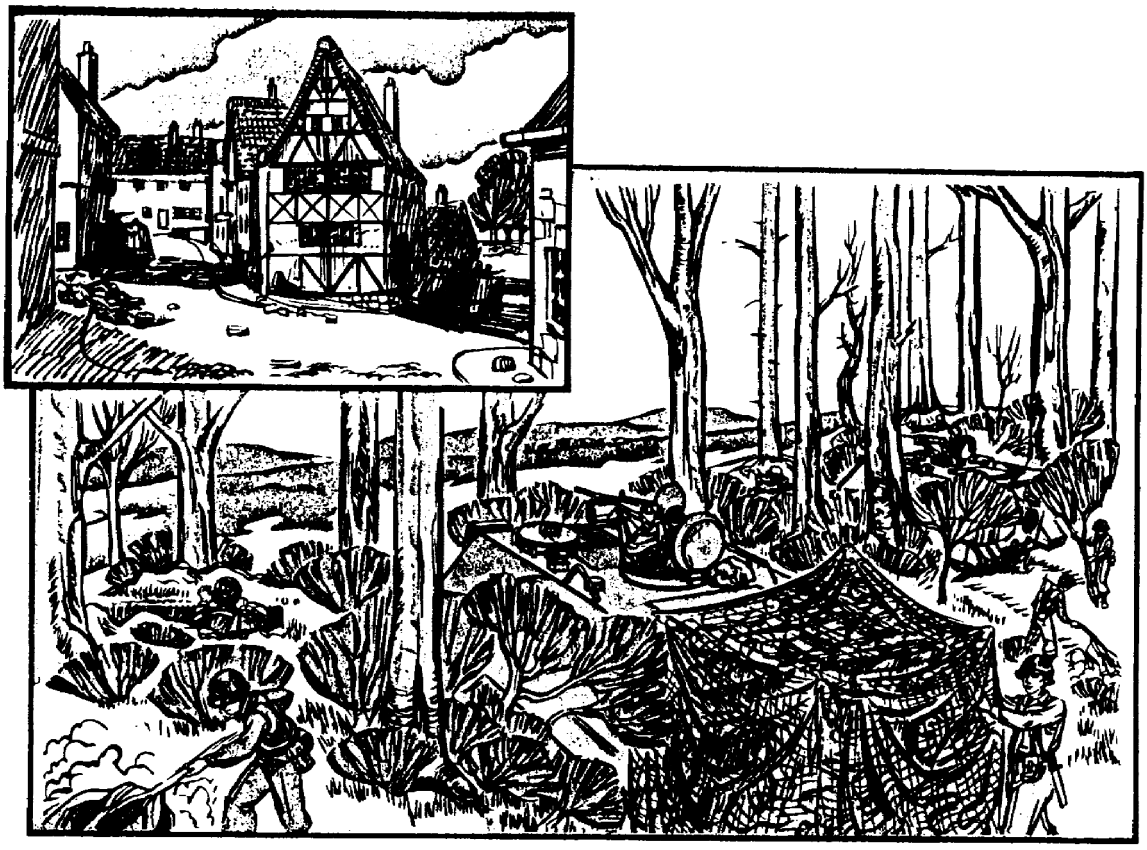
SUBCOURSE
IT 0649

EDITION
A

US ARMY INTELLIGENCE CENTER AND SCHOOL
DETECT CAMOUFLAGE AND
ANALYZE DEFENSIVE MEASURES
ON AERIAL IMAGERY



THE ARMY INSTITUTE FOR PROFESSIONAL DEVELOPMENT
ARMY CORRESPONDENCE COURSE PROGRAM

AIPD

READINESS/
PROFESSIONALISM

THRU
GROWTH

DETECT CAMOUFLAGE AND ANALYZE DEFENSIVE MEASURES ON AERIAL IMAGERY

Subcourse Number IT 0649

EDITION A

United States Army Intelligence Center and School

4 Credit Hours

Edition Date: SEPTEMBER 1990

SUBCOURSE OVERVIEW

This subcourse is designed to teach you basic procedures involved in detecting camouflage and analyzing defensive measures on aerial imagery.

There are no prerequisites for this subcourse.

This subcourse reflects the doctrine which was current at the time the subcourse was prepared.

TERMINAL LEARNING OBJECTIVE

TASK: You will detect camouflage and analyze defensive measures on aerial imagery.

CONDITION: You will have access to extracts from FM 5-20, STP 34-96D2-SM, STP 34-96D24-SM-TG, TC 34-55, and TM 30-326.

STANDARD: You will detect camouflage and analyze defensive measures on aerial imagery in accordance with (IAW) FM 5-20, STP 34-96D1-SM, STP 34-96D24-SM-TG, TC 34-55, and TM 30-326.

NOTE: Replace the following pages with glossy photo pages attached to the back of this subcourse for better viewing:; 6, 8, 11, 12, 14, 15, 23, 24, 25, 33, 34, 35, 36, 37, 46, 47, 49, 57, 61, 68, 72, 73, 74, 76, 77, 78, 80, 82, and 83.

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LESSON ONE

DETECT CAMOUFLAGE ON AERIAL IMAGERY

MOS Manual Tasks: 301-338-1800
301-338-3701

OVERVIEW

TASK DESCRIPTION:

In this lesson you will learn camouflage techniques used on aerial imagery, to include camouflage uses, detection, identification factors, and concealment principles.

LEARNING OBJECTIVE:

ACTIONS: Describe the information and procedures how to detect and identify camouflage and concealment on aerial imagery.

CONDITIONS: You will be given access to extracts from FM 5-20, STP 34-96D1-SM, and TM 30-326.

STANDARDS: Detect and identify camouflage and concealment on aerial imagery IAW FM 5-20, STP 34-96D1-SM, and TM 30-326.

REFERENCES: The material contained in this lesson was derived from the following publications:

FM 5-20.
STP 34-96D1-SM.
TM 30-326.

INTRODUCTION

Camouflage is one of the basic weapons of war. Correctly used, it can spell the difference between a successful campaign and defeat; to the individual it can mean the difference between life and death. An imagery analyst (IA) will often encounter the enemy's use of camouflage in the analysis of a combat area. A knowledge of the basic methods and techniques of camouflage is essential.

PART A: CAMOUFLAGE USES

1. A good working definition of camouflage is: "Any method of concealing or disguising an activity or installation to mislead the enemy as to position, strength, and possible course of action." Contrary to popular belief, camouflage is not strictly a defensive measure but can be used either defensively or offensively depending on the nature of the mission.

2. Camouflage is used in concealment as follows:

a. Tactical uses of camouflage include the concealment of military equipment or units by the use of paint, natural or artificial vegetation, snow, smoke, or misrepresentation.

b. Strategic uses include the concealment of vitally important areas or installations, such as ammunition factories, oil refineries, power plants, etc.

PART B: CAMOUFLAGE DETECTION

1. The activities of humans leave some type of mark or record on the earth's surface (Figure 1-1). When left by a military unit, these marks will differ from those left by a civilian activity. The IA seeks evidence of enemy movement and deployment of troops and defensive measures through analysis of aerial imagery; based on this analysis the IA may determine the enemy's strength and capabilities.

2. In military observation, the IA must be able to determine the enemy's movement and deployment by observing the enemy and analyzing its equipment. Military observation may be divided into two broad areas:

- Direct or ground observation.
- Indirect or air observation.

3. Direct observation refers to that process whereby the observer sees the subject physically, that is, with the eyes--aided or unaided. Examples of this type of observation include an observer sitting on a hilltop with binoculars or an aerial observer viewing the landscape from an aircraft.

a. Direct observation has many advantages.

(1) It offers immediate information on which action may be based.

(2) The picture is seen in the true third dimension and is easily evaluated by the brain.

(3) The eye is normally an accurate and sensitive receiver.

(4) It allows observation of movement.

b. It has four major disadvantages:

(1) No permanent record for future direct comparison.

(2) Weather and time of day may limit it.

(3) The observer's experience and mission may limit the information obtained.

(4) Human error may result in incomplete and incorrect information.

4. In indirect observation the IA analyzes imagery of the subject, and not the physical subject itself. Aerial photography, infrared (IR), radar, and electro-optical (E-C) imagery are used in indirect observation.

a. Advantages of indirect observation.

(1) Comparative cover is successive imagery of the same area which may detect changes that have taken place.

(2) It results in a permanent record.

(3) It increases the spectrum for observation to the IR and other spectrums invisible to the human eye.

(4) It can be distributed to all echelons for their particular needs.

(5) Photographs may be studied at length.

(6) It reduces distance of observation by enlargement.

(7) Radar will usually detect a metallic object behind a nonmetallic screen, such as a conventional burlap garnished camouflage net.

b. Disadvantages of indirect observation.

(1) The time required to develop photographs and disseminate the information.

(2) Weather may interfere with aerial photographs.

(3) The skill of the IA may limit information obtained.

c. Aerial Photography. In modern warfare aerial photography as assumed a place of extreme importance, and in regard to camouflage detection and inspection, photography has reached a stage where it is

indispensables. Aerial photographs are divided into three categories: vertical, oblique, and panoramic.

(1) A vertical aerial photograph (Figure 1-1) is taken with the camera axis perpendicular to the earth's surface. It is the most difficult to use for the novice photo reader, because people are not used to viewing objects from directly overhead. However, the trained IA can achieve the best results from vertical photography through the use of stereovision (Figure 1-2). In the stereogram (Figure 1-7) the average photo reader might locate the cargo truck at Annotation 'a' but without stereovision, few will find the camouflaged equipment at 'b' or the generator at 'c' and the trailer with an unidentified shed or tank at 'd".

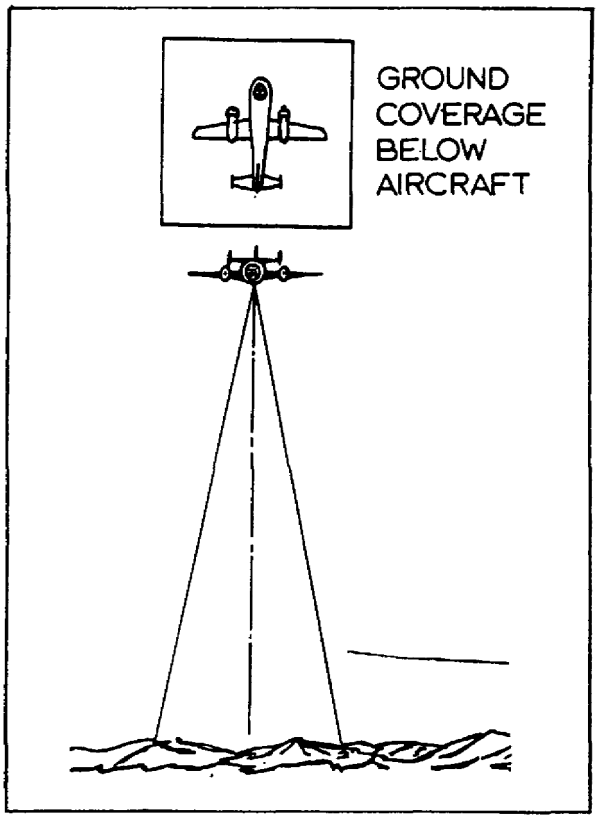


Figure 1-1. Vertical Photo.

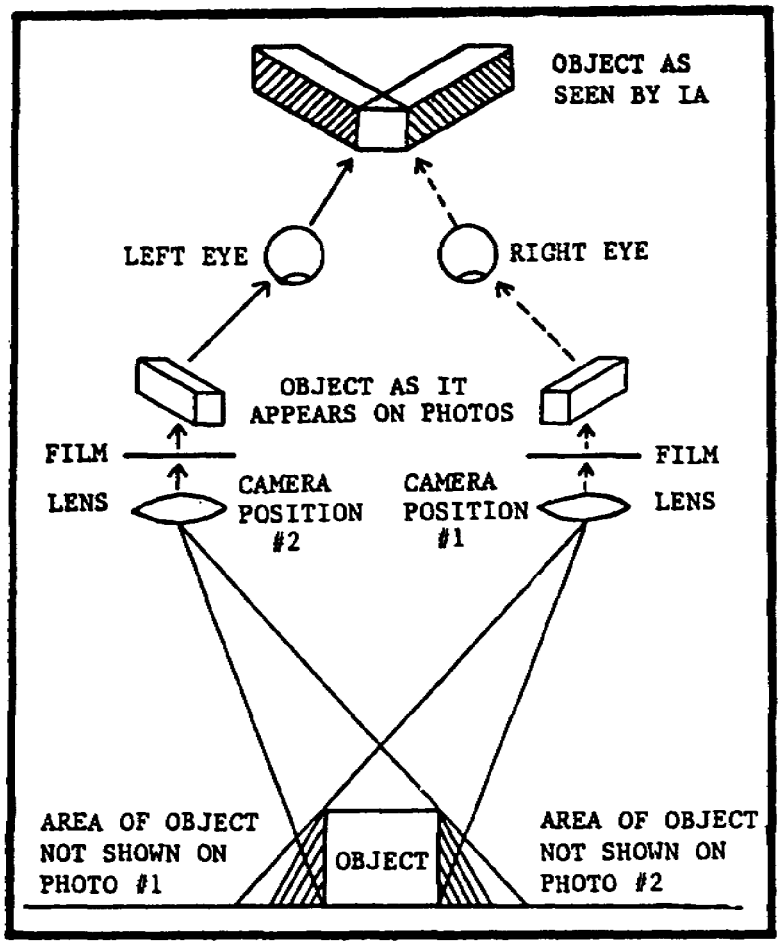


Figure 1-2. Stereovision.

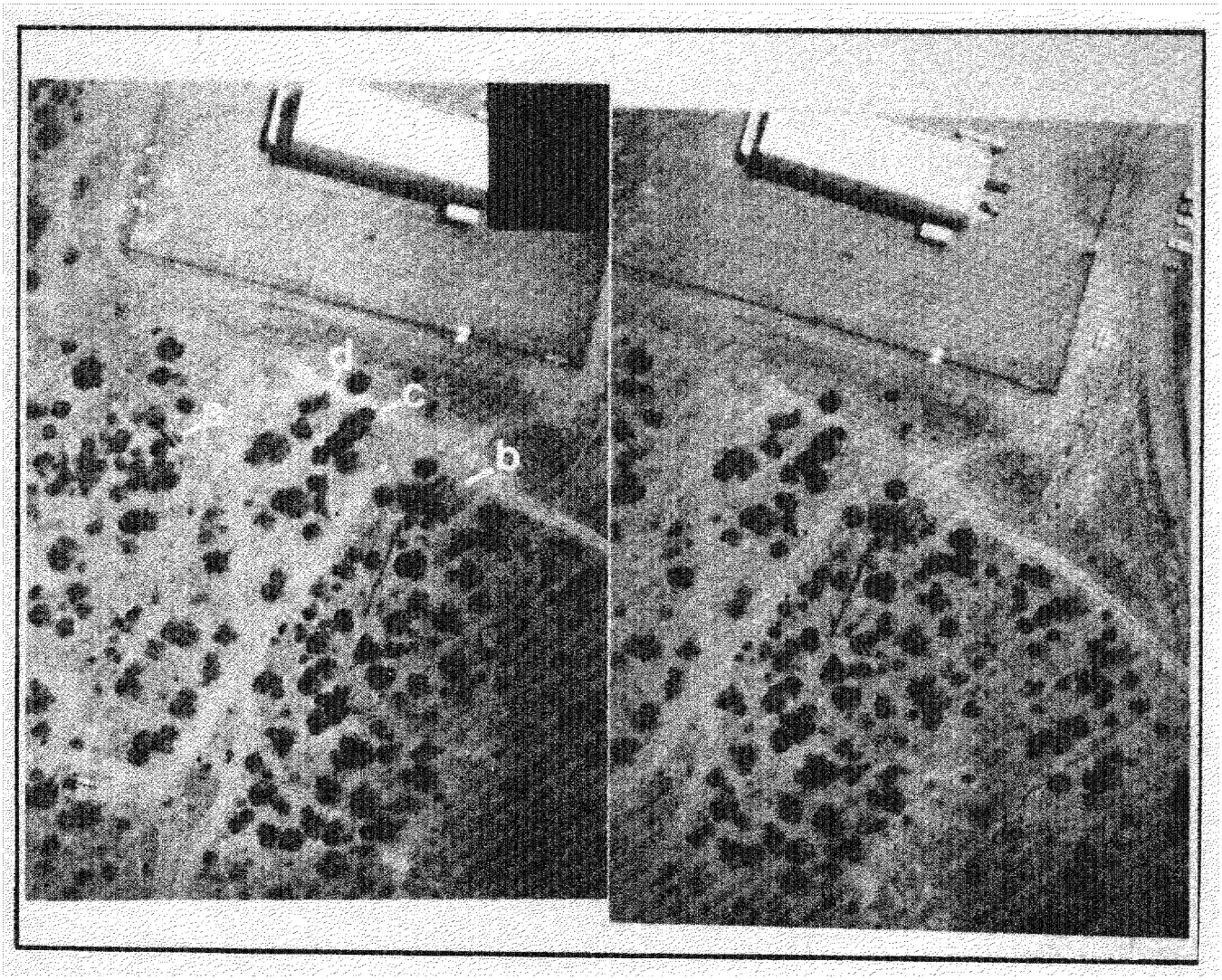


Figure 1-3. Vertical Stereogram.

(2) The oblique aerial photograph presents the more natural view of the target. There are two types of oblique photos:

(a) High oblique photographs are those taken at an angle raised from the vertical so that the apparent horizon shows on the photo. It also shows a partial third dimension by giving the side and top view of the object (Figure 1-4).

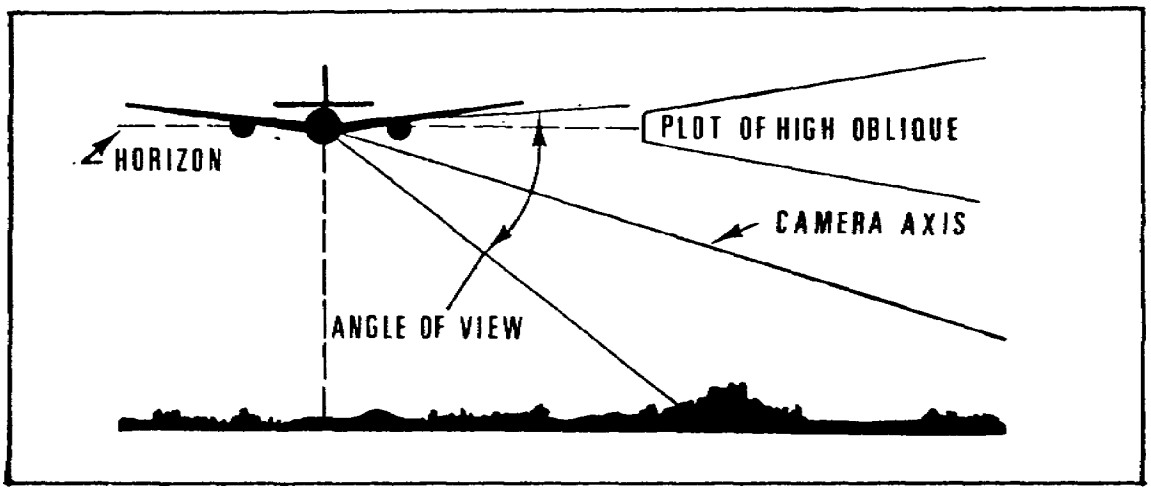


Figure 1-4. High Oblique Photo.

(b) The low oblique is similar to the high oblique except that it does not show the horizon. This is accomplished by taking the photograph at an angle less than 30° from the perpendicular to the line of flight (Figure 1-5).

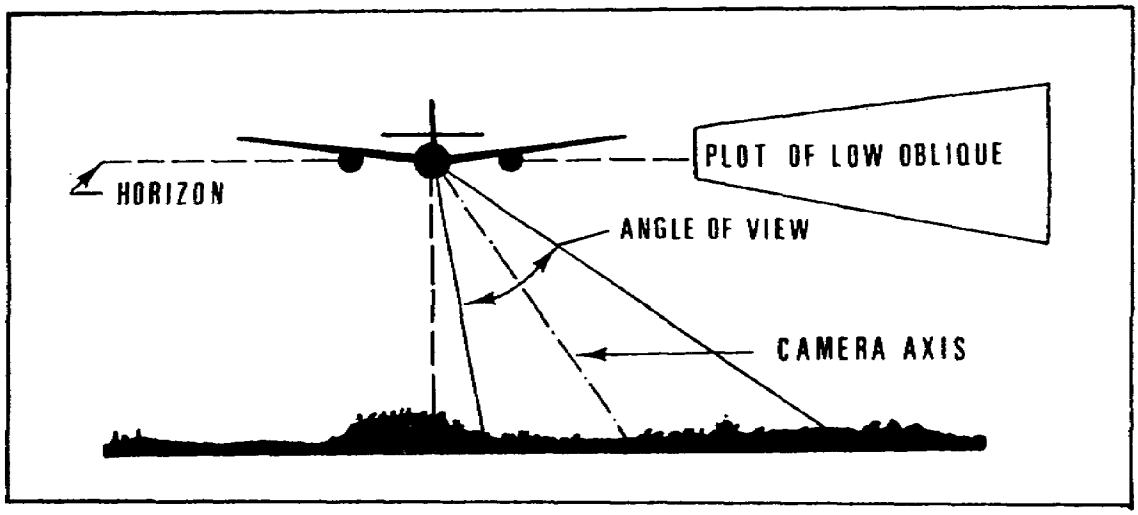


Figure 1-5. Low Oblique Photo.

(c) With the oblique photo, either high or low, you are looking at the side view or under any overhead obstructions. Obliques are ideal in checking the substructure of a bridge. This view also gives the aircraft vulnerability to AAA fire. The problem with obliques is that it is difficult to see enemy positions on the reverse slope or behind heavy stands of trees (Figure 1-6).

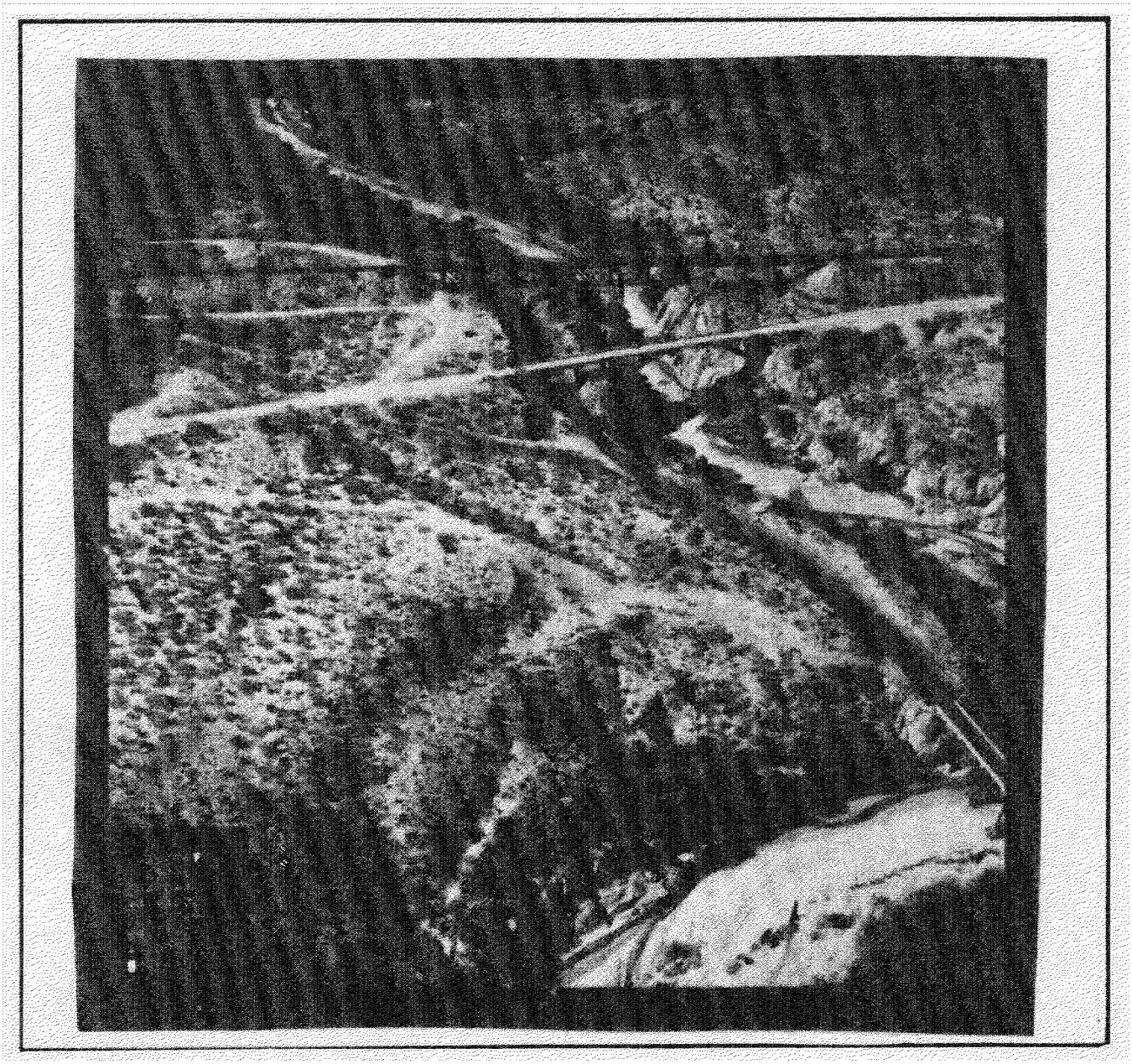


Figure 1-6. Low Oblique Photo.

