frequency from interfering with friendly communications.

UNDERSTANDING JAMMING

To understand jamming, consider the following situation:

The operation plan identifies the enemy's COP and the associated communications as priority targets for jamming. The COP has located our battalion task force (BTF) and is passing this information to the advance guard battalion (AGB) (Figure 3-5). There is no interference with their communications. The AGB operator is able to hear and copy all of the COP's transmissions.

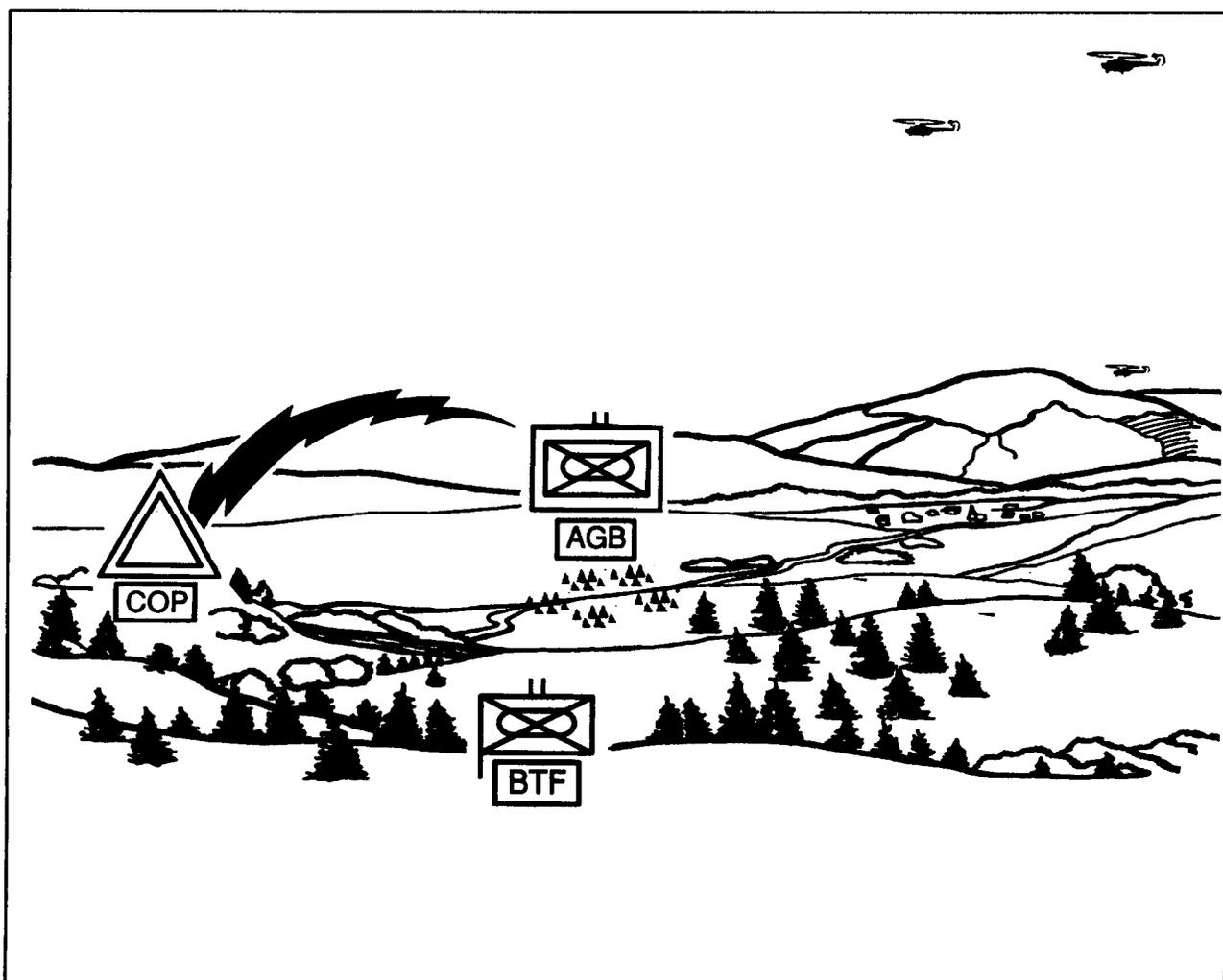


Figure 3-5. The advance guard battalion.

Identifying the Target

Intercept positions have identified the COP and AGB frequency and intercepted the link's transmissions. DF operations provided a general location for both stations. The emitter locations are given to the TCAE, where the jamming mission is planned. The mission planner determines the minimum jammer power output required to jam the COP and AGB communications as well as a location to deploy the friendly jammer (Figure 3-6).