(3) Panoramic photos are taken by a camera system with a moving lens or a rotating prism which sweeps or scans the area of interest, from side to side, across the line of flight of the aircraft. This sweep produces a near vertical view in the center of the photo, with either high or low obliques on either side, depending on the type of camera used. The film size can be 2.25 to 4.5 inches wide, and the frame can be anywhere from 9 to 75 inches long. This allows the system to photograph a large area on either side of the aircraft's line of flight in a single pass. There are two types of panoramic photos:

(a) Low panoramic photos are obtained from a camera that scans a 180 degree arc across the flight path resulting in a strip showing terrain from directly under the aircraft to the horizon on both sides of the flightpath (Figure 1-7).

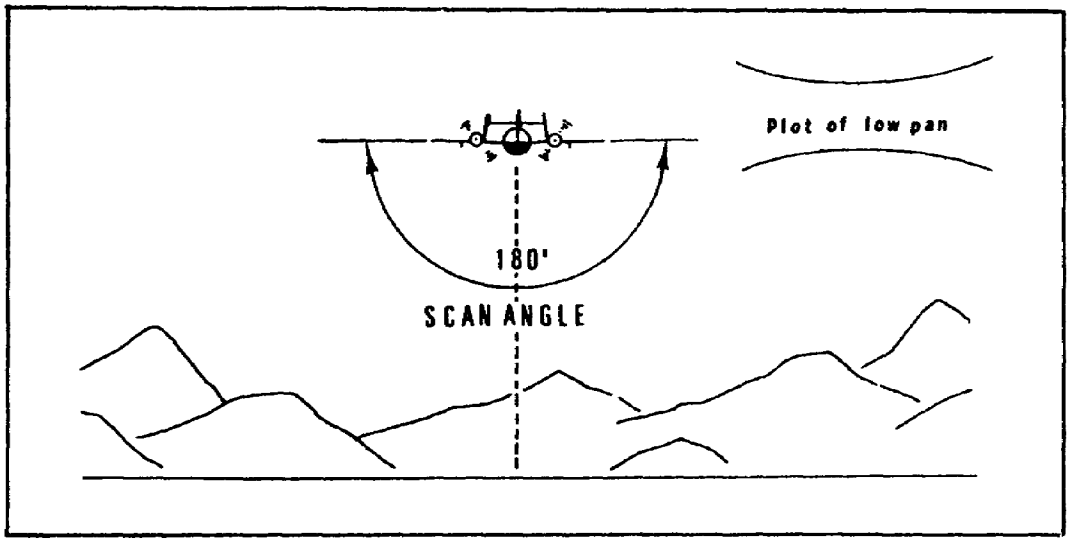


Figure 1-7. Low Panoramic Photo.

(b) High panoramic photos are obtained from a camera that scans a 90-105 degree arc across the flight path and only part way to the horizon (Figure 1-8).

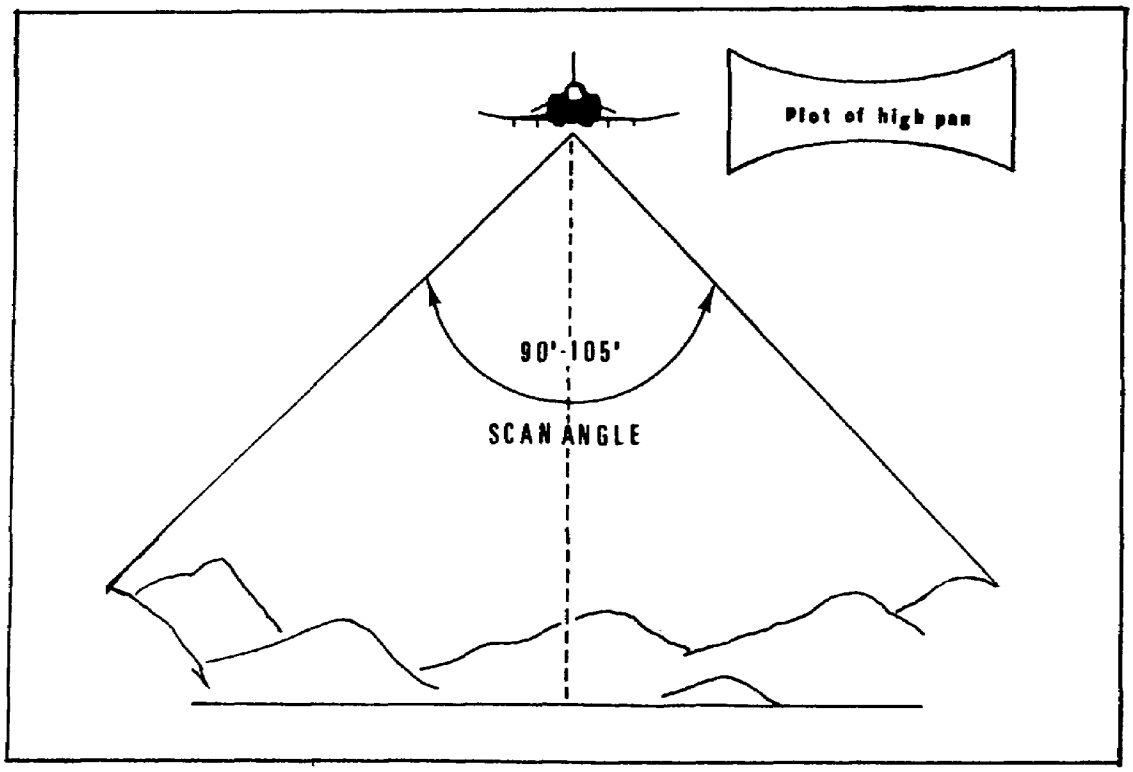


Figure 1-8. High Panoramic Photo.

(c) Panoramic photography is especially valuable when the mission is a route reconnaissance and the road is not exactly straight. The problem with panoramic photography is that it is difficult to obtain stereovision without special light tables and optics. Figure 1-9 is a reduced low pan photo with annotations (a-b shows a bridge; i-k indicates an antenna, etc.).

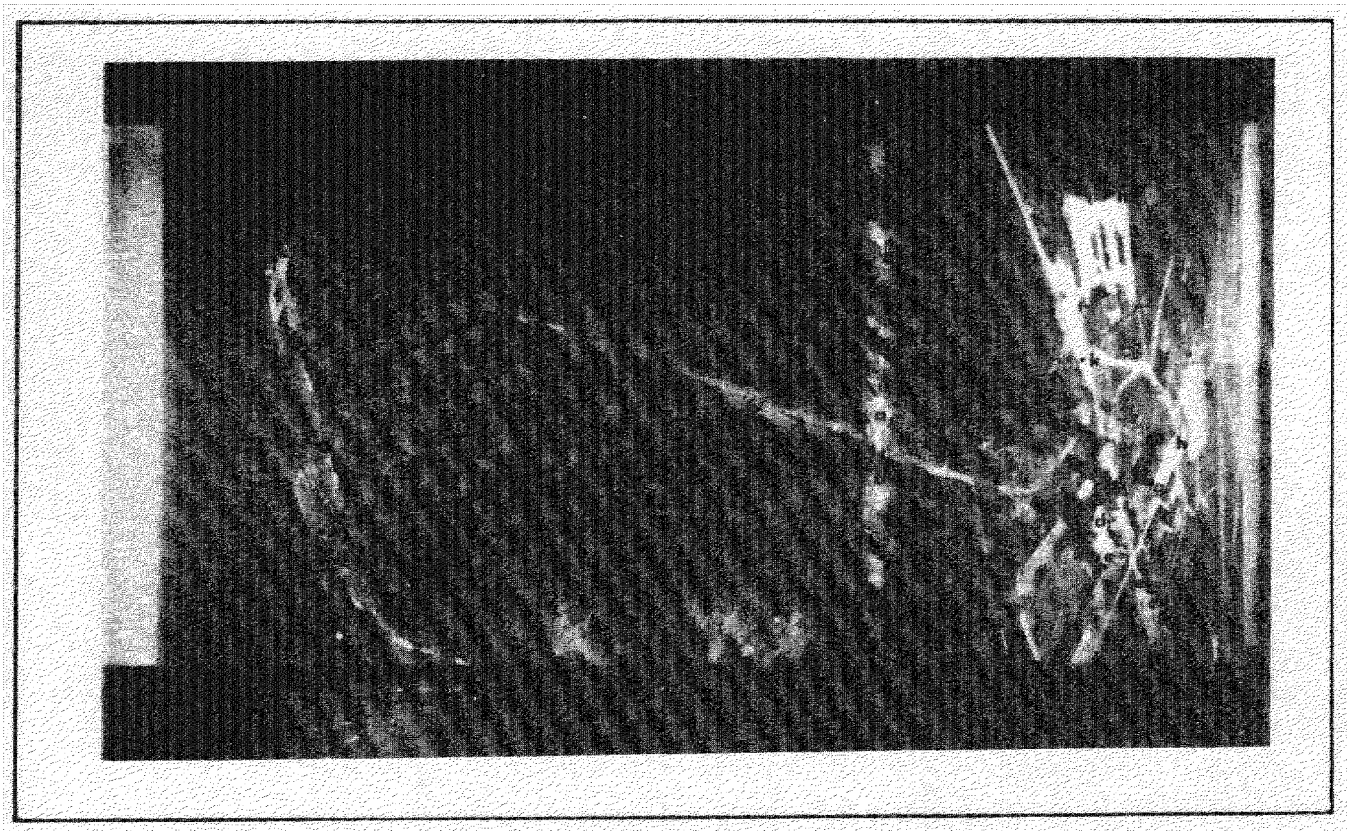


Figure 1-9. Low Panoramic Photo.

d. IR imagery is next in resolution to conventional photography. An IR system is a passive sensor which detects emitted and reflected thermal radiation coming from the terrain and objects on the terrain. However, emitted IR energy is rapidly reduced by the heat absorbing characteristics of rain, snow, clouds, foliage, and hail. There are also periods during daylight that false signals will be imaged. To achieve the maximum capability, the IR system must operate at low altitudes. Its scan coverage is limited to the area directly below and adjacent to the flight path of the aircraft; therefore, it is normally used only for point, linear, or small area targets. Since this sensor is passive, in that it does not depend upon detecting the reflection of transmitted energy as does radar, it is impossible to jam, but it may be deceived by the enemy's deliberate use of heat-producing devices. (Figures 1-10 and 1-11).

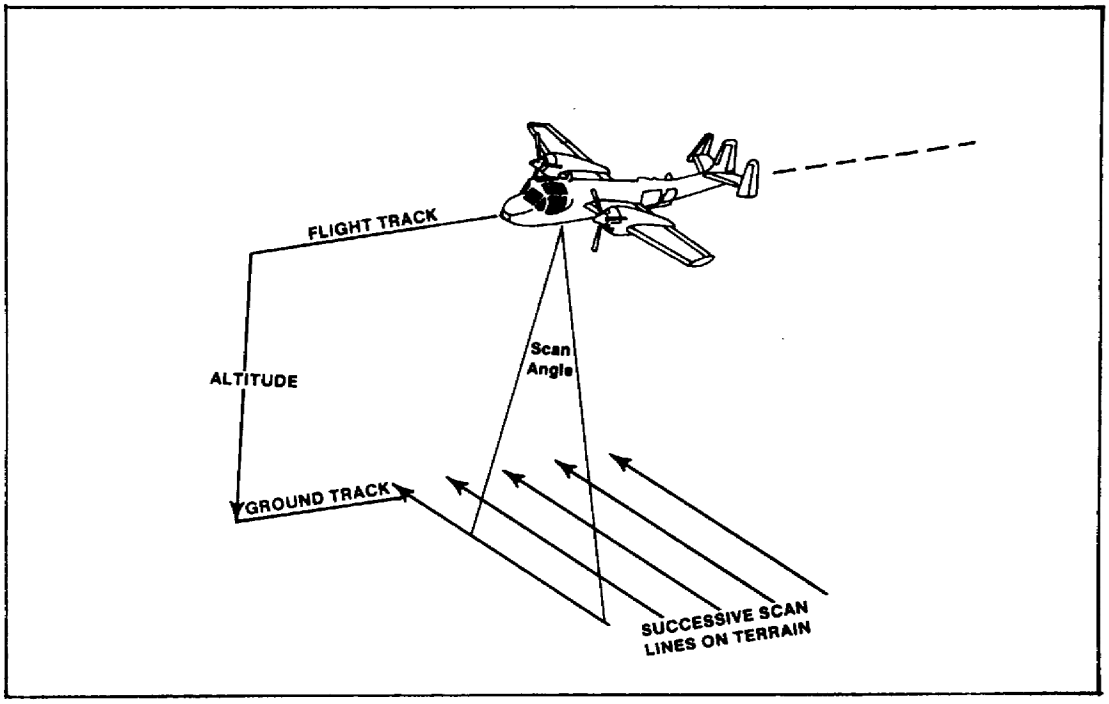


Figure 1-10. IR Imaging.

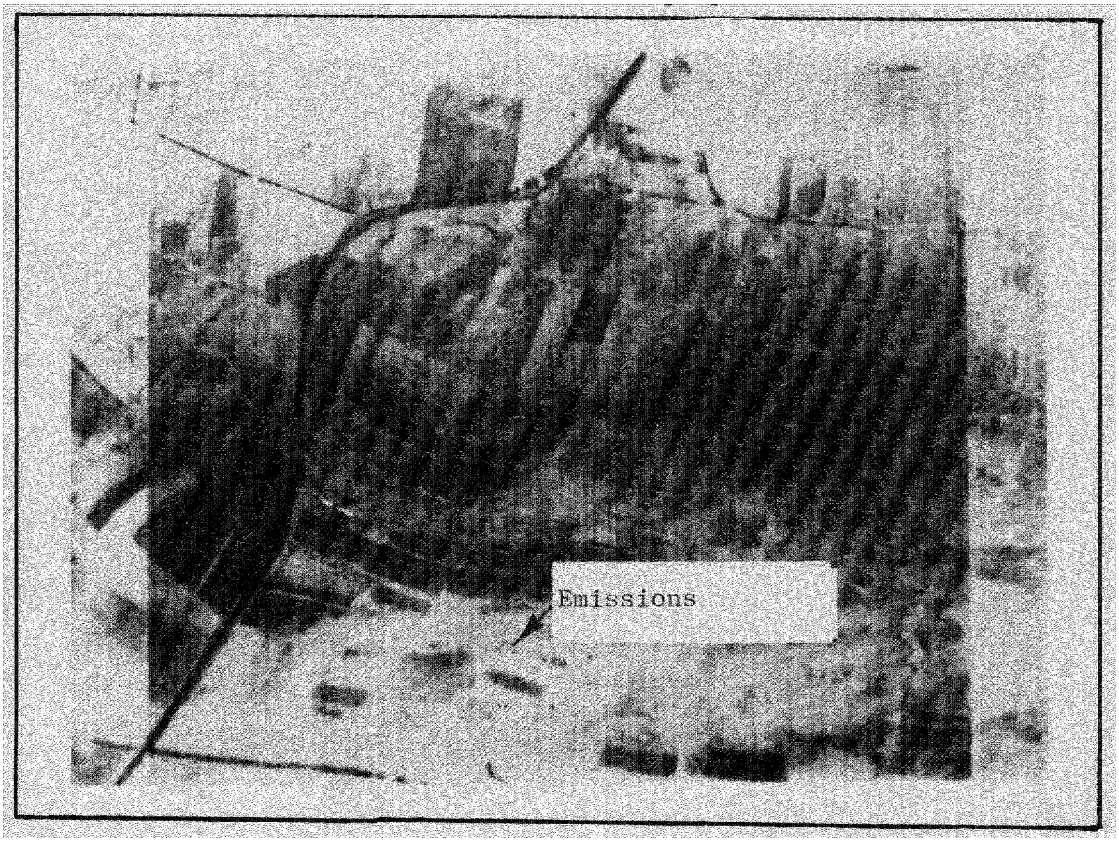


Figure 1-11. IR Photo.

e. Radar has matured to the point where it is a very important asset; in many cases it is the only sensor used. The vulnerability of platforms operating radars is greatly offset by the penetrating capability, resolution, and geometric fidelity of radar over long distances. Because microwaves can penetrate virtually all atmospheric conditions, airborne radars are limited only by the ability of their platforms to operate in adverse weather conditions. There are two type of radars in use:

(1) Side-Looking airborne radar (SLAR) is flown by the Army's OV-1D Mohawk using an active electronic device which emits energy and senses that portion of the emitted energy; this energy is returned by reflection from the terrain and objects on the terrain. It should be noted that since the radar pulse is line-of-sight, any high ground or tall objects in the path of the radar pulse will block out radar returns from objects behind them (Figures 1-12 and 1-13).

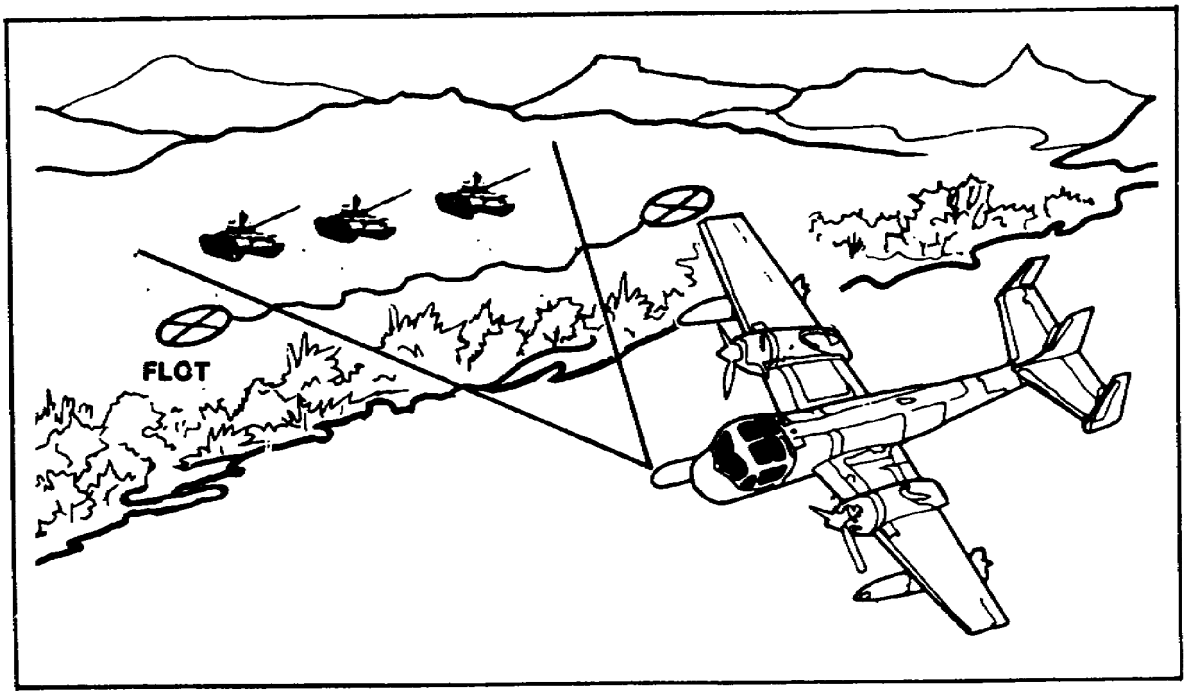


Figure 1-12. SLAR Sensing.

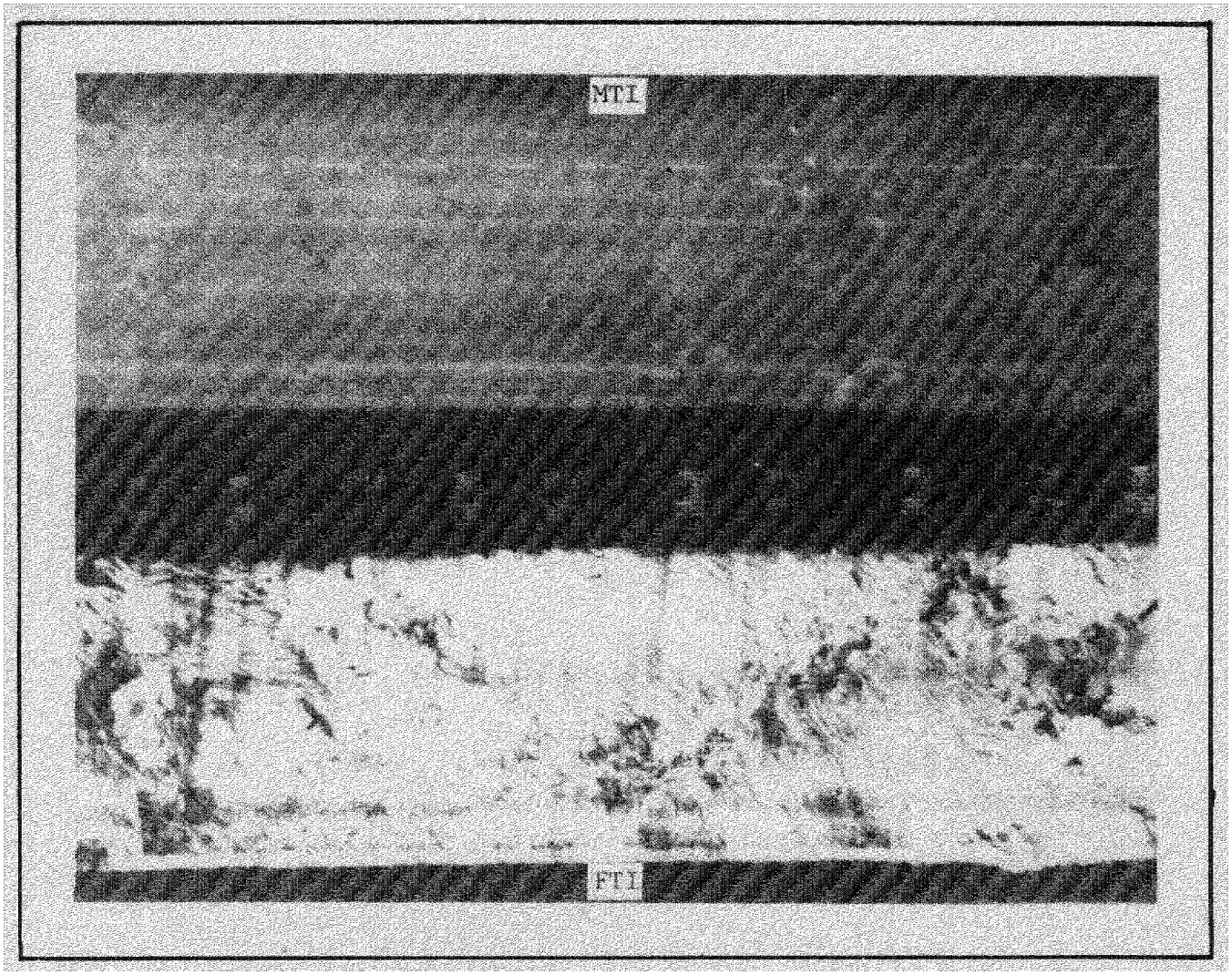


Figure 1-13. Reduced SLAR Photo flown by an OV-1D.

(2) Synthetic aperture radar (SAR)(Figure 1-14) is flown by the Air Force's RF-4C aircraft in a standoff mode to gain resolution primarily on fixed targets. SAR is flown using a system which has a higher resolution than the SLAR flown by the OV-1D.

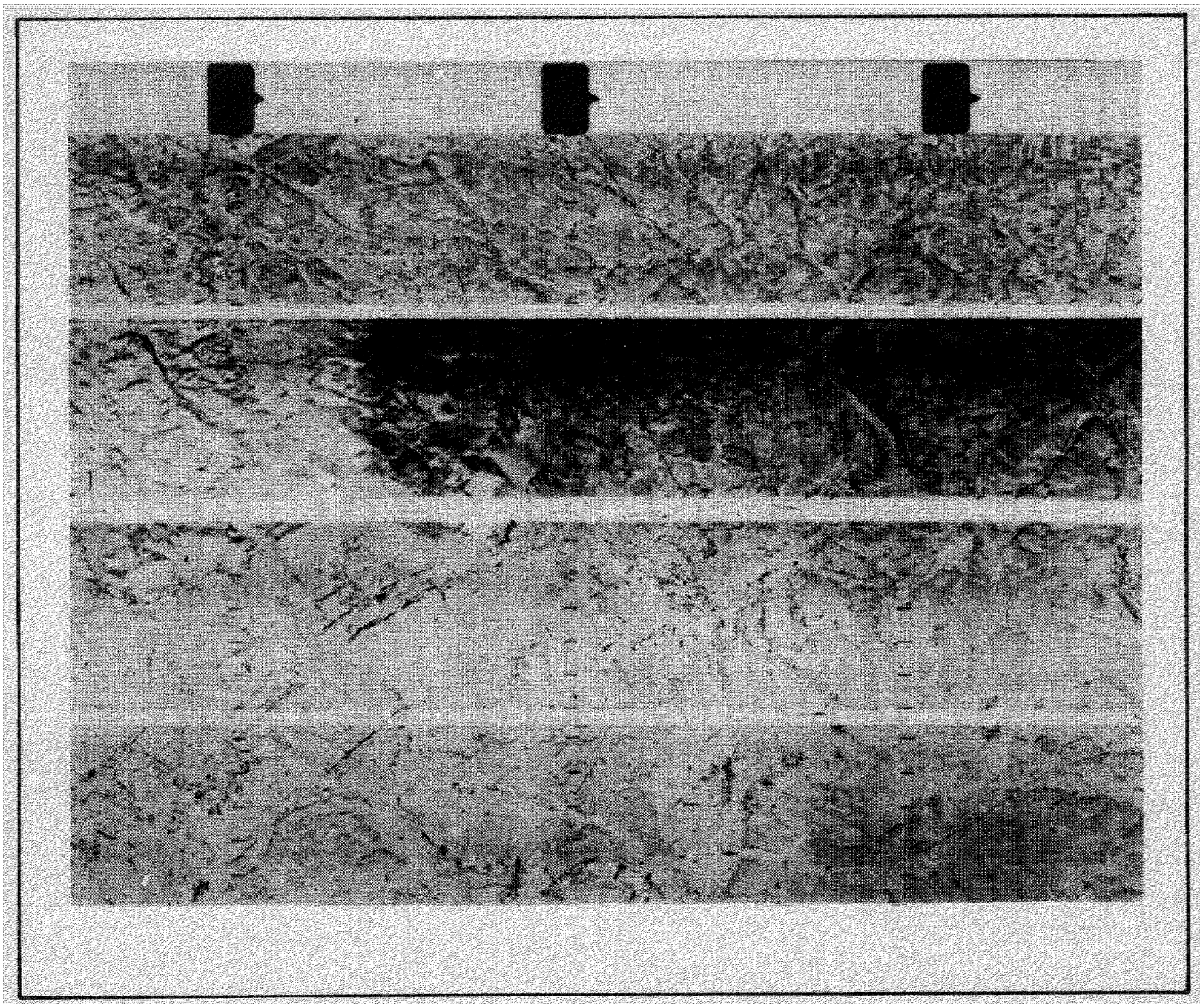


Figure 1-14. Reduced Example of AN/UPD-8 SAR flown by a RF-4C.

f. The electro-optical (E-O) sensor employs digital imaging technology similar to a thermal sensor to collect imagery in the visual range. Major advances of E-O sensors are:

(1) Sensor range is much greater than that of film.

(2) The sensor can penetrate light atmospheric conditions that are opaque to a sensor using photographic emissions.

(3) E-O imagery can be manipulated to reveal the characteristics of an object that are not readily apparent in the original image.

5. There are four types of film used in aerial photography to assist in detecting camouflage:

a. Black and white film records images in tone gradation between white and black. While not reproducing color, it does provide a permanent record of tonal differences. Select filters are often used to improve the photograph or to record only the light that is known to give the greatest tonal differences between natural backgrounds and the object being sought (Figures 1-3, 1-6, and 1-9.

b. Color film will detect camouflage which does not match the colors in the background. However, this film has many operational difficulties and gives best results only under ideal conditions. Colors tend to blend together at high attitudes, shadow density is not as accurate on this film as on the black and white film, and atmospheric conditions must be ideal in order to obtain a clear photograph. For these reasons, this film is not widely used.

c. IR waves or rays refer to a position of the electromagnetic spectrum which is invisible to the human eye. Most things in nature, such as living, green vegetation, reflect these IR waves readily and in large quantities. Most artificial materials normally do not reflect these IR waves to the same extent. Thus, IF film which is nothing more than black and white film that is sensitive to IR waves, can result in a picture showing contrasts between natural materials and artificial materials. The natural materials will show up as a light tone of gray while the artificial materials will up show up as a dark tone of gray. IR film has another important use. It can be used to take photographs at night if there is a source of IR radiation. To counter the detecting ability of this film, camouflage paints and dyes have been developed that have a high IR reflectance, similar to foliage. All camouflage materials are now issued with this type of coloring so that IFR film can no longer detect differences between natural and artificial camouflage that has been treated with such paint and dye (Figure 1-11).

d. Camouflage detection film was designed specifically to detect green colored artificial camouflage by recording it as blue to blue-green in contrast to a red recording of natural vegetation. It combines the advantages of both IR and color films. The structure of the film is such that high IR reflective objects-natural vegetation-record as red; low IR reflective objects record as blue or green.

FART C: BASIC IDENTIFICATION FACTORS

1. There are five basic factors an IA uses to help in identifying an object or installation found on imagery: size, shape, shadow, shade, and surroundings, or the Five Ss.

2. Size of an object can readily aid in its identification and also in the identification of surrounding objects. If the scale of a vertical image is known or can be determined, it is a fairly simple process to take a measurement and determine the actual size of the object to be identified. In the identification of equipment, you will find accurate measurements are essential. Not only can you use accurate measurements to identify an object, you can also use relative size (Figure 1-15). If you know the object on the right is a house, by comparing the size of the center object to the known object (the house), you should determine if it is a garage or large storage building. If you have made this deduction, you should decide the object on the left is a small storage shed or an outhouse.

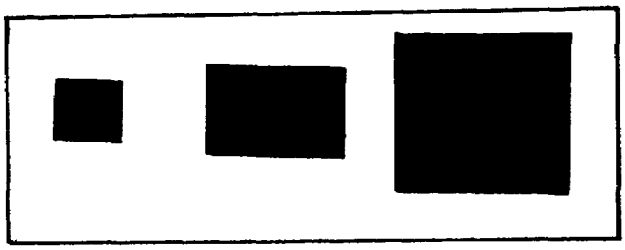


Figure 1-15. Size.

3. Shape of an object is a definite aid in your identification process because one of the first things you must do is determine whether the object is natural or manmade (Figure 1-16). Natural terrain features are irregular in shape, but manmade objects have very regular geometric patterns with straight lines and regular curves. Using this knowledge, the IA can quickly scan a series of images and eliminate the irrelevant from the relevant, distinguish cultural features from those of military significance, and devote attention to the important areas. The importance of shape is further emphasized when we realize the enemy's camouflage efforts are primarily directed toward breaking up the shape of enemy installations and equipment.

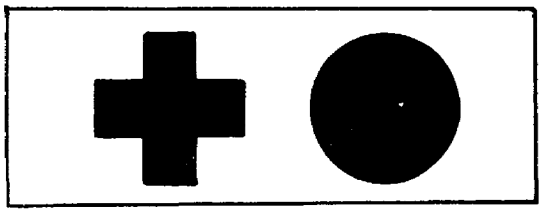


Figure 1-16. Shape.

4. Shadow. The pictorial effect and analysis of vertical images are greatly influenced by shadows (Figure 1-17). The shape of an object is often more discernible from the shadow it casts than from its vertical (top) view. By studying the vertical image of an object together with its shadow, you can learn to associate the vertical appearance of that object with its angular side view as represented by the shadow. This should enable you to form a mental image of the object as it would appear from the ground. An excellent example is a bridge, the shadow of which frequently reveals the construction of a bridge's supporting structure. Also, shadows allow the identification of electronic installations by revealing their characteristic antenna construction.

a. Shadows also aid in the penetration of camouflage which might otherwise successfully conceal some installations. Even fake shadows employed in camouflage can be easily detected on aerial photos. Camouflage shadows are usually painted on the ground and appear in a true position with relation to the sun at only one time of the day. Thus, shadows painted to appear true in the morning will be completely out of position in the afternoon.

b. Shadows also aid in the orientation of an image with a map as, depending on the time of day, the shadows fall generally toward the north (between NW and NE) in the northern hemisphere.

c. Shadows can hide objects as well. A tank parked in the shadow of a building or tree can be overlooked by the IA who doesn't pay attention to such details as tank tracks leading up to, but not away from, the building or tree.

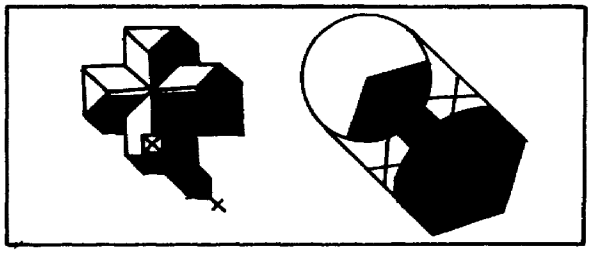


Figure 1-17. Shadow.

5. Shade. The distinguishable variations of gray in which an object appears on a black and white image are known as its tone or shade (Figure 1-18). The shade of an object is almost entirely due to the amount of light reflected from it to the camera. Light reflection, in turn, depends on a number of contributing factors, such as the texture of the surface, position of the sun, and wind velocity.

a. The wind may disturb the reflecting surface of a body of water, or it may expose an entirely new surface to reflected light, as when the wind bends crops or vegetation. Therefore, the shade of an object may vary even on two consecutive images of the same mission.

b. Thus, when the earth, grass, or vegetation is crushed flat, say by a tank or truck, the reflected light will be altered from the norm. Depending on weather conditions, tracks made by one man walking across a grassy field can be detected up to 48 hours later on images taken from 30,000 feet.

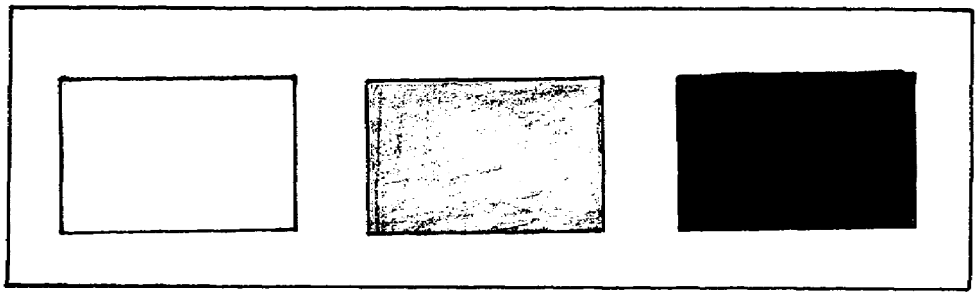


Figure 1-18. Shade.

6. Surroundings (Figure 1-19). This factor is applied as an aid to identification in instances where an object under consideration is:

a. One of a number of similarly shaped objects; for example, shellholes or fighting positions.

b. Too small to be identified by size, shape, or shadow.

c. Unidentifiable after its size, shape, shadow, and shade have been considered. Then it is necessary to note the object and features associated with or surrounding it. For example, antitank positions are usually found in close proximity to roadblocks; machine-gun positions usually line airstrip positions; radar units compliment antiaircraft artillery (AAA) positions; manufacturing plants usually have electric transformer yards in the area; and so on.

d. Of the five factors of identification, surroundings are probably the most important to military identification. To make use of surroundings fully, you should be familiar with the enemy's weapons and equipment, organization and tactics, and the topographic and geographic aspects of the area of interest. The items in Figure 1-19 are groups of buildings. Both building groups are similar, but in different surroundings they are identified differently. Surrounded by cultivated fields, the group on the left becomes a farm with house, barn, and silo. A railroad track added to the group of buildings on the right changes the analysis to a railroad station with storage buildings and a water tank.

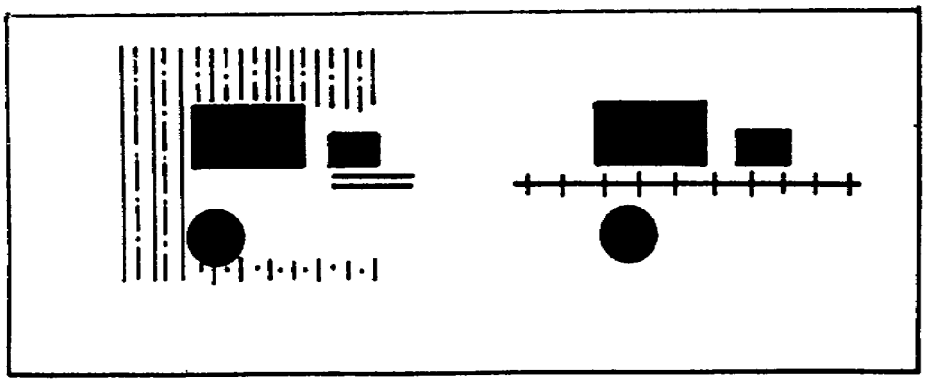


Figure 1-19. Surroundings.

PART D: CAMOUFLAGE IDENTIFICATION FACTORS

1. Identification (ID) factors should help your eye and brain to identify camouflaged objects. Specific ID factors are listed within each ID factor, i.e., ID factor: nature of the enemy; specific ID factor: litter or trash, etc.

2. Color is an aid to an IA when there is contrast between the color of an object and its background. The greater the contrast in color the more visible the object appears. While color alone will usually not identify an object, it is often an aid in locating the object or confirming a tentative identification (Figure 1-20).

a. A secondary consideration is the tone of color. This is the modification of color in varying shades. Usually darker shades of a given color will be less likely to attract your attention than the lighter, more brilliant shades.

b. Differences in color are readily observable from the air. Color differences may result from the dying or wilting of either the foliage used for camouflage or the trees, shrubs, etc., from which the foliage was taken. Poor use of camouflage nets versus the surrounding terrain is a dead give away.

3. Texture refers to the ability of an object to reflect, absorb and diffuse light. It may be defined as the relative smoothness or roughness of a surface. A rough surface, such as a field of grass, reflects little light and casts many shadows on itself (Figure 1-21). Consequently it appears very dark to the eye or on a photograph. A smooth surface, such as an airstrip or the roof of a building, reflects more light on an aerial image. Thus an airstrip, even though it might be camouflaged the same color as the surrounding terrain, would show up as a tighter tone on an image. The absence of texture results in shine.

4. Shine is the most revealing breach of camouflage discipline. This alone can attract attention to a location under observation. Shine is generally associated with the reflection of sunlight from windshields, windows, mess kits, and other such texture-less surfaces. Even the lenses of field glasses, when used in direct sunlight, can reflect a bright shine similar to that of a mirror (Figure 1-22).

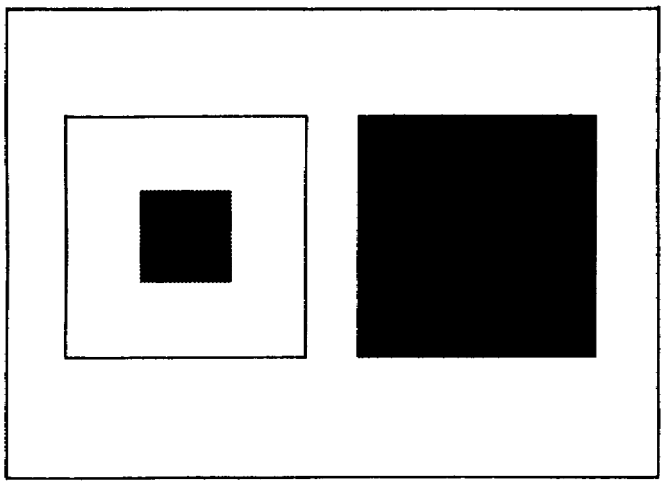


Figure 1-20. Color.

Figure 1-21. Texture.

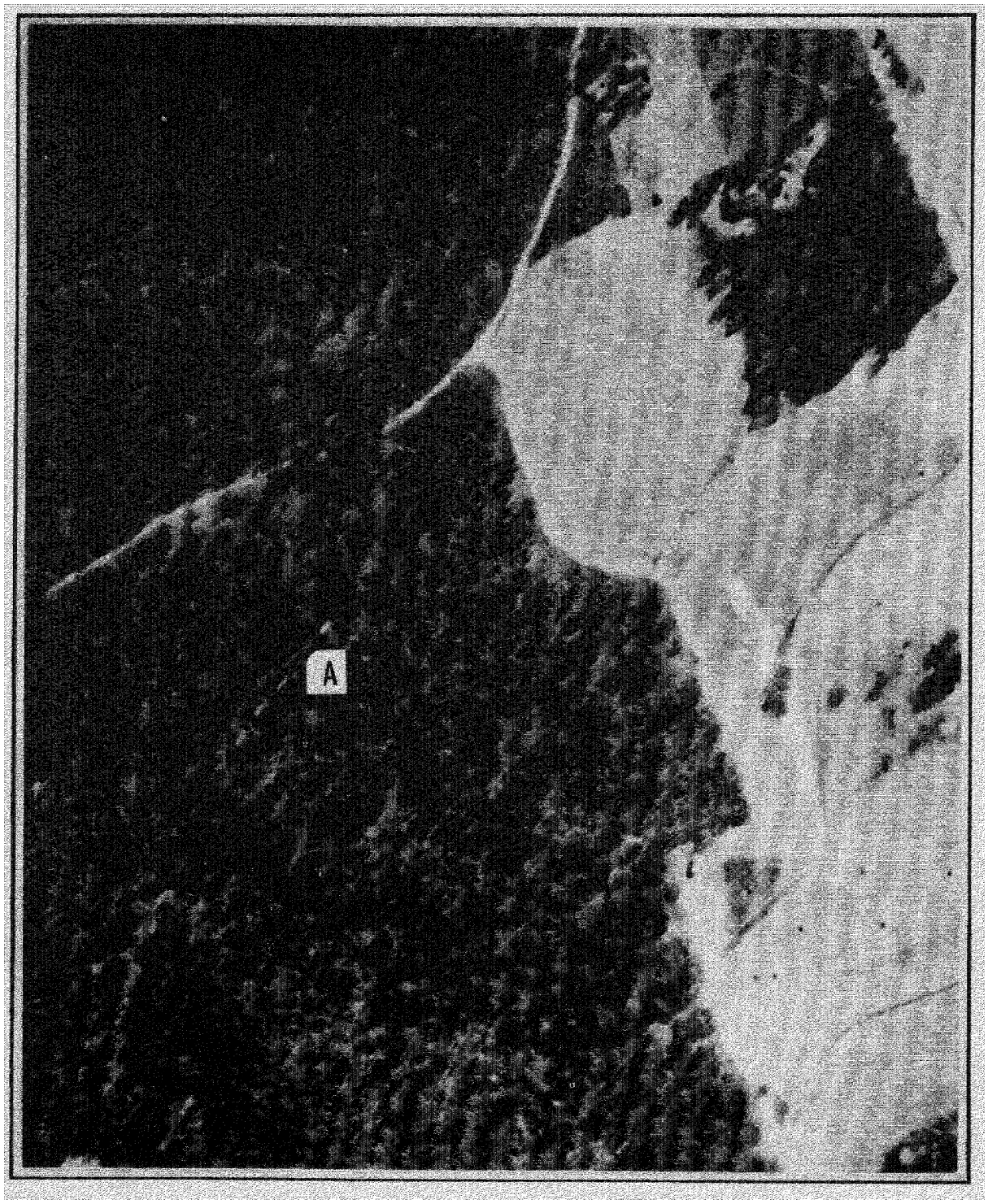


Figure 1-22. Shine Reveals Bivouac Area.

NOTE: Full use has not been made of natural cover and concealment. Some of the vehicles in the woods can be seen by their shining outlines (Annotation A). However, excellent use has been made of existing roads and trails in entering and leaving the area.

5. Movement or track activity. The most easily detectable clue to enemy activity is movement (Figure 1-23). Even if all other clues are absent, track activity can reveal the positions of enemy personnel and equipment. Tracks leading into an area should be observed for movement as to type, quantity and recency of traffic. The type of tread marks present would distinguish the traffic as either wheeled or tracked vehicles. The width and depth of the ruts, and the apparent soil conditions, in conjunction with the type vehicle would provide some information about the volume of traffic or weight of the vehicles. Information on frequency of use could be obtained from such factors as dust still in the air around dry trails, water still seeping into the tracks on wet trails, etc.

Figure 1-23. Improper Camouflage and Movement.

6. Nature of the enemy. If the enemy is skillful in the art of camouflage, the observer should be extremely cautious of overly obvious sightings. A careless enemy will have litter in the area thus giving it a trashy appearance; this can be found in bivouacs. The lack of camouflage may be intentional due to high concentrations of antiaircraft weapons and little concern about aerial observation or to detract the attention of the IA from more important information. Figure 1-23 shows how improperly used camouflage can draw attention. There is poor camouflage discipline; some vehicles are covered while others are not.

7. Smoke which appears in an area should be observed for color, volume, and pattern of appearance. These characteristics can be used to indicate different sources of the smoke; for example, billows of dark smoke could indicate diesel-driven vehicle traffic, and light colored smoke a bivouac area.

8. Light. At night, light is very useful for detecting enemy activity. The ground observer can pick up breaches in camouflage discipline, which are more likely to occur at night than in daylight hours. Figure 1-24 is a photograph taken at night with a flasher unit. This practice is now rarely if ever used due to the illumination of the aircraft, making it an almost impossible target to miss. However, an aerial observer can detect the bivouac area at night if the troops do not exercise proper light discipline; furthermore, the night photo of the bivouac area in Figure 1-24 shows no effort to take advantage of small trees for cover and there is a tendency to group close together at nighttime.

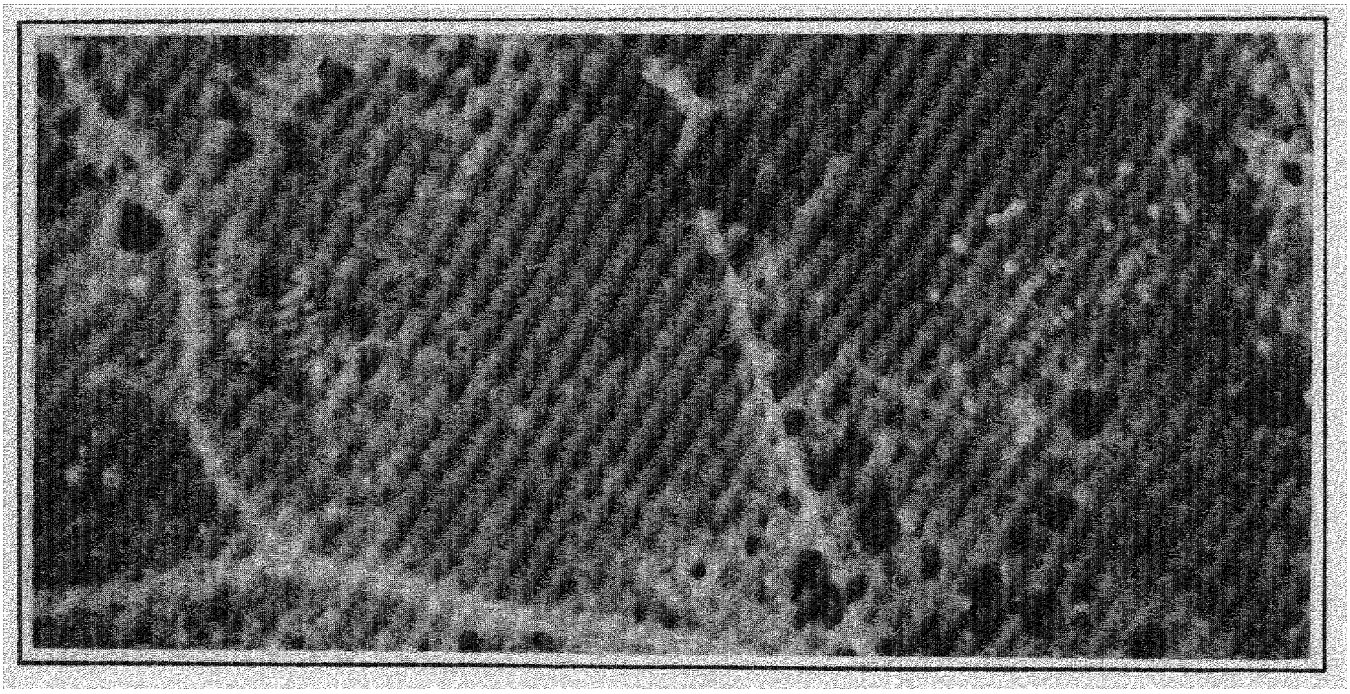


Figure 1-24. Night Photo of a Bivouac Area

9. Relative position. An object is often identified by its position with relation to its surroundings. A long object on a railroad track is assumed to be a train, similar objects on a river and parallel to its banks are assumed to be boats or barges. A large structure in a group of farm buildings might be a barn (Figure 1-25). Position is nothing more than the space relationship of one object to another object or objects. Landmarks attract attention.