Tasking the Mission

This information is forwarded, using secure communications, to the appropriate jamming team. Upon receiving the tasking, the jamming equipment is deployed to the designated location. The jamming equipment operator then—

- Tunes the jammer to proper frequency.
- Makes the necessary adjustments based on the multiple asset tasking message.
- Jams the target receiver as directed.

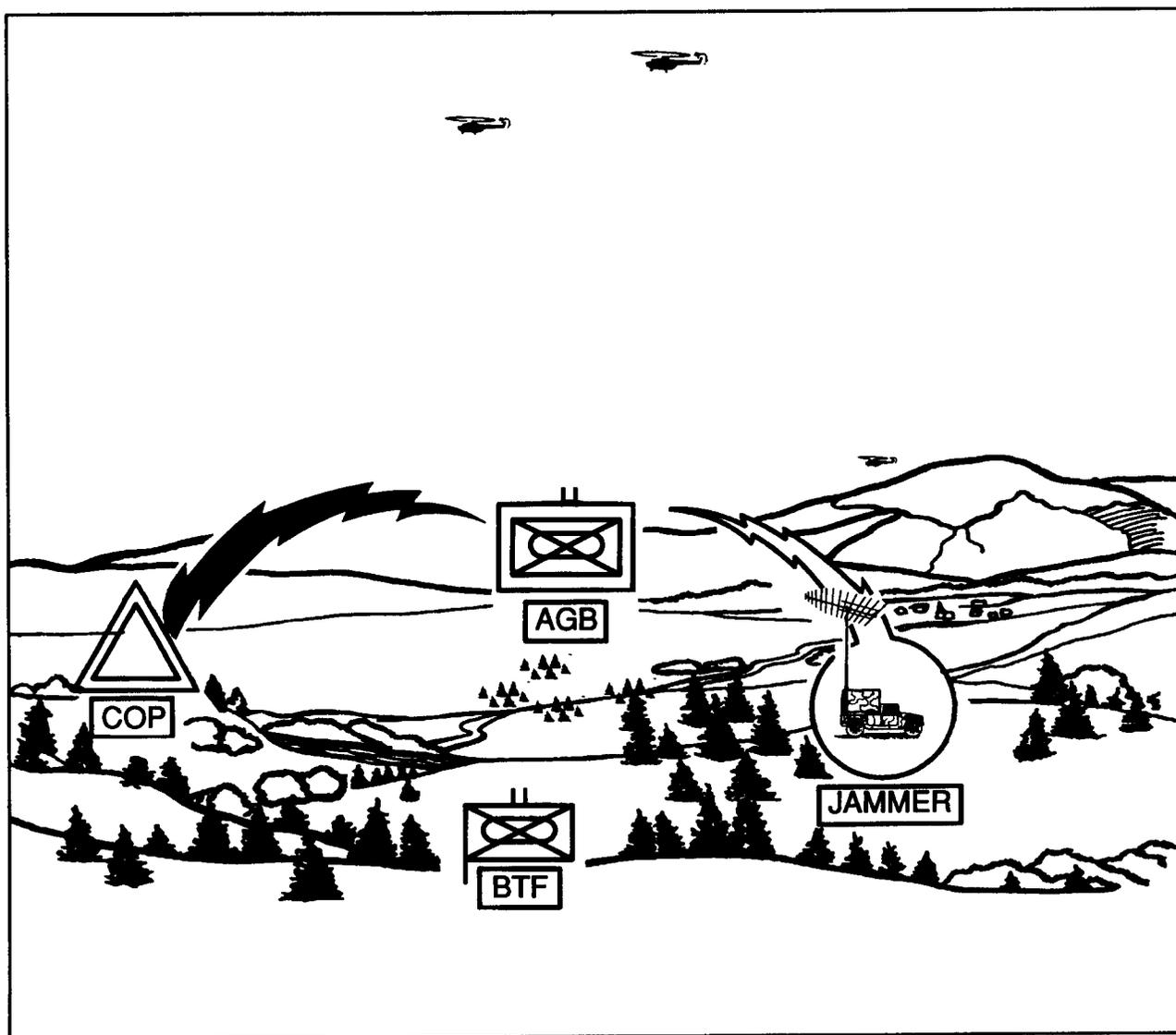


Figure 3-6. Jammer deployment.

Accomplishing the Mission

This mission successfully disrupted the enemy communication and delayed passage of the information. Therefore, the mission planner computed the correct minimum jammer power output required for this mission and the enemy's target receiver was captured. Jamming interfered with receipt of the message and required the AGB operator to ask for repeats of the message.