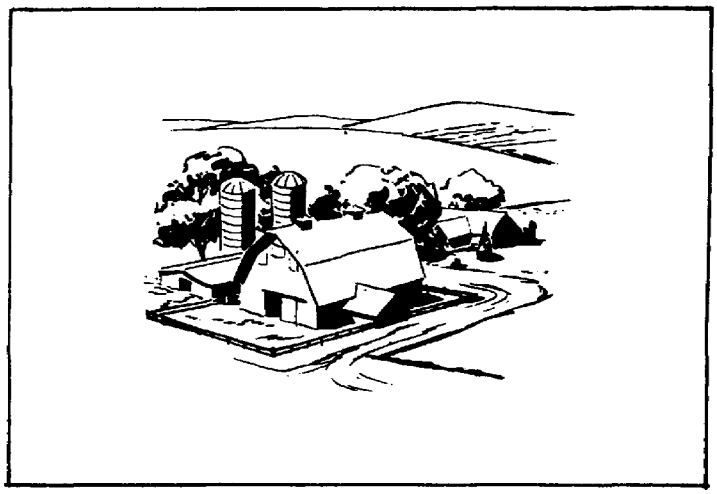


Figure 1-25. Relative Position.

PART E: CONCEALMENT PRINCIPLES AND METHODS

1. Two factors must be considered when analyzing a site: dispersion and terrain patterns.

a. Dispersion. The requirement for dispersion dictates the size of the site. A site is useless if it will not permit enough dispersal for effective operation.

b. Terrain pattern is a vital point to consider since any change in an existing pattern will immediately indicate the presence of some activity. The four generalized terrain patters--rural, urban, wooded, and barren--all have distinctive characteristics.

(1) Rural terrain is recognized from the air by virtue of its peculiar checkerboard pattern. This is a result of the different types of crops and vegetation found on most farms.

(2) Urban terrain is characterized by more or less uniform rows of housing, interwoven with streets, and punctuated by carefully located trees and shrubs.

(3) Wooded terrain is a natural, irregular work of nature unlike the almost geometric pattern of manmade rural and urban terrain.

(4) Barren terrain. Like the wooded terrain, barren terrain presents the IA with an uneven, irregular work of nature, without the abrupt patterns of rural and urban areas.

2. The enemy will normally select the most advantageous location or position to hide troops or equipment. The enemy will most likely take advantage of natural cover, defilade, and conceal access to its positions and avoid landmarks because they stand out. Where possible, concealment is achieved with minimum construction. Figures 1-26 through 1-33 show sketches of the right and wrong ways of camouflaging. As an IA you should be looking for the enemy's mistakes.

3. Landmarks attract attention. Positions normally avoid terrain features which are used as reference points for ground and aerial fires (Figure 1-29).

4. There are three camouflage methods: blending, hiding, and disguising.

a. Blending can be accomplished in several ways. For example, the simplest way would be to blend into the background as much as possible, such as parking vehicles along a tree line as opposed to parking against the sky line or integrating a command post (CP) into a rural town (Figures 1-30 and 1-31). Another method would be to paint equipment to blend into its background.

NOTE: Tracks, spoil, and debris are the most common signs of military activity which indicate concealed or camouflaged objects and are normally avoided (Figure 1-32).

b. Hiding is another method of camouflage, in looking for a hiding place, remember to study shadows. There are two kinds of shadows, concealing and revealing. Revealing shadows may give the location of equipment not otherwise detected, but, on the other hand, concealing shadows may hide the equipment completely. An example of this would be to park vehicles close to buildings or the shadowed side (Figures 1-27 and 1-33).

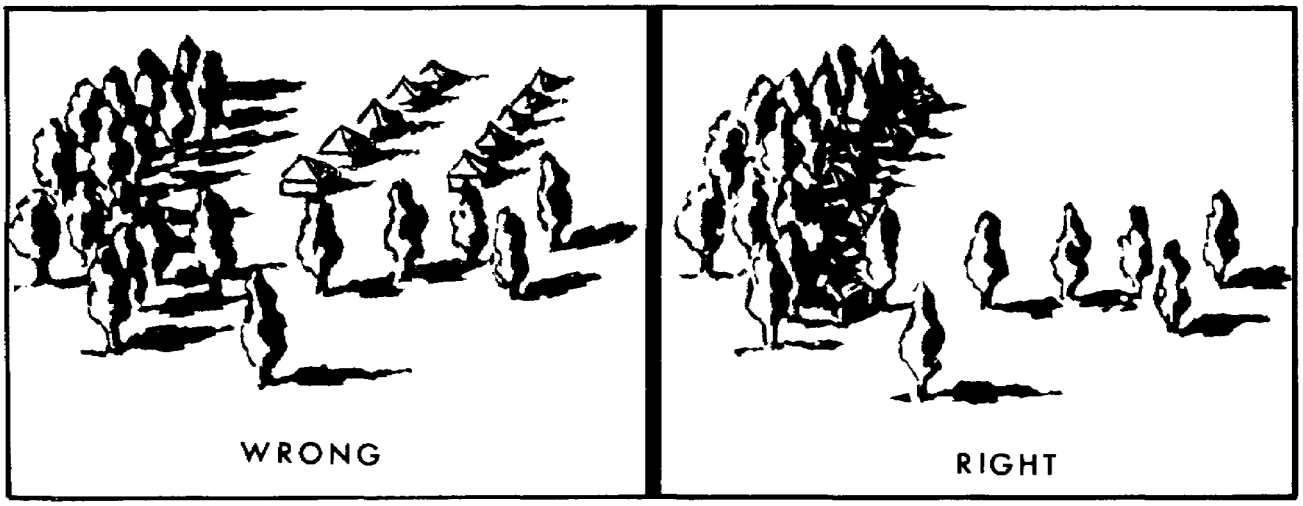


Figure 1-26. Example of Proper Siting and Dispersal of Tents in Sparsely Vegetated (Barren) Terrain).

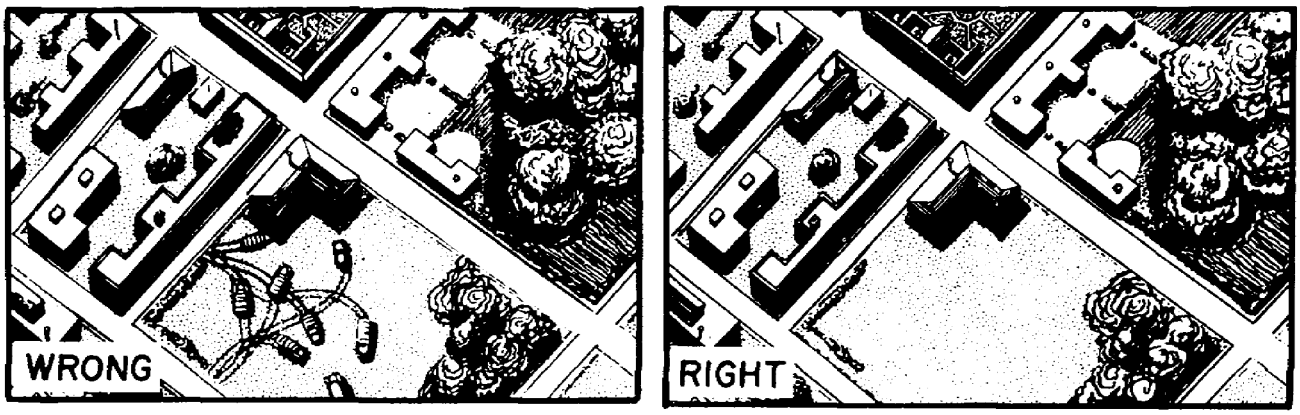


Figure 1-27. Example of Military Objects Parallel to and Close to Pattern Lines in Regular Urban Terrain.

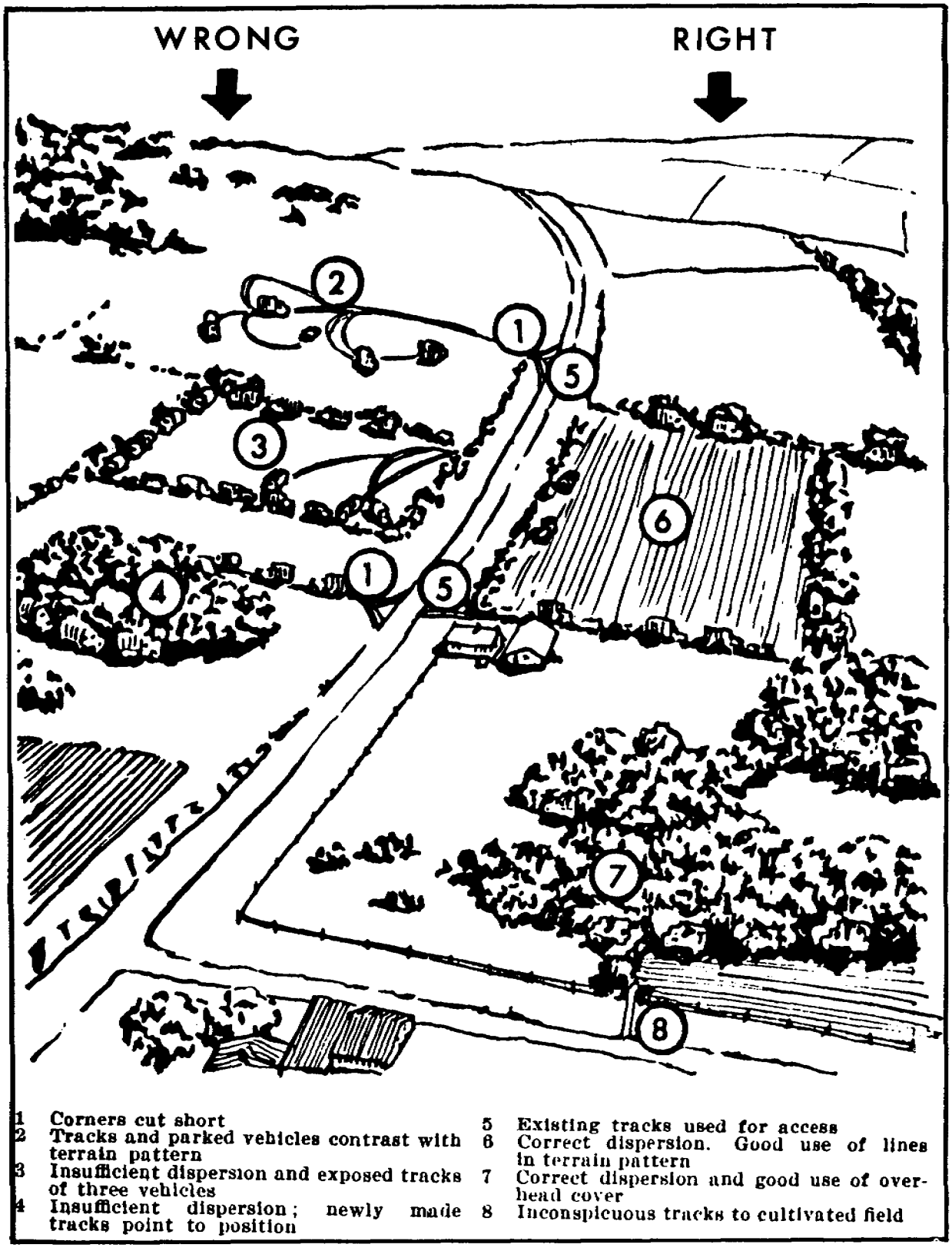


Figure 1-28. Use of Terrain and Proper Dispersion.

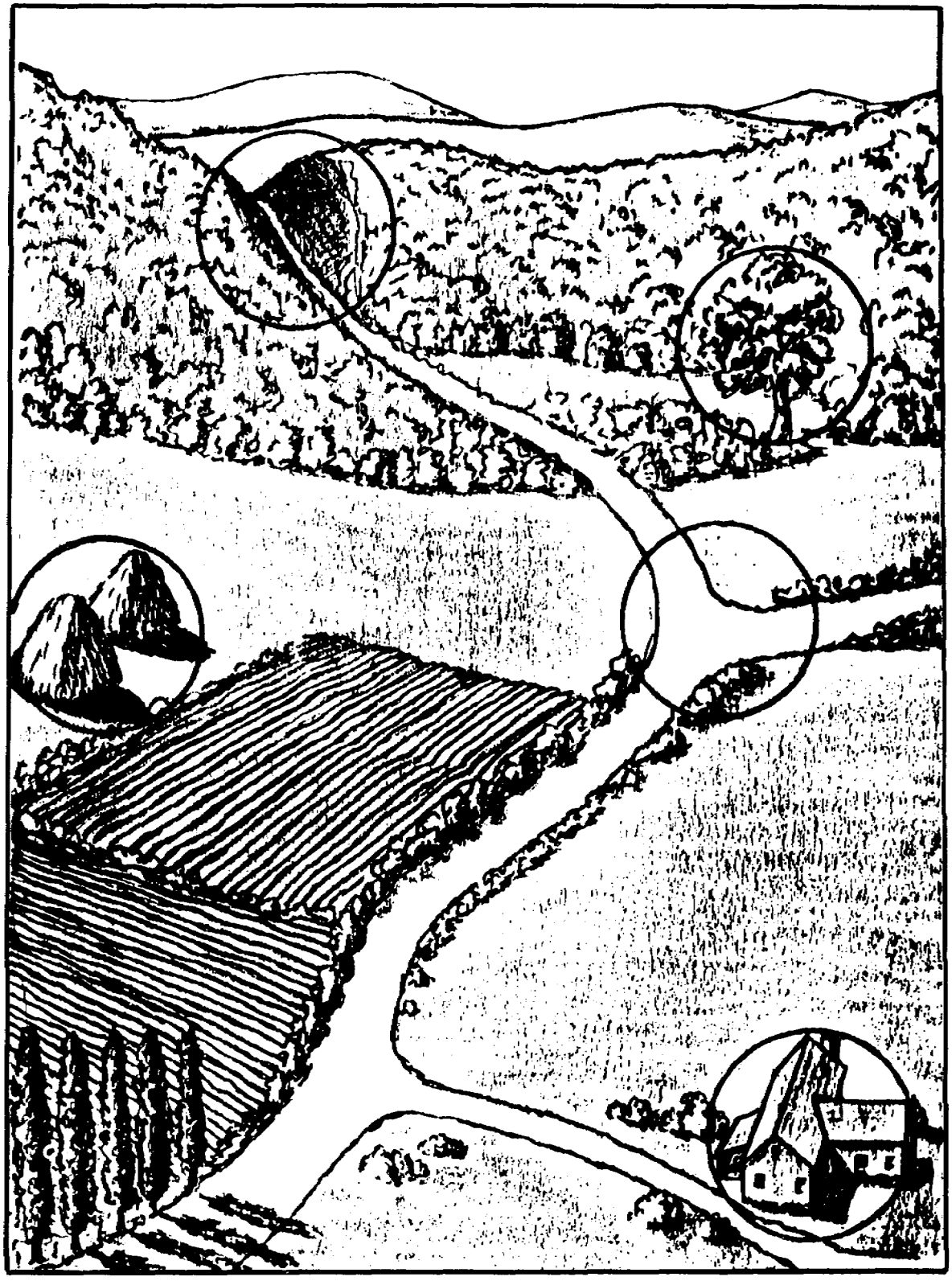


Figure 1-29. Landmarks Attract Attention.

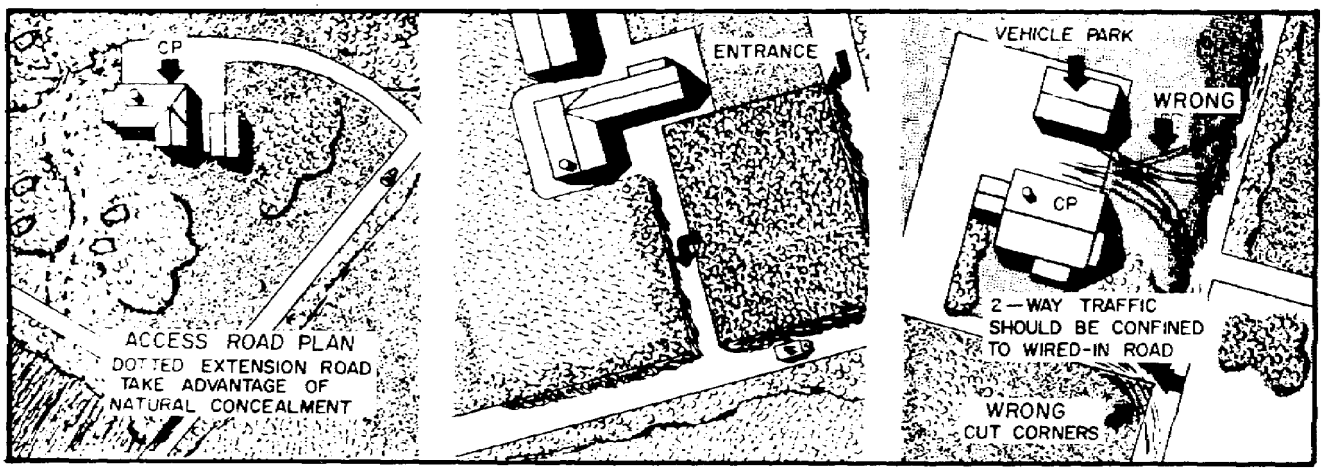


Figure 1-30. Camouflaged CP.

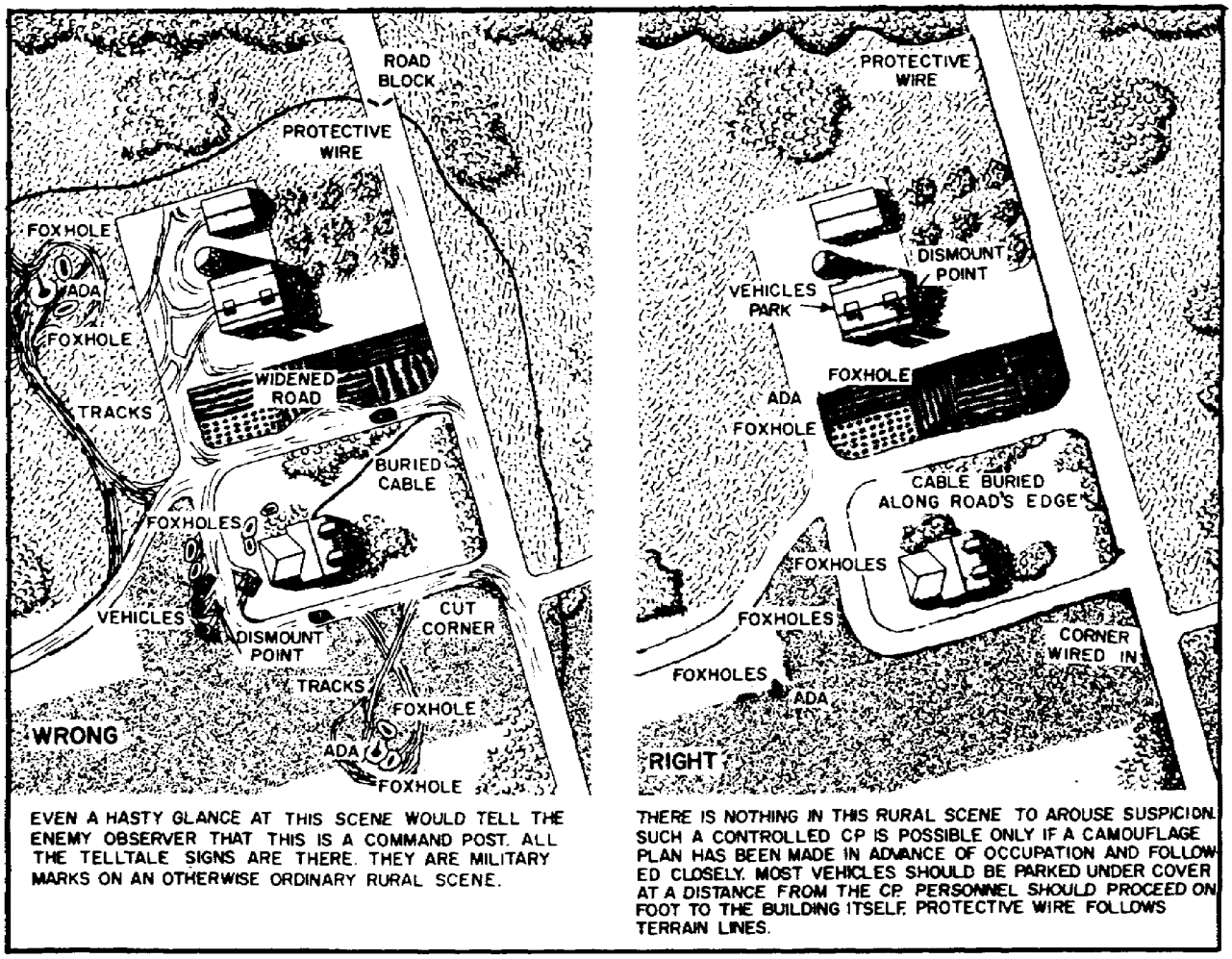


Figure 1-31. Camouflaged CP Layout.

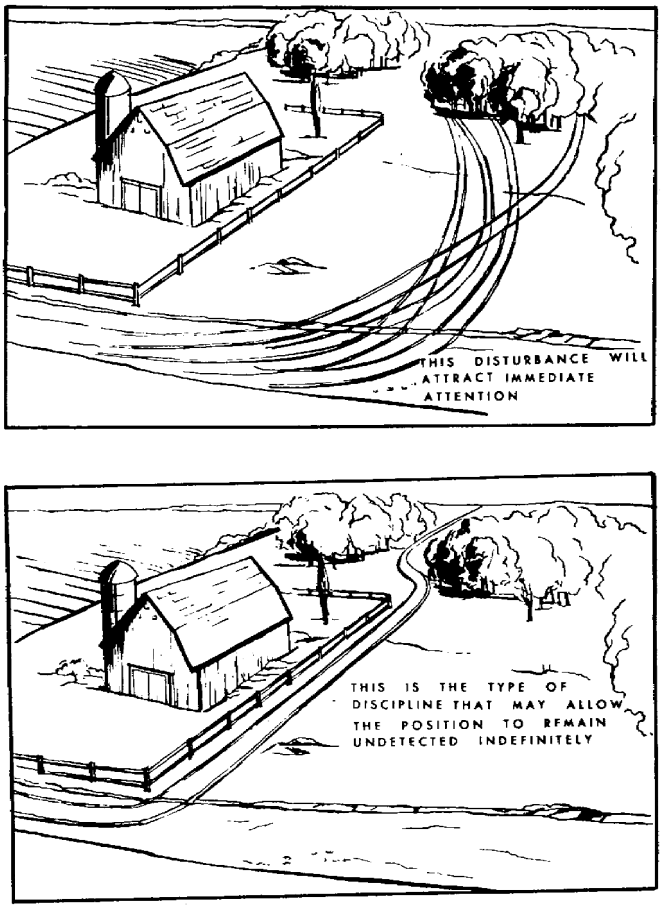


Figure 1-32. Track Activity.

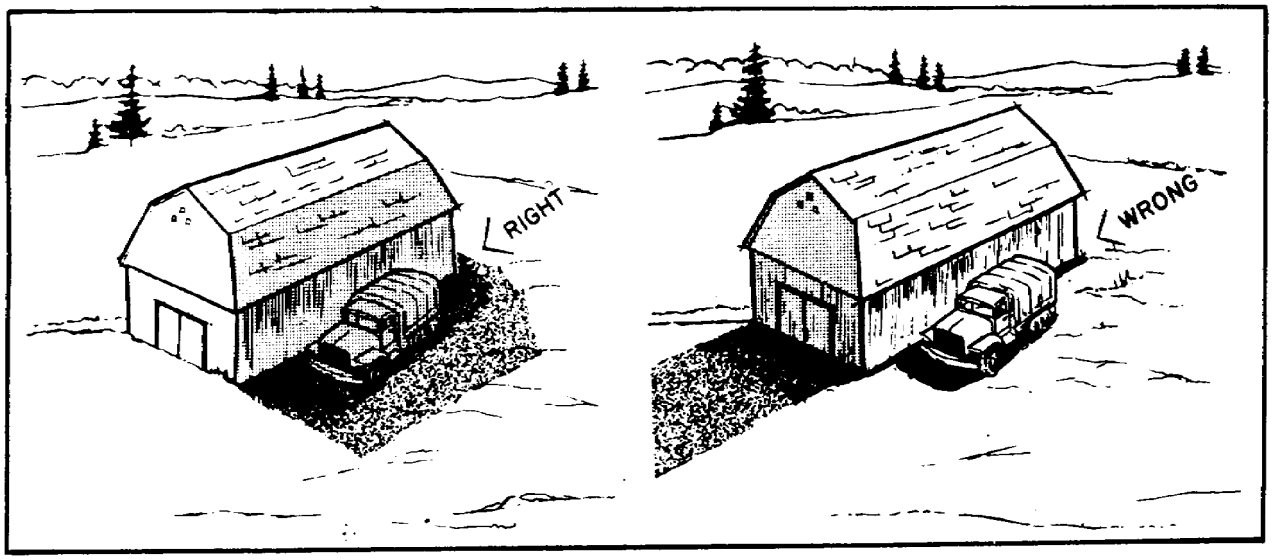


Figure 1-33. Parking in Shadows.

c. Disguising involves the simulation of an object or activity of military significance. Clever disguises will mislead the enemy as to identity, strength, and intention, and will draw fire from the real target.

5. There are various concealment methods IAs can encounter.

a. Roads, open terrain and fields permit objects to be sighted more easily; therefore, IAs often concentrate their attention upon these areas (Figure 1-34). In this situation it is almost impossible to conceal the tanks. Note the long shadows cast by the trees and heavy tracks in open field.

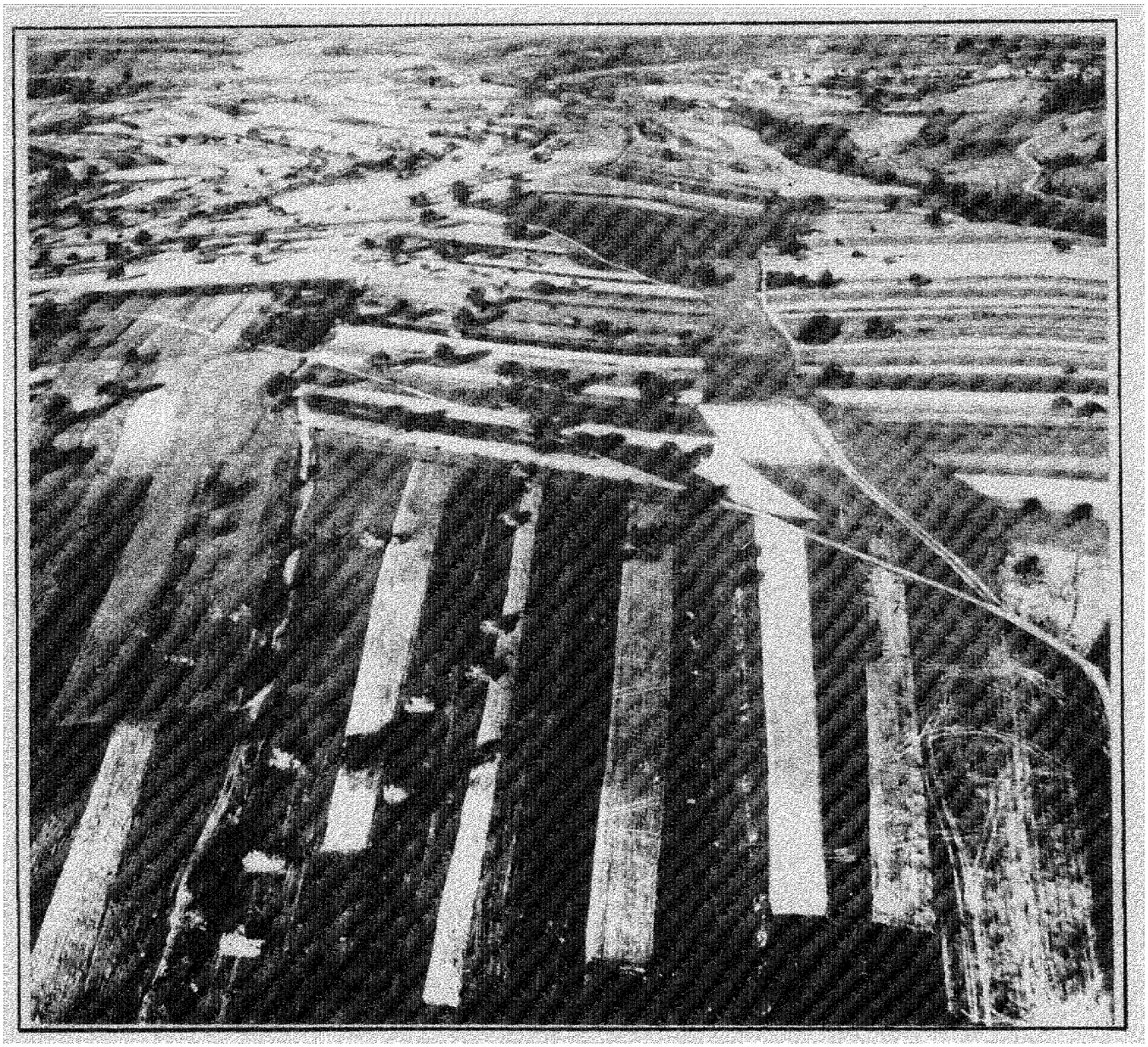


Figure 1-34. An Armored Unit in Open Field.

b. Areas of natural cover and concealment can make identification of equipment a difficult task; however, you should sight down through tree stands and adjacent low-lying shrubs and bushes to search for and identify objects and equipment. A close study of image B, Figure 1-35, reveals no signs of activity except tracks in fields next to the wooded area. You have to search hard to find the bridging equipment described in sketch A.

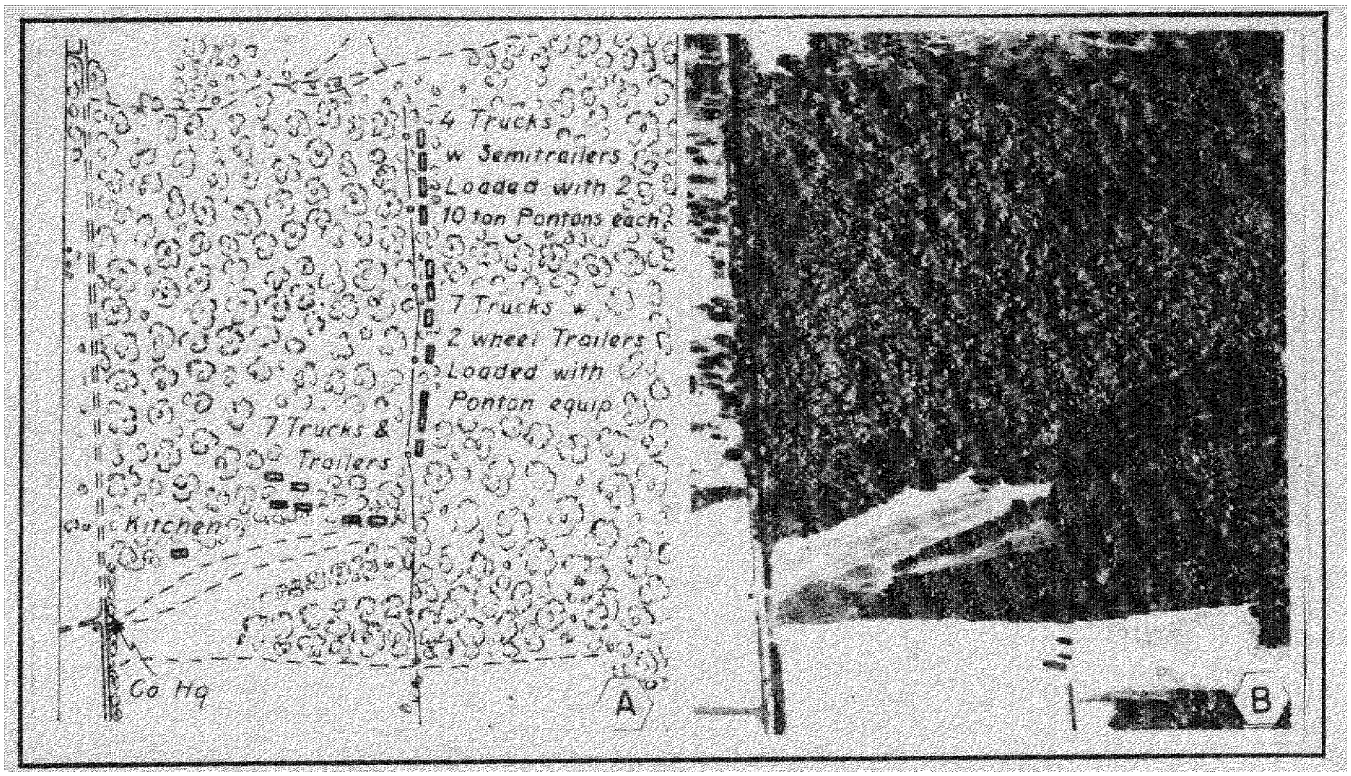


Figure 1-35. Engineer Bridging Company in Bivouac.

c. You can encounter fairly good use of existing cover; however, few poorly camouflaged vehicles can reveal an entire unit. A study of Figure 1-36 reveals two trucks with trailers loaded with lumber (Annotation 1), two 2-1/2-ton trucks with 1/2-ton trailers (Annotation 2), an earth auger (Annotation 3), road grader (Annotation 4), 2-1/2-ton trucks (Annotation 5), common vehicle (Annotation 6) 2-1/2-ton truck with 1/2-ton trailer (Annotation 7), and 1/2-ton pickup truck (Annotation 8).

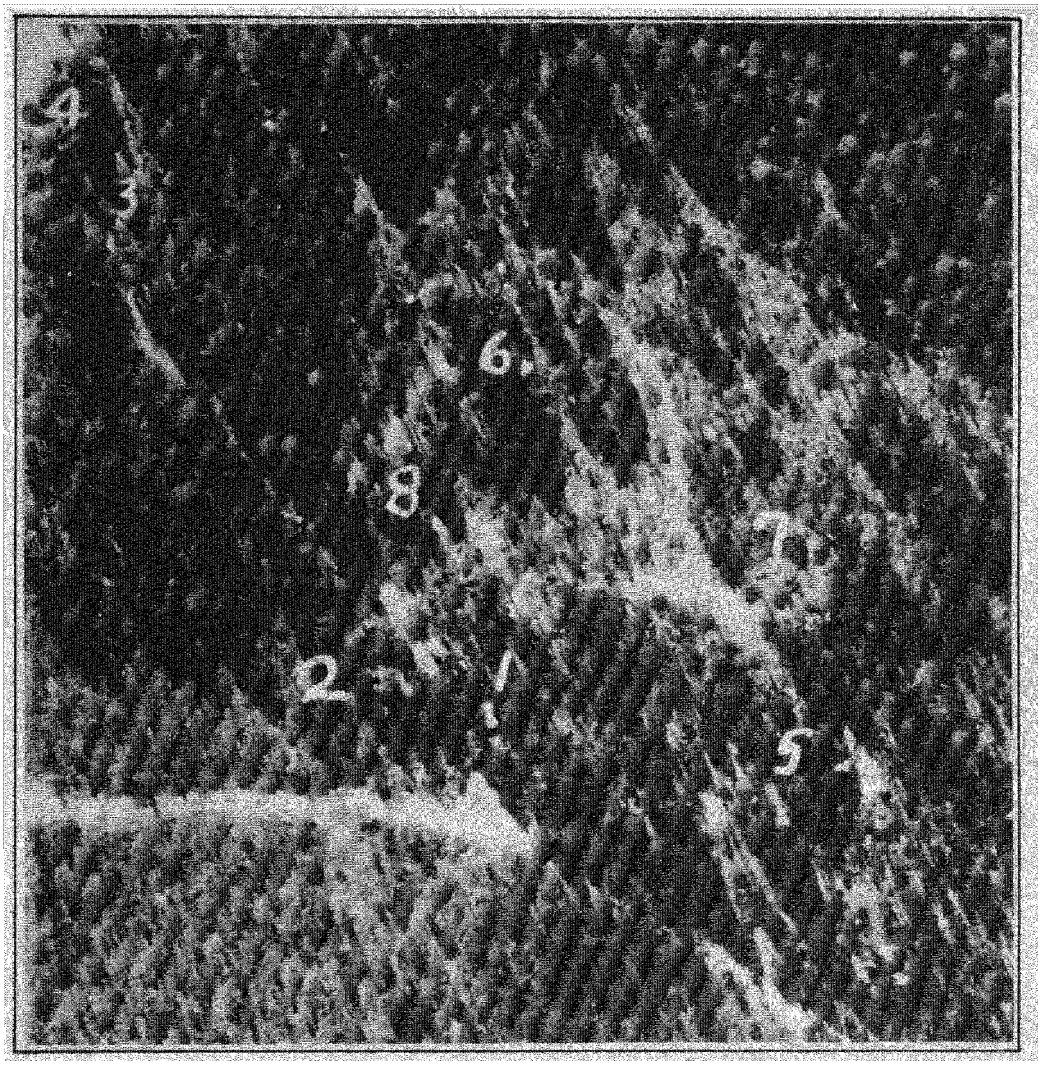


Figure 1-36. Construction Engineer Unit in Bivouac Area.

PART E: DUMMY POSITIONS, EQUIPMENT, AND DECOYS

1. Camouflage is a technique of hiding from view which is physically present; deception is the technique of making what is physically present appear to be something different. This can be achieved by the use of dummy or decoy equipment.

2. Be suspicious of everything on the image that does not have an explanation. The lack of activity could indicate a dummy position; for example, tracked or wheeled vehicles that give no apparent indication of how they got where they are. If they are in the middle of a field with no tracks leading up to them, they are probably decoys. However, there may be tracks surrounding the decoys, which could be caused by vehicles used in setting up the decoys. If an IA analyzing a series of missile sites noticed one particular site has no missile transporter vehicles and a lack of track activity around it, the IA should analyze this particular site as a dummy installation.

3. Materials. Field construction can be accomplished from any local or salvage material that is available and suitable. This may include salvage tenting, empty crates, boxes, stacked supplies, and parts of wrecked items of equipment that may be partially camouflaged to resemble a camouflaged piece of real equipment (Figure 1-37).

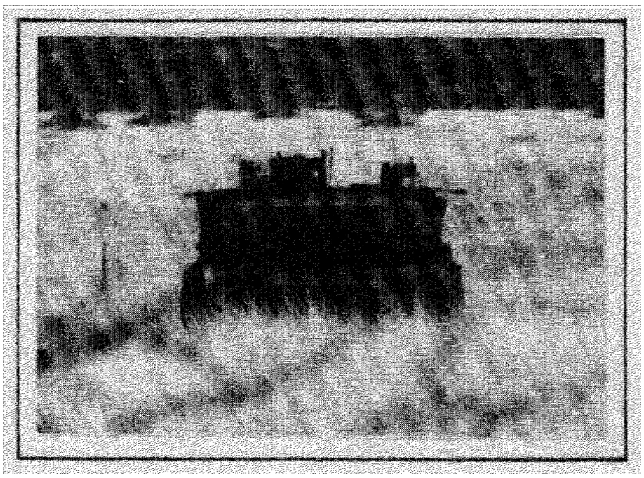


Figure 1-37. Dummy Tank.

4. Dummies are imitations of actual objects or installations usually composed of dummy weapons, emplacements, vehicles, and equipment. They are designed to simulate real activity and to draw fire away from camouflaged or concealed activities.

5. Decoys are located in logical military positions but far enough from actual targets to prevent fire directed against them from hitting the real installations.

6. Dummies are decoys representing bridges, supply dumps, railheads, airfields, industrial plants, POL tank farms, etc., may be located several miles from the real targets. Those representing tanks, artillery pieces, AAA batteries, self-propelled guns may be located several hundred meters from actual positions. They may be constructed from brush, trees, earth, or any available materials. Normally, dummy setups include logs sticking out to simulate artillery pieces, aircraft images painted on the ground, obsolete or unserviceable equipment and any other device the enemy may be dreaming up. Dummies and decoys are usually constructed so as to be easily detected; e.g., there is a lack of track activity, a distinct pattern of weapon emplacements without the usual auxiliary buildings, the absence of missile transporter vehicles at a missile site, the absence of foxholes, trenches, AAA positions, barbed wire and other defenses normally found in a typical enemy activity pattern. Further, sizes of objects or equipment differ to the actual sizes. Additionally, AAA positions may be set up in the open near natural cover which would normally be used for concealment. These may be decoys laid out for detection.

7. Simulation. Equipment in positions also may be simulated by digging shallow outlines in the ground or by painting either on cloth or on the ground. The latter method is effective only as a temporary measure since the lack of height and perceptive will be immediately apparent in stereo-images or low oblique images.

8. Such deductive processes are made routinely by IAs. Consistent accuracy in analyzing requires a receptive mind, competency in the IAs area of responsibility, and close attention to image details.

9. Finally, the IA should become very familiar with regional culture in the area of responsibility, which should preclude any misidentifications, such as gravesites for weapons positions (Figure 1-38).

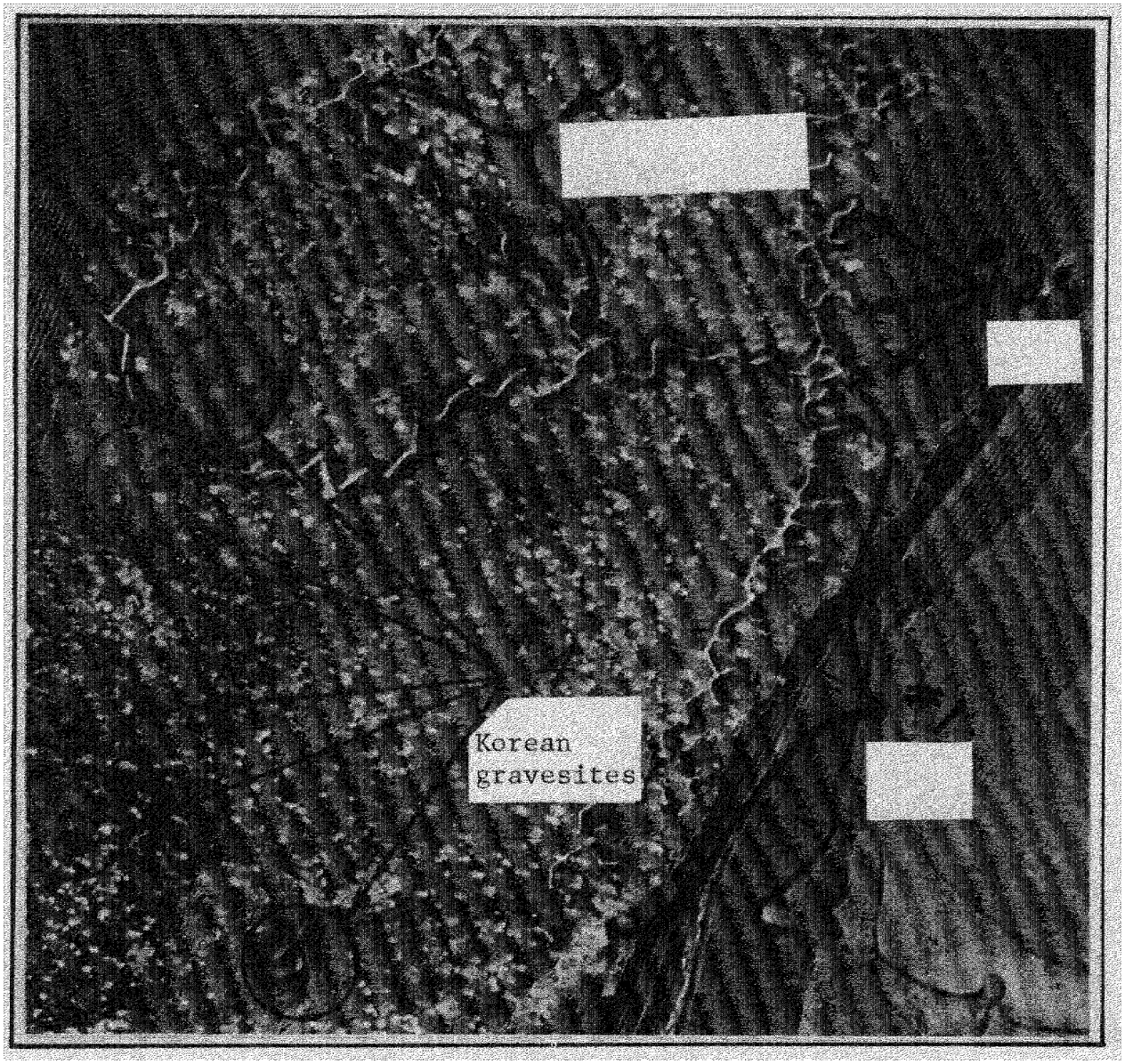


Figure 1-38. Korean Gravesite near Trenches.

LESSON ONE

PRACTICE EXERCISE

The following items will test your grasp of the material covered in this lesson. There is only one correct answer to each item. When you have completed the exercise, check your answers with the answer key that follows. If you answer any item incorrectly, study again that part of the lesson which contains the portion involved.

1. What is successive imagery of the same area detecting changes which have taken place?

   A. Oblique aerial photograph.

   B. Infrared.

   C. Vertical aerial photography.

   D. Comparative cover.

2. Which camouflage method is used in parking vehicles along a tree line?

   A. Hiding.

   B. Blending.

   C. Disguising.

   D. Avoiding.

3. Which of the following is considered indirect observation?

   A. Ground observation.

   B. Visual observation.

   C. Air observation.

   D. Imagery analysis.

4. Which of the following are the most common signs of military activity?

   A. Concealed shadows.

   B. Tracks, spoil, and debris.

   C. Dispersal for effective operation.

   D. Hiding.

5. What type of terrain appears in a natural, irregular pattern?

   A. City.

   B. Rural.

   C. Urban.

   D. Wooded.

6. Which of the five Ss allow the identification of electronic installations by revealing their characteristic antenna construction?

   A. Surroundings.

   B. Size.

   C. Shape.

   D. Shade.

   E. Shadow.

7. Which camouflage identification factor should you use in identifying a train on a rail road track?

   A. Relative positions.

   B. Nature of the enemy.

   C. Smoke.

   D. Light.

8. Which film was designed to detect green colored artificial camouflage by recording it as blue to blue-green in contrast to a red recording of natural vegetation?

   A. Color.

   B. Camouflage Detection.

   C. IR.

   D. Panchromatic.

LESSON ONE

PRACTICE EXERCISE

ANSWER KEY AND FEEDBACK

ITEM	CORRECT ANSWER AND FEEDBACK
1.	D. Comparative cover consists of successive imagery of the same area taken at different times (page 3, para 4a(2)).
2.	B. Blending is used when parking vehicles along a tree line (page 27, para 4a).
3.	D. In indirect observation the IA analyzes imagery (page 3, para 4).
4.	B. The most common signs of military activity are tracks, spoils, and debris (page 27. NOTE).
5.	D. Wooded terrain is a natural, irregular work of nature unlike the almost geometric pattern of manmade rural and urban terrain (page 27, para 1b(3)).
6.	E. Shadows allow the identification of electronic Installations by revealing their characteristic antenna construction (page 18, para 4).
7.	A. You should use the relative position identification factor in identifying a train on a railroad track (page 26, para 9).
8.	B. Camouflage detection film was designed to detect green-colored artificial camouflage by recording it as blue to blue-green in contrast to a red recording of natural vegetation (page 17, para 5d).

LESSON TWO

ANALYZE DEFENSIVE MEASURES ON AERIAL IMAGERY

MOS Manual Tasks: 301-338-1800
301-338-1809
301-338-3701

OVERVIEW

TASK DESCRIPTION:

In this lesson you will learn how to analyze defensive measures on aerial imagery.

LEARNING OBJECTIVE:

ACTIONS: Describe the information and procedures in analyzing defensive measures on aerial imagery.

CONDITIONS: You will be given extracts from STP 34-96D1-SM, STP 34-96D24-SM-TG, and TC 34-55.

STANDARDS: Analyze defensive measures IAW STP 34-96D1-SM, STP 34-96D24-SM-TG, and TC 34-55.

REFERENCE: The material contained in this lesson was derived from the following publications:

STP 34-96D1-SM.
STP 34-96D24-SM-TG.
TC 34-55.

INTRODUCTION

One of the IAs important duties is analyzing enemy defensive measures on aerial imagery. By knowing the general appearance of the enemy's various types of defenses and by applying this Knowledge to the Inspection of photos, the IA contributes valuable intelligence information. Defensive measures include defense systems, field fortifications, field works, obstacles, barriers, and other defenses.

PART A: GENERAL INDICATORS

1. General indicators of defensive measures are economics, spoil, track activity, camouflage, and relationship to the FEBA.

2. Economics. There is a disregard for the economical use of the land. Armored and wheeled vehicles will drive through crops and cultivated fields. Trench systems, antitank ditches, and gun positions will be found any place the military situation dictates.

3. Spoil is the excess earth piled up around a dug out emplacement/revetment. The earthen spoil around foxholes, trenches, and emplacements will not conform to the pattern of civilian construction or activity. The tone and texture of freshly turned dirt on aerial imagery are readily detectable.

4. Track Activity. The most important and probably the best indications of defensive measures are the telltale marks left by the military when on the move. Civilians stay on existing routes while military vehicles, equipment, and personnel move to points dictated by the situation. Most tracks left behind are difficult if not Impossible to hide.