Determining the Power Output

It is very difficult, if not impossible, to determine the exact jammer power output required to

electronically capture a target receiver. The criteria for determining the minimum jammer power output required to capture a receiver is not universally accepted. Before determining the minimum amount of jammer power output required for a given tactical situation, the mission planner must understand that groundbased jamming is very complex. In free space, some of these variables are not important. However, on the ground they can become critical. Some of the variables which can cause attenuation of radio waves are terrain, ground conductivity, vegetation, and weather (Figure 3-7).

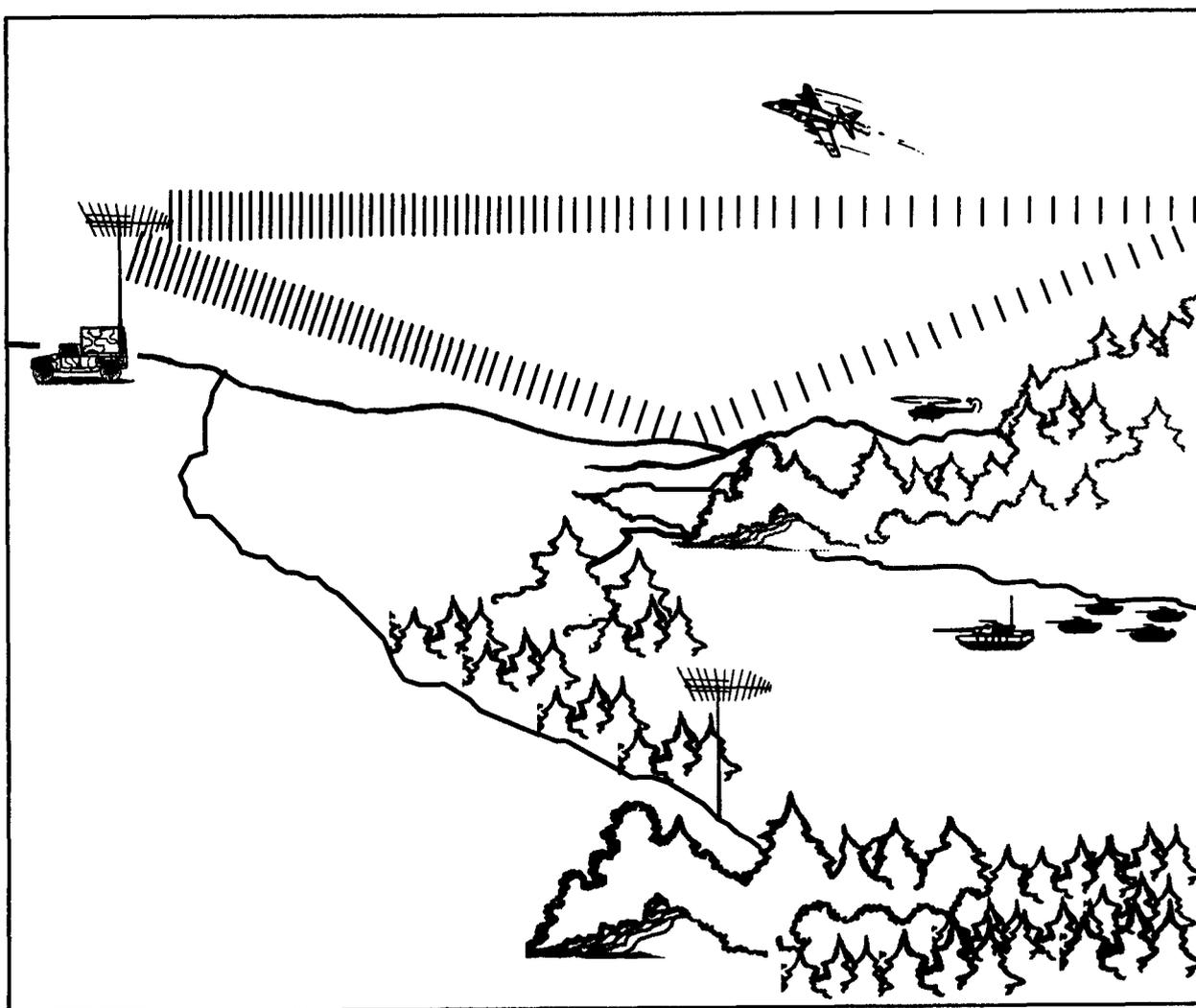


Figure 3-7. Radio wave attenuation.