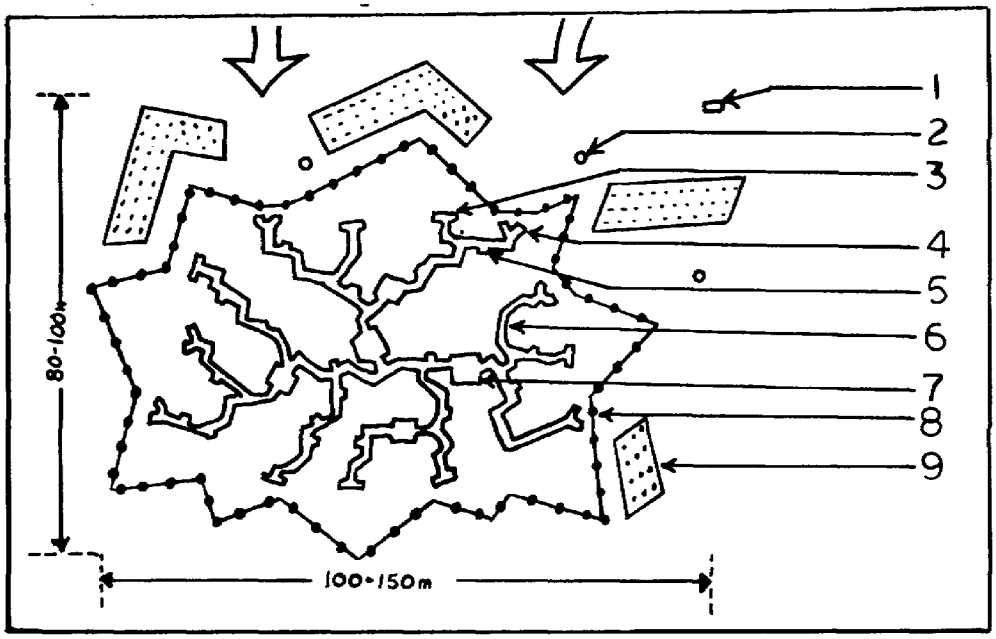
5. Camouflage advertises the military attempt to hide or deceive. Unless camouflage discipline is at its maximum, it only points the finger to defensive measures In the field. Readily detected, poor camouflage only invites the IA to make a closer examination.

6. Relationship to the FEBA. Military doctrine is universal in that one expects to find fighting positions (foxholes), automatic weapon emplacements, trenches and bunkers on the front lines. An IA would not look for artillery emplacements on the front lines. A knowledge and understanding of the tactics and a capabilities of an enemy will aid IAs in their search. Economics, spoil, track activity, and especially camouflage are general indicators of defensive measures in conventional warfare. They are also employed in unconventional warfare. However, when considering relationship to the FEBA, the IA must think of relationship of activity to the surrounding local area. Since there is no FEBA in an unconventional war, the IA must be on the lookout for indicators of defensive measures anywhere.

PART B: ANALYZE FIELD FORTIFICATIONS AND STATIC DEFENSES

1. Field fortifications are fortified areas containing fortified works of some nature which are always constructed when military forces nave a defensive role. Fortified works may range in complexity from simple positions hastily prepared with locally available material to large permanent-type works in organized and integrated belts or zones.

2. Static defenses are permanent fortifications which can include concrete pillboxes or casements with thick walls, fixed turrets, Intricate underground passages, and elaborate shelters for the protection of guns and personnel. Strongpoints may include bunkers, dugouts, and trenches with firing bays; they are surrounded by minefields and barbed wire. Again we must emphasize the factors of time, local considerations, and type of terrain, which influence the amount of permanent construction and degree of sophistication (Figure 2-1).



Legend:

Annotation	Defensive Measure
1	Fighting position
2	Antitank pit
3	Firing bay
4	Machine-gun emplacement
5	Ammunition bay
6	Communication trench
7	Dugout
8	Wire entanglement
9	Minefield

Figure 2-1. Strongpoint Layout.

3. Pillboxes are covered structures which normally house machine-guns but may contain antitank weapons, automatic rifles, or riflemen. Usually permanent in nature, they can be distinguished from bunkers by their concrete and/or steel construction. Bunkers are usually built of logs, sandbags, earth, and so on. However, concrete pillboxes can be covered with earth and vegetation and take on the appearance of bunkers. Pillboxes are sited to cover defense lines, roads, bridges, obstacles, and material on these structures will hinder the IA engaged in their identification (Figure 2-2).

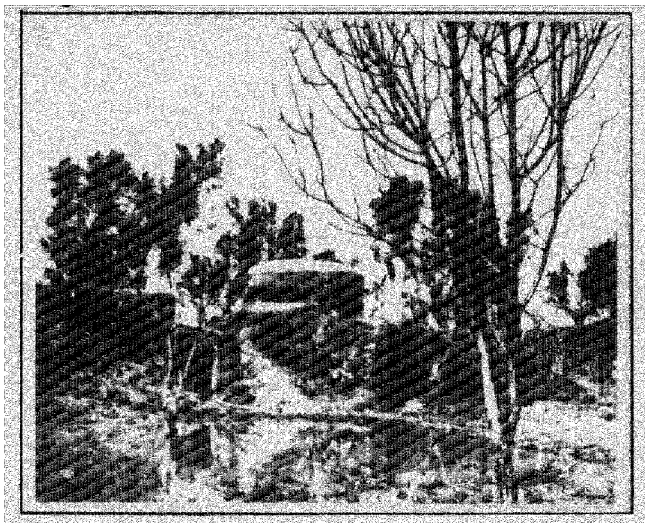


Figure 2-2. Pillbox.

4. Casemates are similar to pillboxes, except they normally house artillery and are therefore larger in size. These are usually self-contained units providing quarters for the gun crew and storage facilities for ammunition and supplies. Because of their tremendous size, they can be identified even though camouflaged. Comparative cover taken during construction is extremely helpful in determining the size of weapons; otherwise, size of weapons in individual casemates are difficult to determine (Figure 2-3).

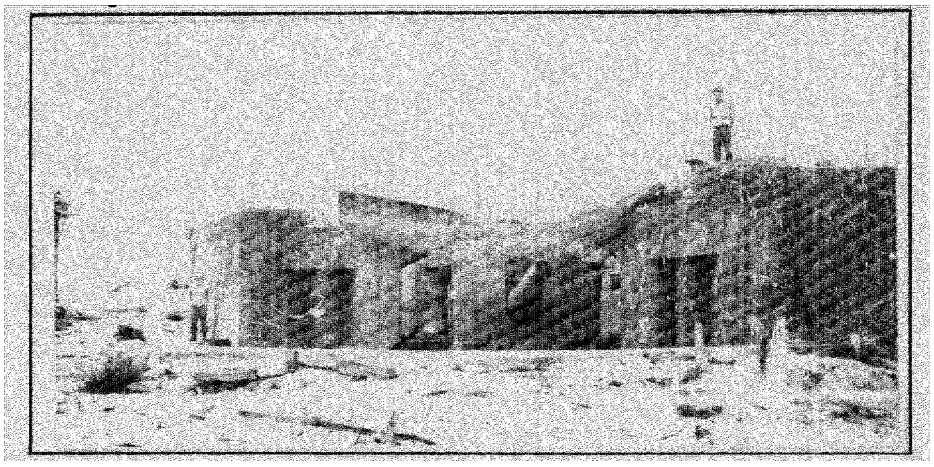
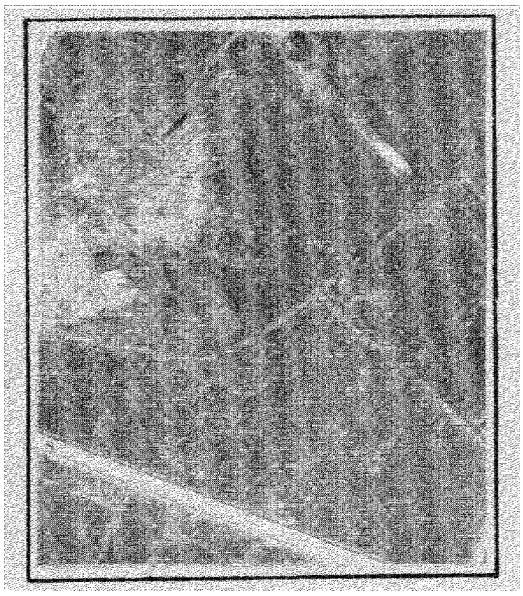


Figure 2-3. Casemate.

PART C: ANALYZE FIELDWORKS

1. Fieldworks are defensive positions of a temporary or semi-permanent nature. They are usually found In forward areas where the enemy has had time to dig in. Even in highly fluid situations fieldworks may be found. Fieldworks include fighting positions (foxholes), trenches, breastworks, dugouts, bunkers, caves, weapon pits, and weapon emplacements.

2. Fighting positions are the individual rifleman's basic defensive position. They can afford a maximum of protection against enemy fire of all types, except direct hits, and the crushing action of tanks. Fighting positions can be improved by adding expedient types of overhead cover. The size, shape, and method of constructing a fighting position varies to fit existing tactical and terrain conditions. Fighting positions are usually dug with the long side parallel to the front, but are distributed around weapons emplacements to provide all around defense (Figure 2-4). Fighting positions are sited primarily for clear fields of fire, Concealment is a secondary consideration.



2-4. Fighting Positions.

3. Trenches. The standard trench offers much less protection, is harder to conceal, and requires more time and labor to construct than fighting positions. However, it improves communication, control, supply, and evacuation. The use of trenches is a command decision. Trenches are the most common type of fieldwork. The dark shade of the shadow in the trench itself, and, when newly dug, the light-shaded spoil forming a parapet on either or both sides make recognition easy. Trenches may be categorized as follows (Figure 2-5):

a. Firing trenches contain firing bays for riflemen and light automatic weapons in engaging the enemy.

b. Communication trenches usually lead away from the fire trenches and connect the different parts of a defensive system.

c. Shelter trenches may only be slits, vehicle revements, or air raid shelters.

d. Camouflage or dummy trenches may also be encountered; these are very shallow and lack depth and shadow.

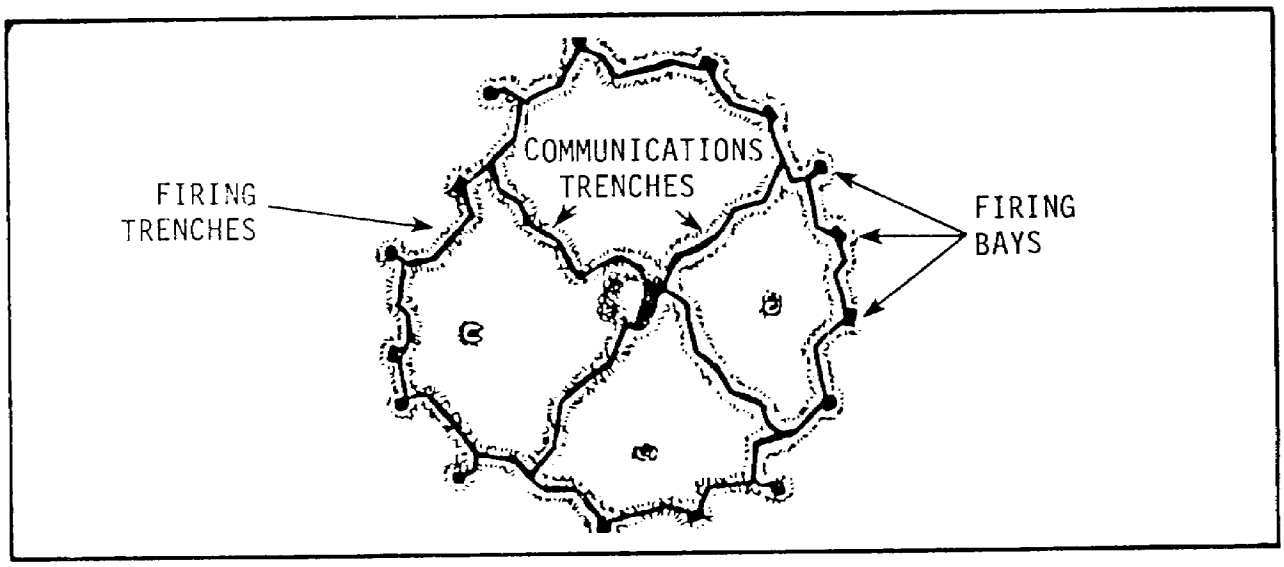


Figure 2-5. Typical Trench System.

4. Breastworks are found in rocky terrain or low country susceptible to flooding. Instead of digging, troops build up the ground to form a large emplacement.

5. Dugouts may De found either leading from trenches or isolated close to a trench system. Spoil may reveal them. When carefully concealed in hedgerows or close country, however, comparative cover is necessary for identification.

6. Bunkers are overhead enclosed, dug-in foxholes or a dug-in, or enclosed firing trenches (Figure 2-6). Caves are the most common types of bunkers in use.

7. Caves are very effective in jungle and mountainous terrain and in rugged hill country. They afford maximum cover and concealment, are the easiest of all Individual positions to camouflage, and because of their elevated position over surrounding low ground, make good observation posts and provide excellent fields of fire. These positions are dug laterally into the slopes of hills (Figure 2-7), ridges, snowdrifts, and snowbanks.

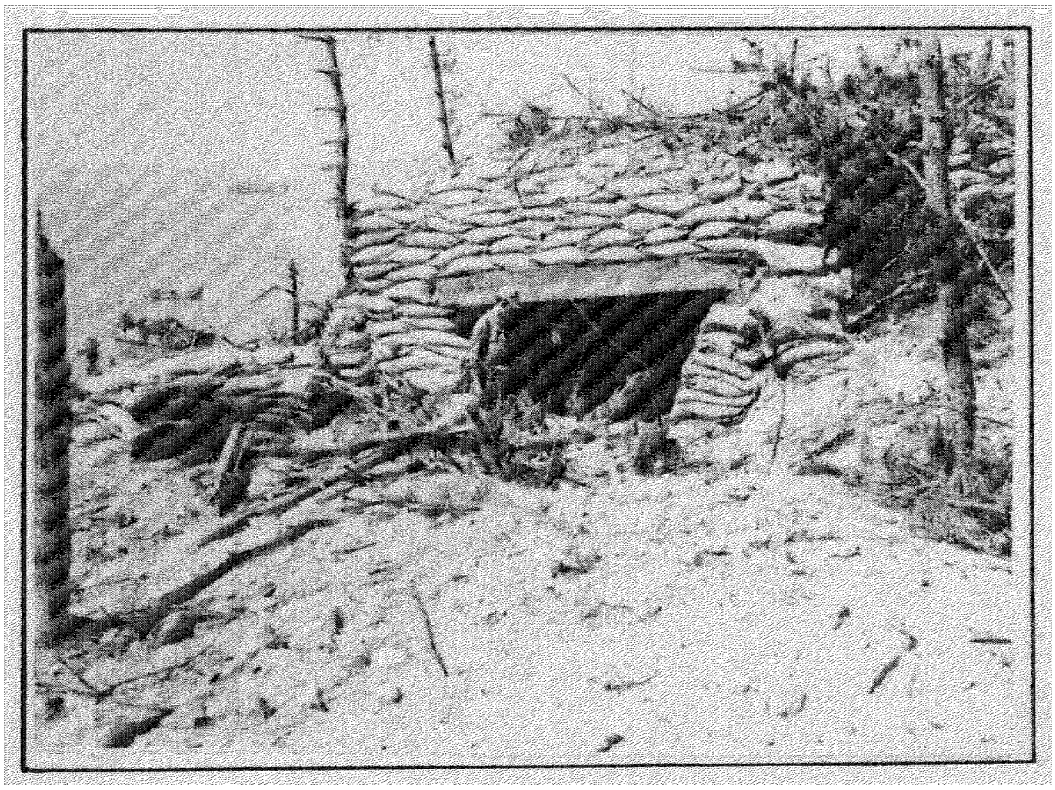


Figure 2-6. Typical Bunker.

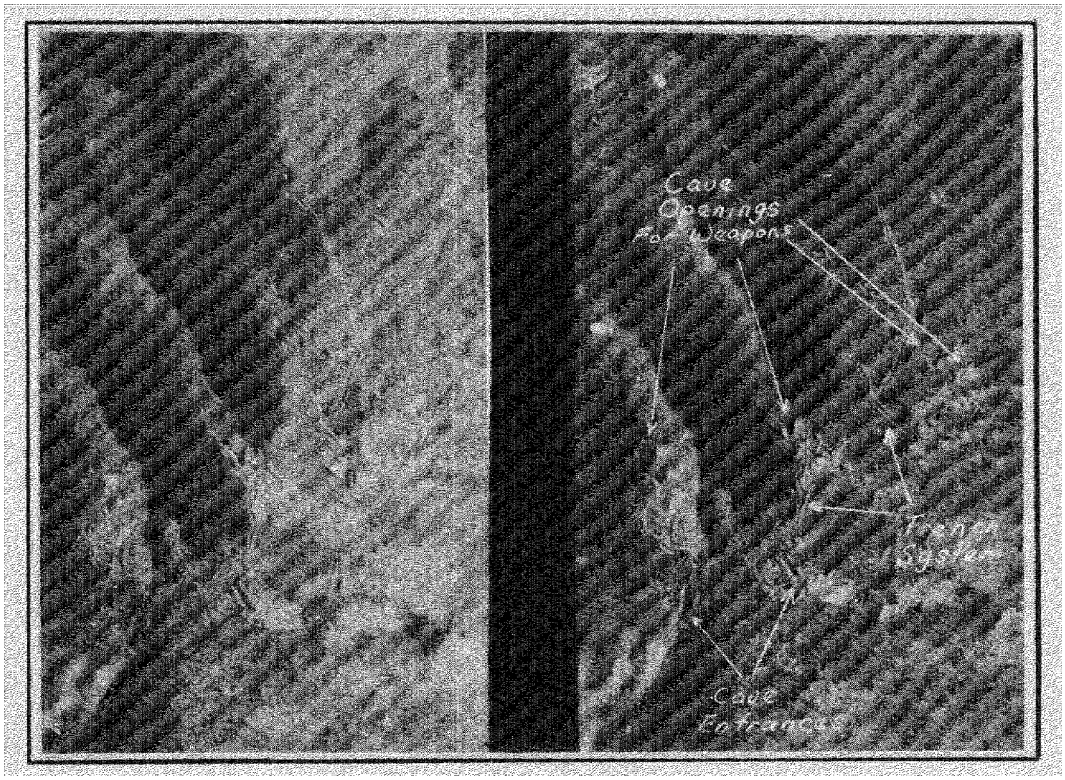


Figure 2-7. Caves and Trench System.

8. Weapon pits are small firing positions which may contain a rifleman, a light or heavy mortar, a light or heavy machine-gun, or a flamethrower. It is rarely possible to say what type of weapon occupies the weapon pit. The tactical positioning may give some clue. Mortars are often behind cover because they are capable of high-trajectory indirect fire; therefore, mortars do not need a clear field of fire. Machine-guns, which are flat-trajectory, direct fire weapons, usually require a clear field of fire (Figure 2-8 and 2-9).

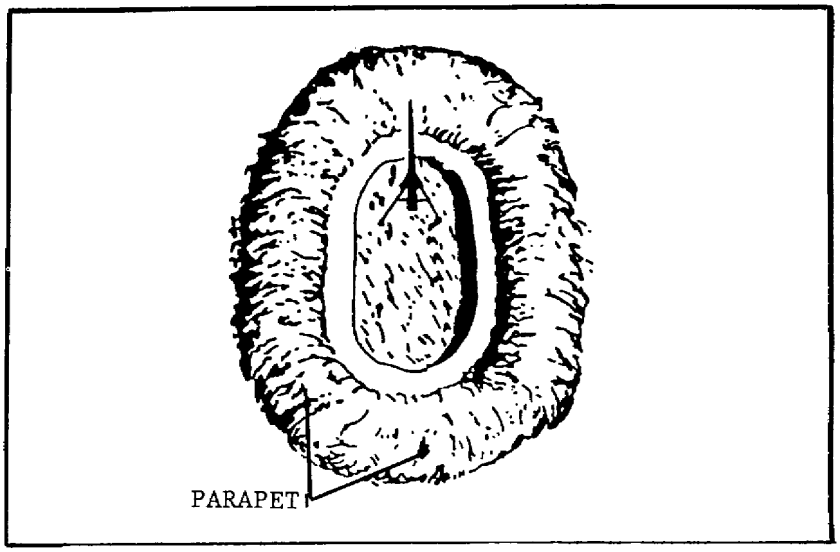


Figure 2-8. Typical Machine-Gun Position.

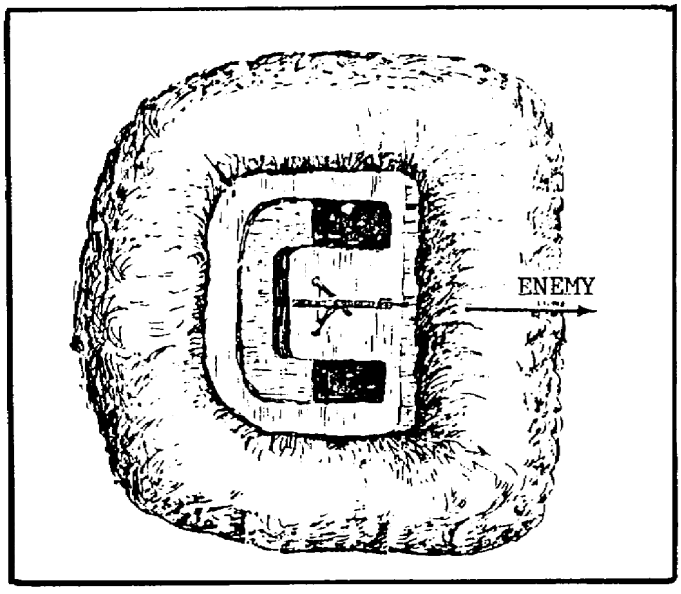


Figure 2-9. Typical Horseshoe-type Mortar Position.

9. Weapons emplacements are usually constructed for antitank, artillery, or antiaircraft (AAA) guns. The siting assists in identification. Antitank guns are direct fire weapons and usually engage targets from the flank or rear.

a. Rectangular vehicle revetments often protect self-propelled (SP) guns and tanks when firing (Figures 2-10 and 2-11). SP guns and tanks can be dug in deep enough to afford proper protection for the vehicle's hull. Maximum spoil is placed on the front of the emplacements with some on the sides. The rear is left open for entry or exit of the vehicle. This presents a smaller target to the enemy.

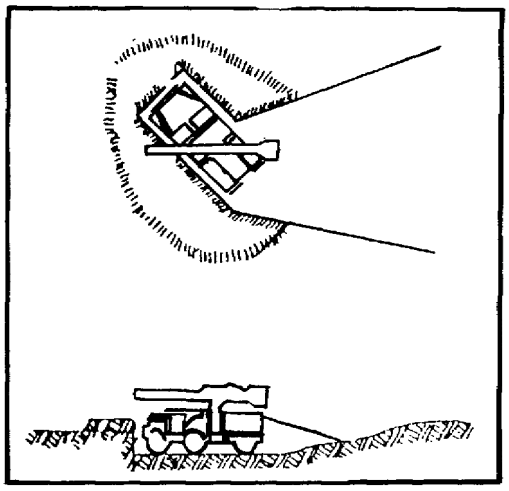


Figure 2-10. Typical SP Gun Revetment.

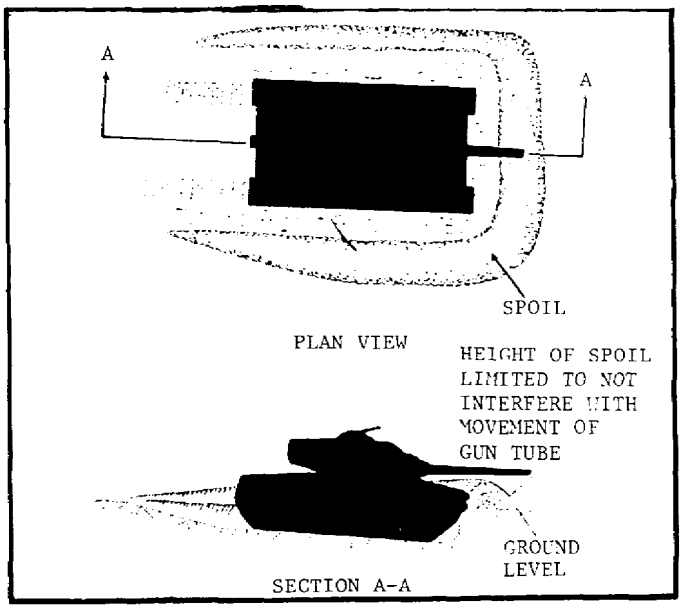


Figure 2-11. Rectangular Tank Revetment.

b. Locating artillery and missile launch sites on aerial imagery is an important and, at times, difficult task for an IA. It requires full use of the five basic factors of identification and the use of information from other intelligence sources and agencies, such as technical intelligence, order of battle, and interrogation personnel. Antiaircraft artillery (AAA) is easier to locate than field artillery because it is usually found in the open. It is difficult to camouflage and bears little or no resemblance or relationship to natural or civilian surroundings. With the extended use of surface-to-air missiles and rockets, it is expected fewer of these installations will be seen.

c. Artillery and AAA guns can also be dug in to minimize damage from aircraft or incoming artillery. The spoil is usually put around the edges to increase the height of the protective wall. This spoil will show up on aerial imagery (Figure 2-12). Figures 2-13 through 2-17 are sketches and images of artillery and AAA emplacements you may encounter during analysis.

NOTE: DO NOT confuse artillery positions with large bomb craters which can best be identified by their depth.

d. Aircraft revetments are similar to these except, instead of being dug-in, walls are erected up around them. Sometimes overhead cover is also used. Again, the idea is to minimize the damage caused during an attack or because of sabotage. Once artillery is located on aerial imagery, an attempt is made to classify it by examining the weapon site and associated equipment and determining the ground dimensions of the emplacements.

NOTE: The term artillery is all encompassing and includes the weapon, weapon site, ammunition storage, command posts, and fire direction or control center.

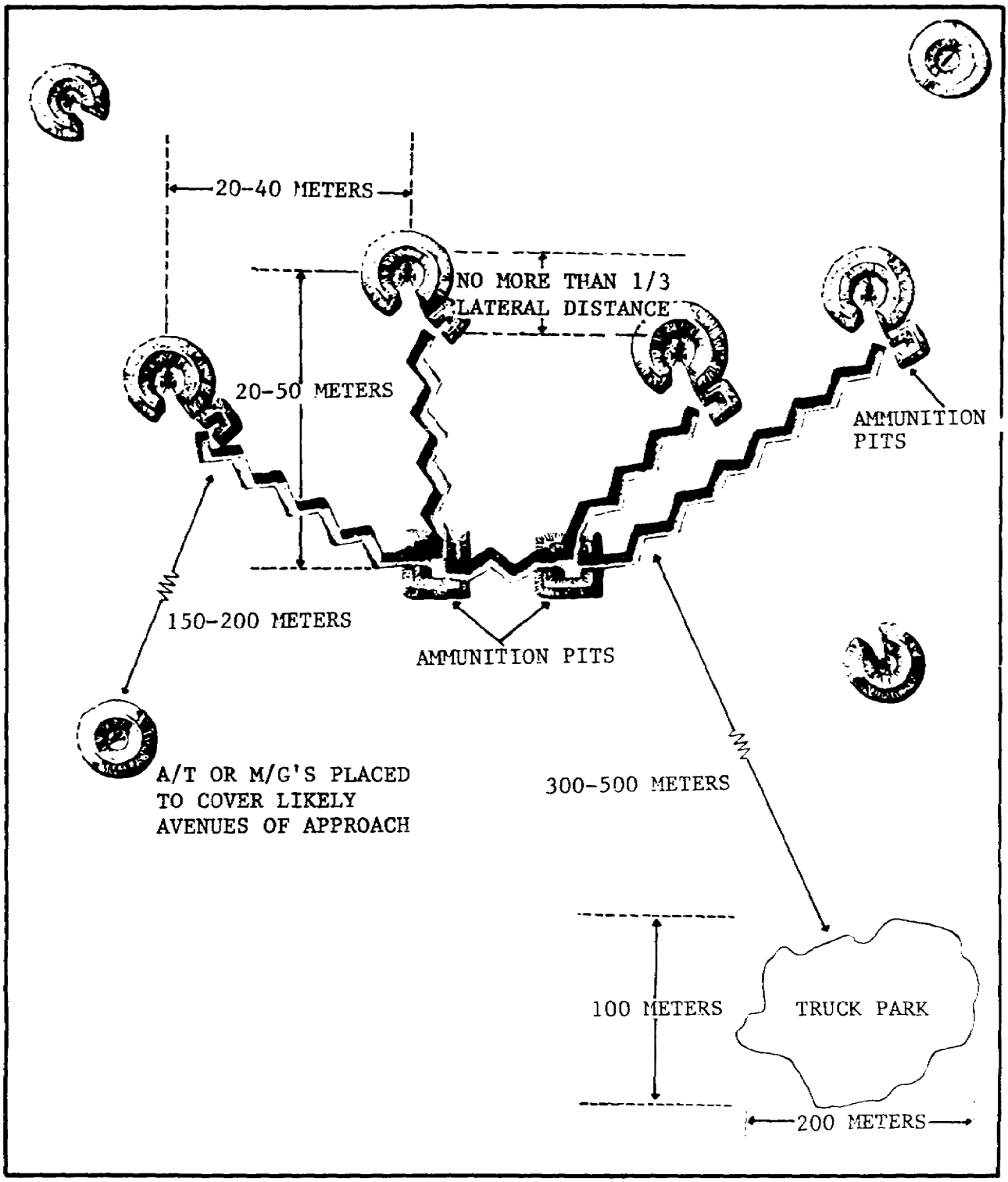


Figure 2-12. Field Artillery Battery Layout.

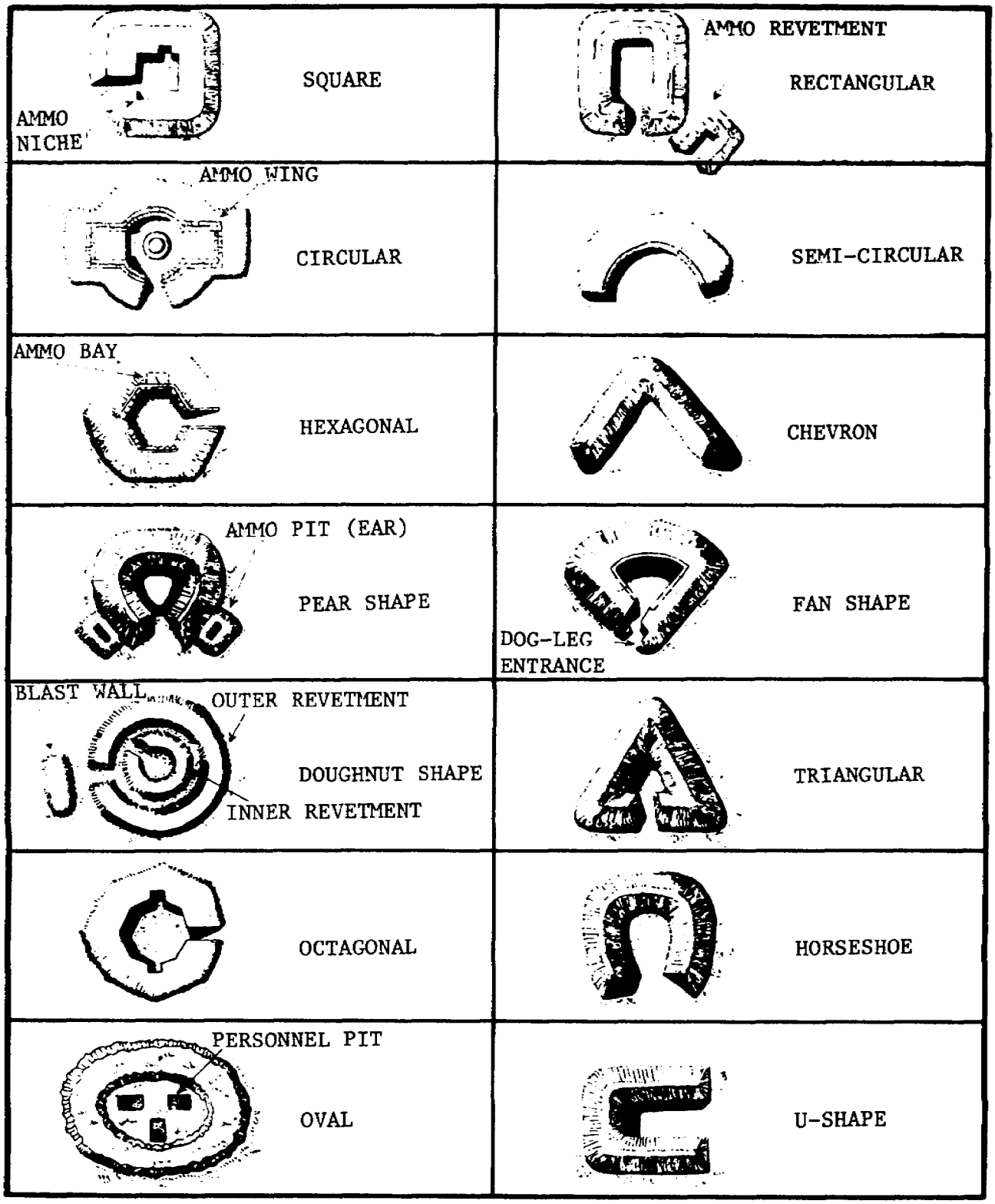


Figure 2-13. Basic Types of Artillery Emplacements.

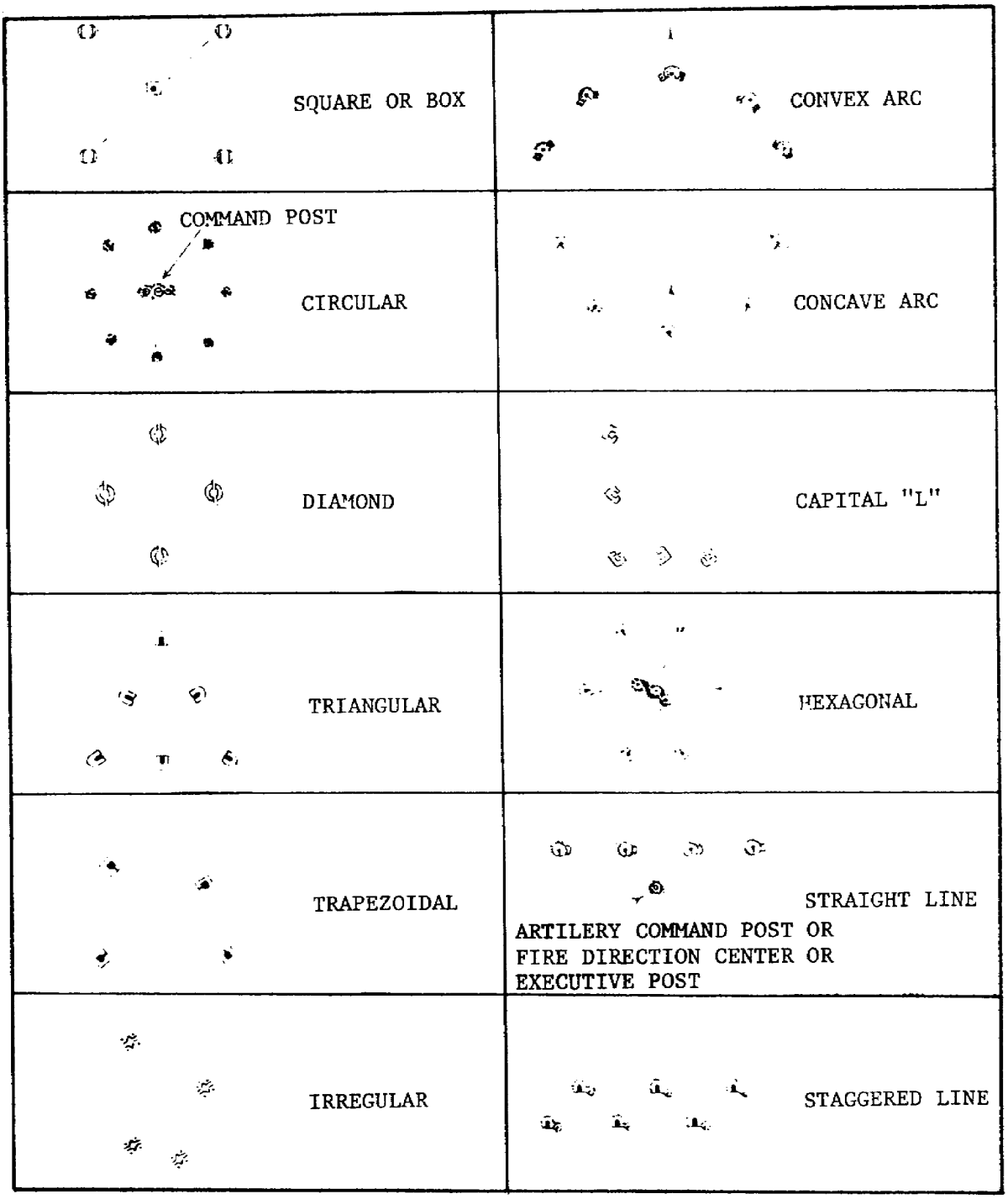
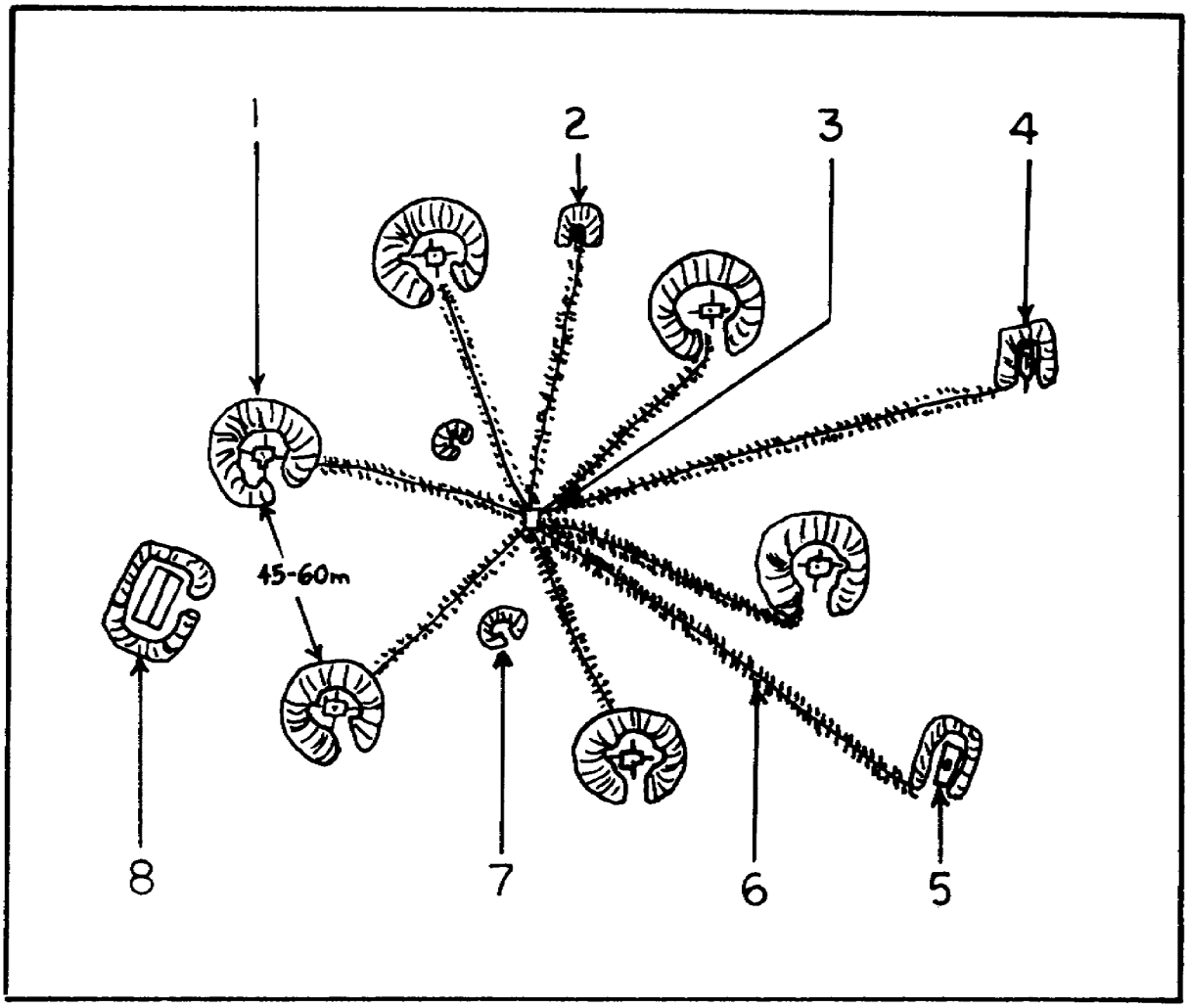


Figure 2-14. Typical Artillery Battery Layout Patterns.



Legend:

Annotation	Item
1)	AAA Gun Position
2)	Generator
3)	Junction box
4)	Fire control radar
5)	Fire control radar
6)	Cable trenches
7)	AA-Machine-gun
8)	Crew quarters

Figure 2-15. AAA Gun Battery Position.

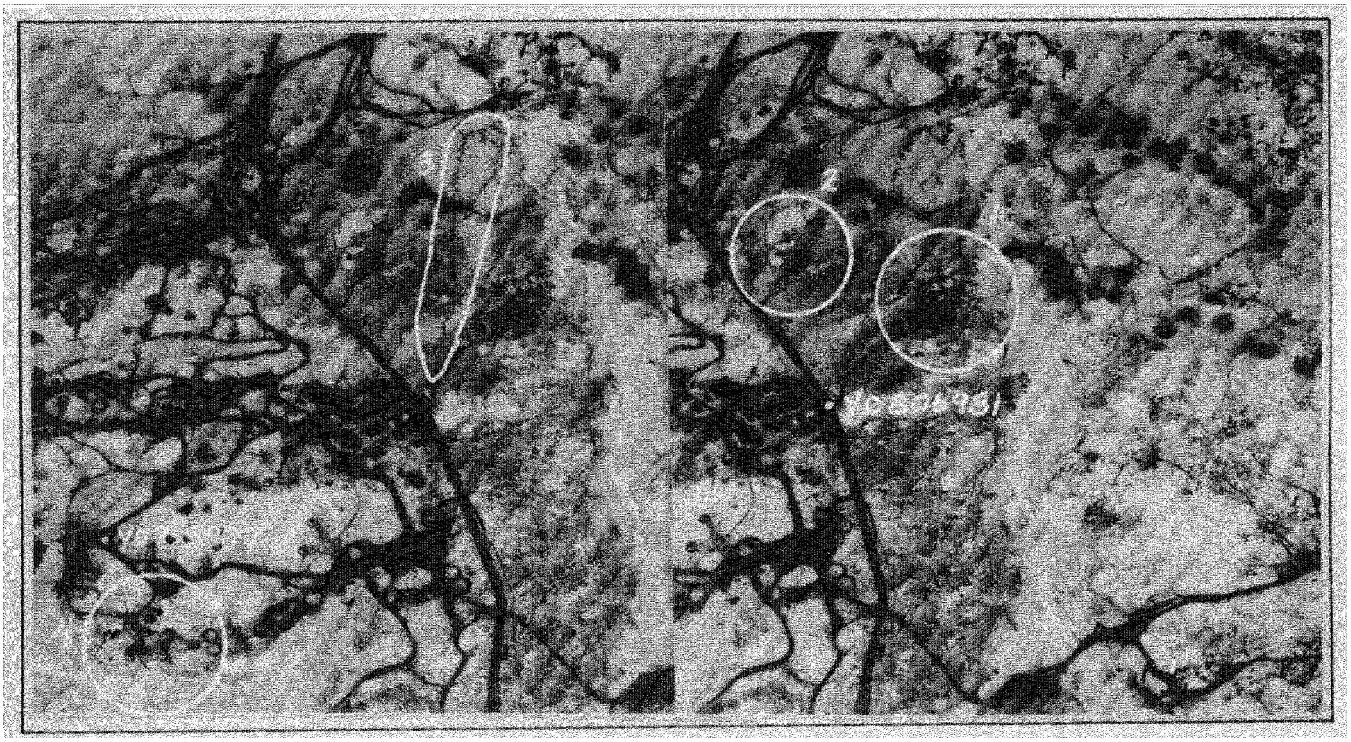


Figure 2-16. AAA Positions (Annotations 1 and 2).

Figure 2-17. AAA Positions.

PART D: ANALYZE OBSTACLES, BARRIERS, AND OTHER DEFENSES

1. Obstacles, barriers, and other defenses are normally of a temporary or semi-permanent nature, however, they can be found in permanent positions, i.e., Berlin Wall, Maginot line, etc.

2. An obstacle or barrier is an obstruction that stops, delays, or diverts movement. Obstacles may be natural: deserts, mountains, steep slopes, rivers, streams, gullies, swamps, heavy woods, jungle, deep snow, and such manmade features as cities, towns, embankments, and canals; or they may be artificial: demolished bridges, road craters, abatis artificially flooded areas, minefields, contaminated areas, barbed wire entanglements, antitank ditches, and log, steel, and concrete structures. The quantity and types of artificial obstacles constructed are limited only by the time, labor, material, transportation, and equipment available, and the imagination and ingenuity of the constructing unit. The nature of the principal enemy threat-infantry, armor, mechanized, airborne, airmobile, amphibious, or any combination thereof-determines the character of the obstacles designed to impede both armor and infantry are more effective than either antimechanized or antipersonnel obstacles employed separately. The following subareas are examples of the various types of obstacles, fortifications, and defenses you may encounter on imagery.

NOTE: Regular patterns of the obstacles and their shadows are the most helpful recognition factors.

a. Minefields are extensively used by modern armies. Aside from the traditional method of hand emplacement, they have developed mine laying equipment and techniques that include helicopter-dropped mines, armored tracked minelayers, and mine-laying trailers. The identification of minefields from aerial may be very difficult especially when proper camouflage discipline is maintained. Minefields are usually detected by--

(1) Spoil marks.

(2) Regular spacing and regular width.

(3) Distributed growth of vegetation.

(4) Tracks along edge of minefield.

(5) Convergency of tracks to "safe" lanes.

(6) Parched grass over buried mines.

NOTE: This applies to regularly constructed antipersonnel and antitank minefields. Scattered mines are almost impossible to detect. There are no known conditions which create imagery effects similar

to those created by a minefield unless it might be a series of spoil marks from laying posts of a fence. In grassy fields or in open virgin ground, freshly laid mines are readily identified even on small-scale imagery. Comparative coverage of an area is an aid in spotting possible minefields since such comparisons can reveal small changes and attempts at camouflage that may otherwise go undetected.

(7) Piles of stones, discarded mine packaging or enemy minefield markers.

(8) Minefields are employed as follows:

(a) Hasty. Used to provide local close-in protective (Figure 2-18)

(b) Deliberate. Used to provide local protective for semifixed installations (Figure 2-19).

(c) Tactical. Used to stop, delay, or disrupt an enemy attack, reduce enemy mobility, block penetrations, and strengthen manned positions (Figure 2-20).

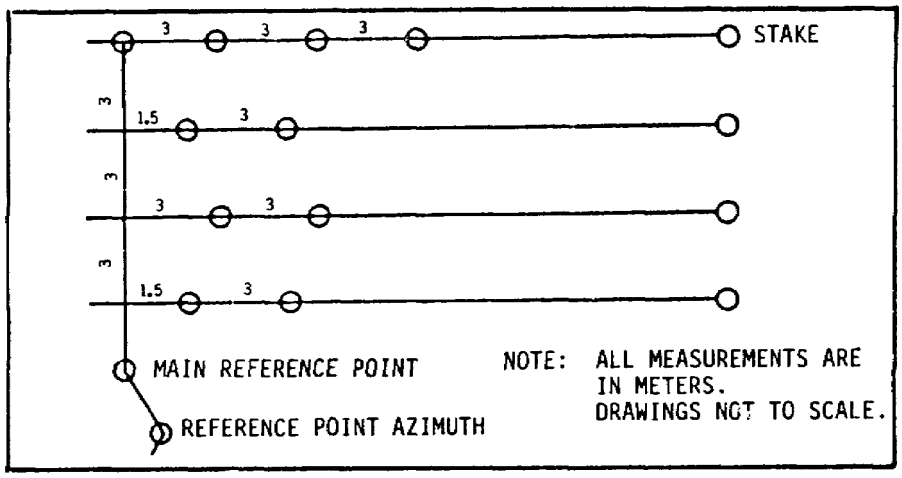


Figure 2-18. Hasty Antitank Minefields Pattern.

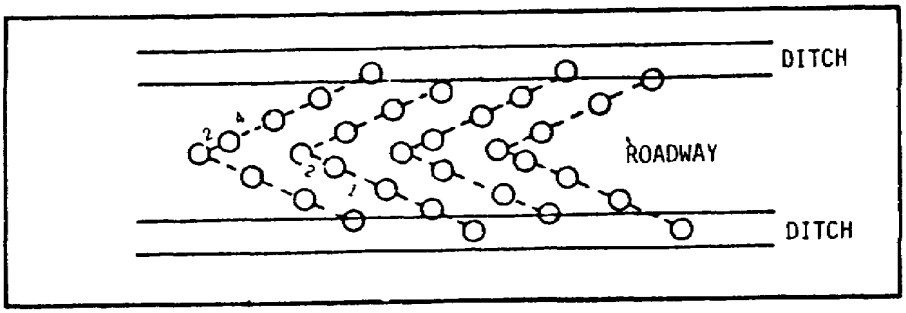


Figure 2-19. Antitank Minefield Roadblock Pattern.

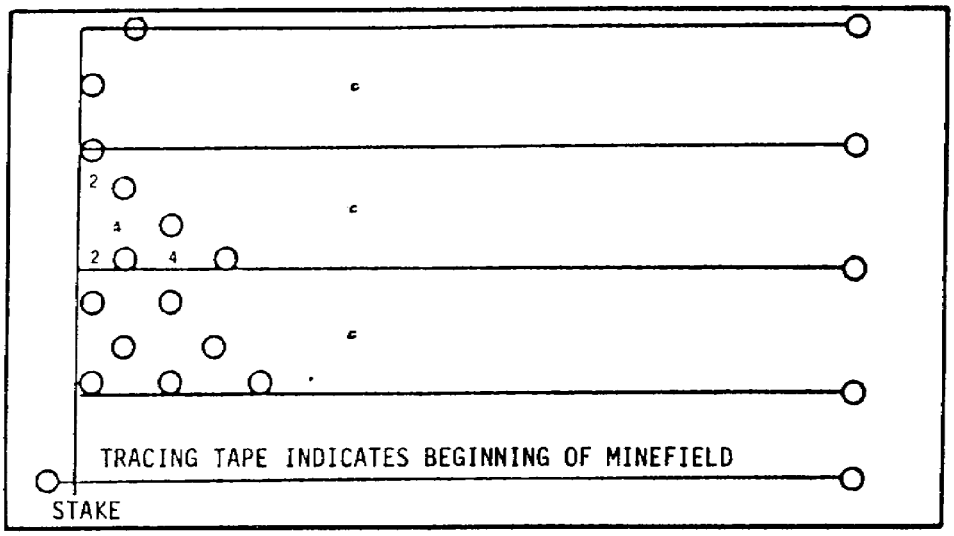


Figure 2-20. Deliberate Soviet Minefield Pattern.

b. Antitank Obstacles.

(1) Antitank ditches. Because of its width, depth, and extensive spoil marks, the antitank ditch is another easily recognizable defensive feature. On vertical, positive images, the ditch will usually appear as a dark straight line with light-shaded shoulders (Figure 2-21).

(2) As is the case with all obstacles, gun positions are usually located nearby in positions which will allow fire to be placed along the entire length of the ditch. Constructed by manual digging, blasting, or mechanical excavation, antitank ditches are located to channelize tanks toward guns, minefields, or natural obstacles. To be effective, the width of the ditch is at least half the length of the tank being guarded against plus one foot. Depth is greater than the highest part of the tank tread.

(3) Antitank ditches are constructed by digging, blasting, or mechanically excavation across a potential avenue of approach to form a barrier to vehicles. They are easily identified because of their straight course and the large amount of spoil distributed on either side.

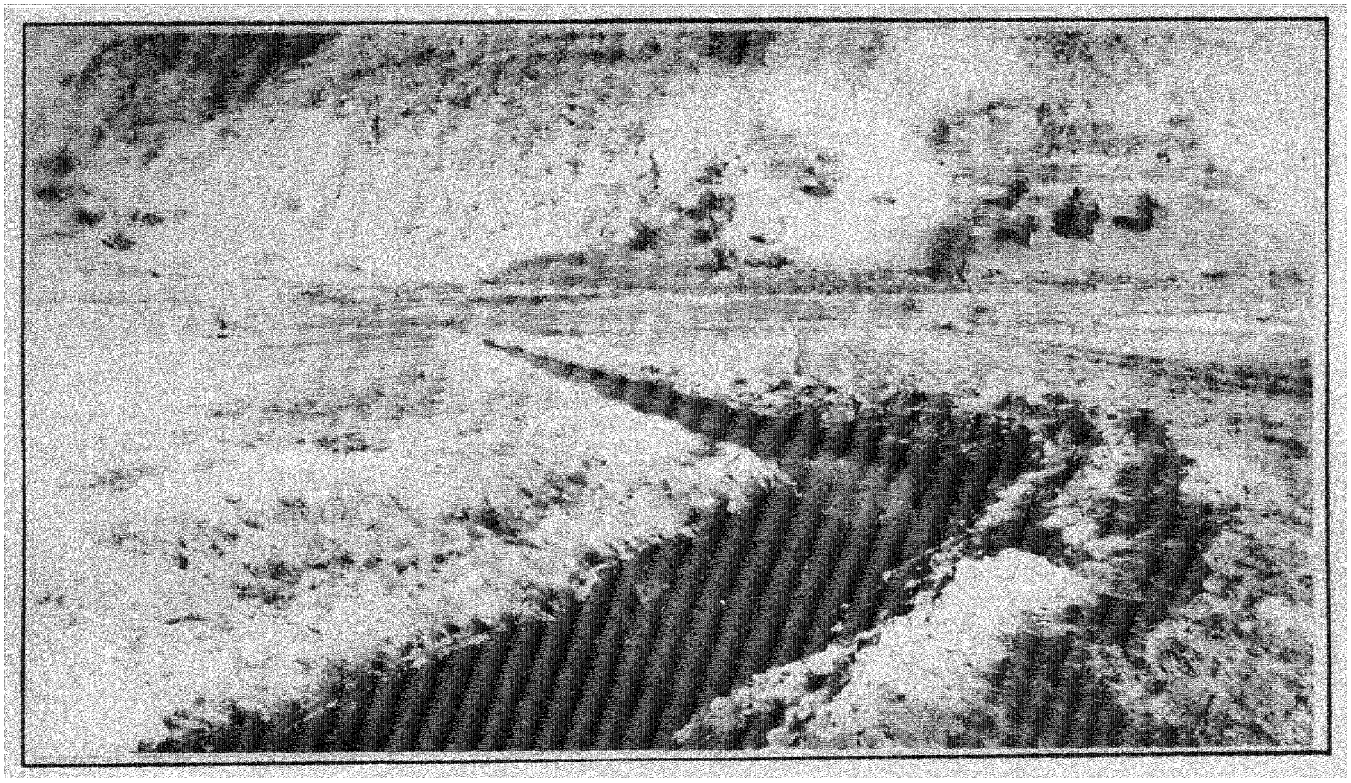


Figure 2-21. Antitank Ditch.

c. Beach or antisea landing obstacles are used to Impede, channelize, or block landing craft. Beach and antitank obstacles can be constructed of steel, concrete, or wood and earth reinforced (Figure 2-22).

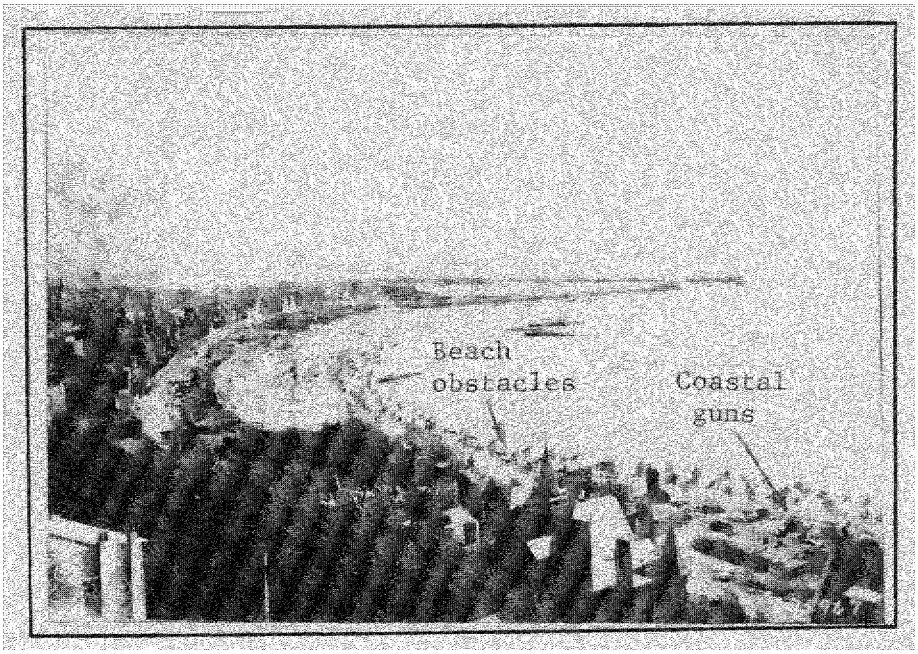


Figure 2-22. Beach Obstacles.

d. Antihelicopter/Antiair obstacles are placed on suitable landing fields and parachute drop zones to demolish aircraft in landing and impede movement and landing of paratroopers. Effective obstacles include craters, posts, stakes, barbed wire, immobilized or parked vehicles, rock-filled oil drums, minefields, felled trees, and persistent toxic chemical agents used alone or integrated with other obstacles.

e. Roadblocks are obstacles across a road which will cause a military vehicle to stop, slow down, or detour around it. Roadblocks normally are sited to supplement a prepared or natural obstacle (Figure 2-23).

f. Demolition obstacles. Properly emplaced demolition charges can create rock slides, road craters, and other hindrances to vehicular traffic. Demolition charges are normally placed on bridges, road junctions, mountain passes, and embankments. Comparative cover may reveal spoil marks for the charges. Electronically controlled charges may have a cable trench leading from the charge (Figure 2-23).

Figure 2-23. Roadblock Caused by Demolition Charge.

g. There are many types of barbed wire. The more common types are trip, concertina, and knife-rest (Figure 2-24). Barbed wire shows up on aerial imagery as a regular, uniform line varying in shade from fight grey to black depending first on whether or not the wire has been newly strung, and second, on the texture of the terrain. Because of its size, you cannot see the wire itself. However, indications, such as posts, tracks, spoil, and uncut or uncropped vegetation, provide a firm basis for positive identification of barbed wire. New wire sometimes appears light in shade because of tracks and spoil disturbed while placing the wire. Tracks may reveal gaps in wire. Grass and weeds grow quickly through the wire and form dark shades. The pattern of the wire may indicate machine-gun positions (Figure 2-25).

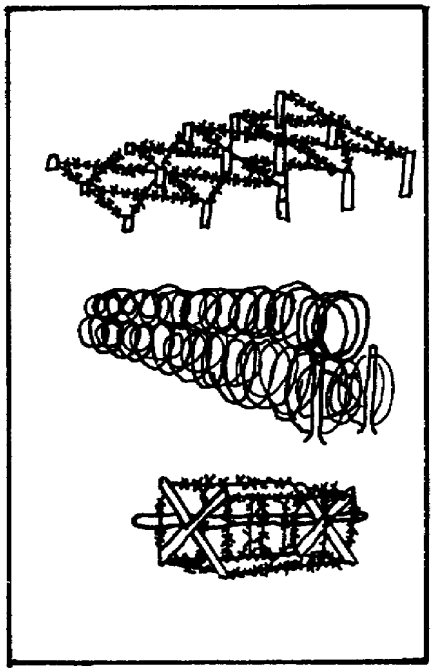


Figure 2-24. Wire Types.

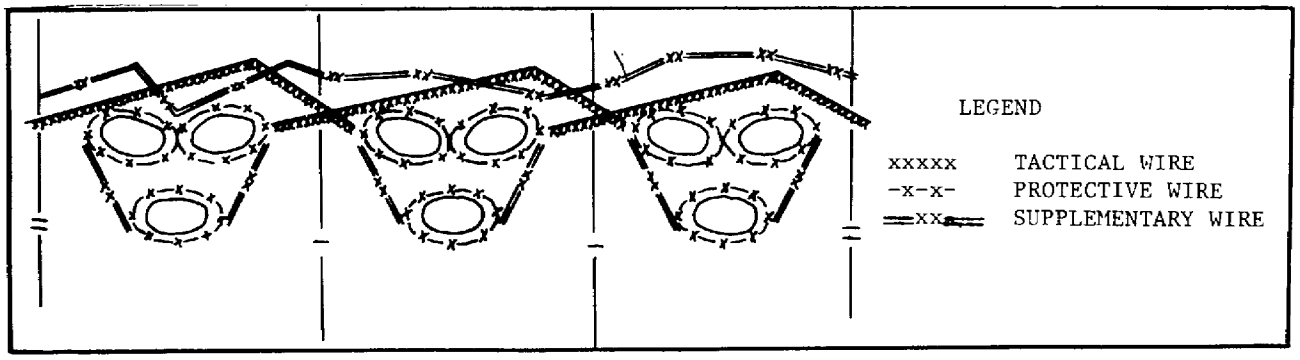


Figure 2-25. Machine-Gun Positions and Wire Patterns.

h. Stump and Post obstacles are tree stumps at least 15 inches in diameter and 2 to 4 feet high combined with tactical wire, mines and booby traps (Figure 2-33).

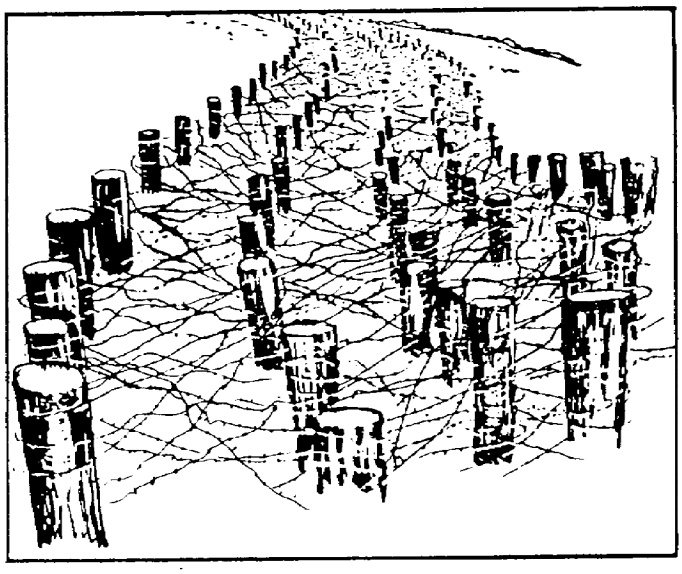
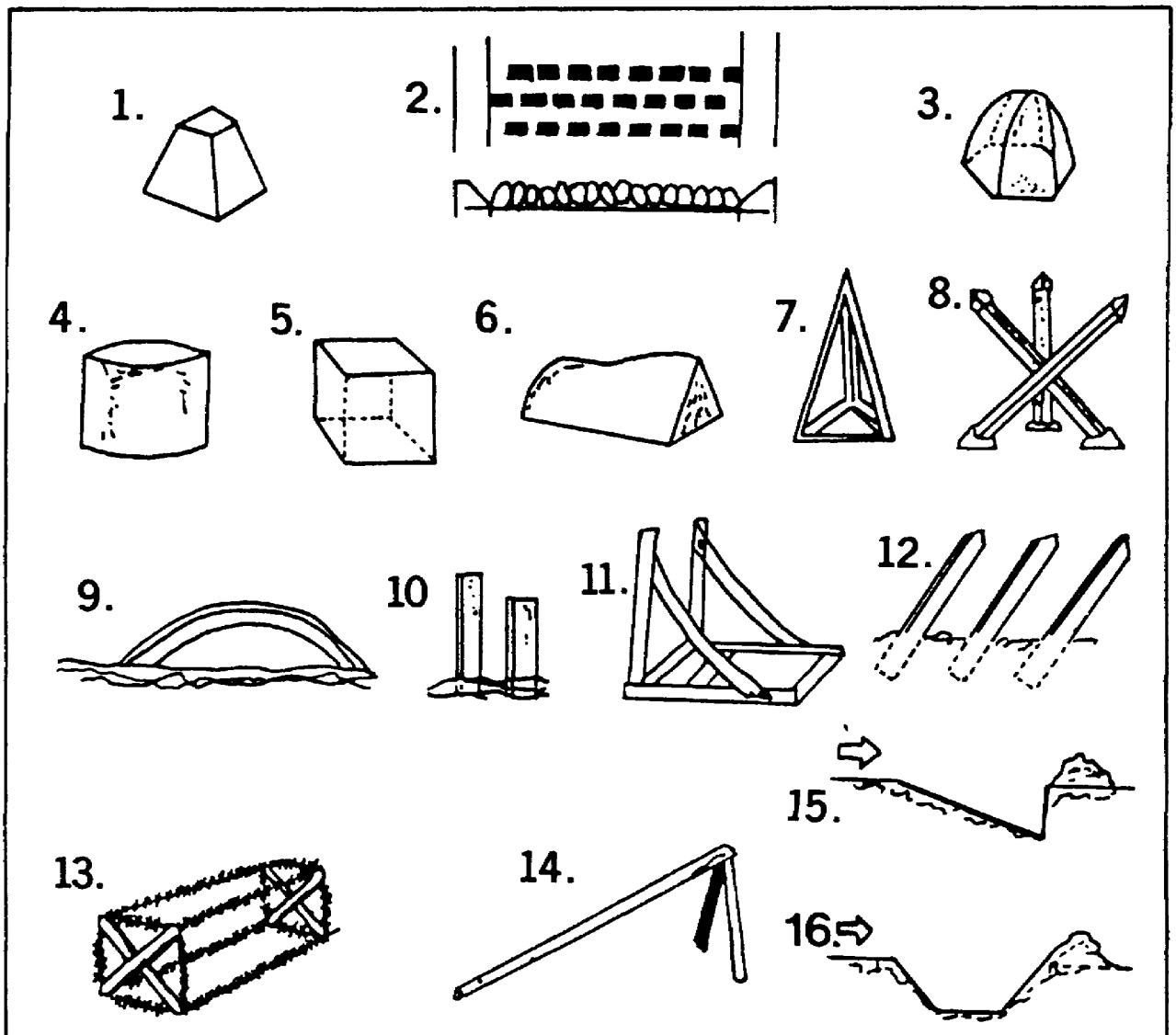


Figure 2-26. Stump and Post Obstacles.

i. Antihelicopter/Antiair obstacles are placed on suitable landing fields and parachute drop zones to demolish aircraft in landing and to impede movement and landing of paratroopers. Effective obstacles include filled oil drums, minefields, felled trees, and persistent toxic chemical agents used alone or Integrated with other obstacles.

j. Concrete obstacles are erected in continuous lines forming an antitank or antisea landing obstacle, i.e., roadblock, crosscountry block (Figure 2-27)

k. Steel obstacles may be scattered near a beach or riverbank as antilanding devices, in small numbers as roadblocks, or in continuous lines as antitank or antisea landing obstacles (Figure 2-27).



Legend:

1. Dragons' teeth (concrete)
2. Elephants' teeth (concrete)
3. Egg (concrete)
4. Cylinder (concrete)
5. Cube (concrete)
6. Coffin
7. Tetrahedron (steel)
8. Hedgehog (steel)
9. Curved rails (steel)
10. Asparagus bed (steel)
11. Angle iron (steel)
12. Stakes (steel or wood)
13. Knife rest (wood)
14. Ramps (wood)
15. Triangular ditch
16. Trapezoidal ditch

Figure 2-27. Obstacles.

LESSON TWO

PRACTICE EXERCISE

The following items will test your grasp of the material covered in this lesson. There is only one correct answer to each item. When you have completed the exercise, check your answers with the answer key that follows. If you answer any item incorrectly, study again that part of the lesson which contains the portion involved.

1. Which of the following activities are constructed to stop, delay, and divert enemy movement?

   A. Ammunition bunkers.

   B. Obstacles.

   C. Track activities.

   D. Dummy positions.

2. Which of the following obstacles is used to hinder the advance of a force and cause it to detour.

   A. Dummy positions.

   B. Foxholes.

   C. Communication trench.

   D. Roadblocks.

3. What are fighting positions primarily sited for?

   A. Concealment.

   B. Size.

   C. Fields of fire.

   D. Defense.

4. Which trenches or parts thereof are used for riflemen and light automatic weapons in engaging the enemy?

   A. Communication.

   B. Shelter.

   C. Dummy.

   D. Firing bays.

5. Which field fortifications include elaborate troop quarters?

   A. Casemates.

   B. Pillboxes.

   C. Fighting positions.

   D. Breastworks.

6. Which obstacle is depicted in Figure 2-28?

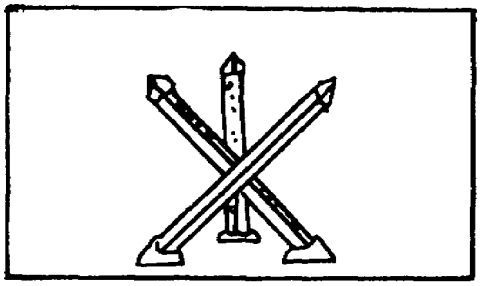


Figure 2-28.

   A. Tetrahedron.

   B. Hedgehog.

   C. Dragon tooth.

   D. Knife rest.

7. Which obstacle is dedicated in Annotation 1 of Figure 1-29?

   A. Antitank ditch.

   B. Trench.

   C. Minefield.

   D. Slit trench.

8. What is depicted by the three large circles in Annotation 2 of Figure 1-29?

   A. Antiaircraft positions.

   B. Artillery positions.

   C. Bunkers.

   D. Bomb craters.

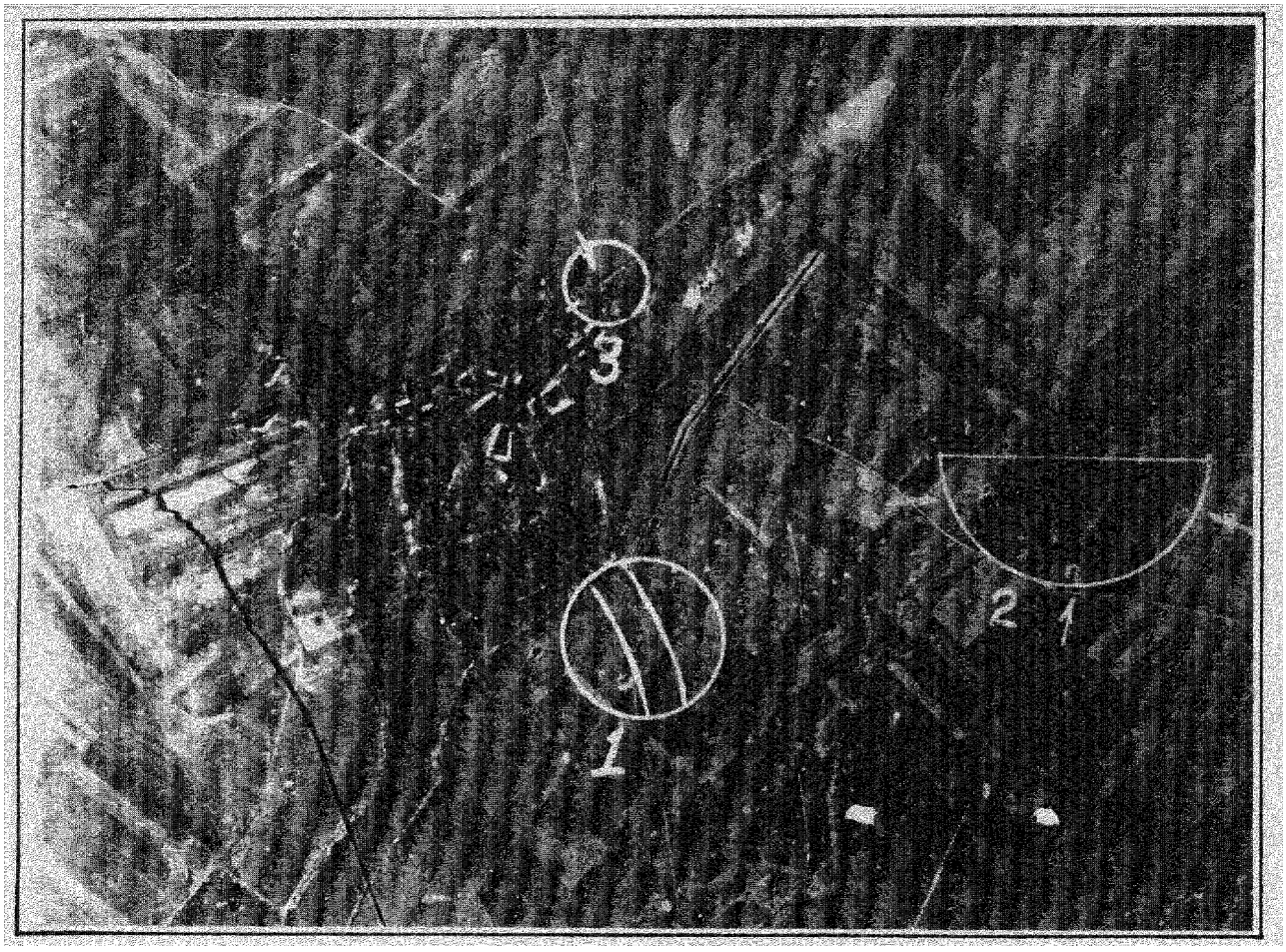


Figure 1-29.

LESSON TWO

PRACTICE EXERCISE

ANSWER KEY AND FEEDBACK

ITEM	CORRECT ANSWER AND FEEDBACK
1.	B. An obstacle is an obstruction that stops, delays, or diverts movement (page 58, para 2).
2.	D. Roadblocks are used to slow down and hinder the advance of a force or causing it to detour through a mined area (page 62, para 2e).
3.	C. Fighting positions are primarily sited for good fields of fire (page 47, para 2).
4.	D. Firing bays are used for riflemen and light automatic weapons in engaging the enemy (page 47, para 3a).
5.	A. A casemate contains elaborate troop quarters (page 45, para 2).
6.	B. The obstacle shown is a hedgehog (page 65, fig 2-27).
7.	A. There is an antitank ditch in Annotation 1 of Figure 1-29 (pages 60/61, para 2b/fig 2-21).
8.	D. The three large circles in Annotation 2 of Figure 1-29 are bomb craters [page 52, para 9c(NOTE)].