SUBCOURSE
EN5501

EDITION
B

US ARMY ENGINEER CENTER AND SCHOOLS

LAND-MINE WARFARE
PART I

Essayons

"LET US TRY"

THE ARMY INSTITUTE FOR PROFESSIONAL DEVELOPMENT

ARMY CORRESPONDENCE COURSE PROGRAM

A
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P
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READINESS / PROFESSIONALISM

THRU GROWTH

LAND-MINE WARFARE
PART I

Subcourse EN5501

EDITION B

United States Army Engineer Center and School
Fort Leonard Wood, Missouri 65473

7 Credit Hours

Edition Date: May 1998

SUBCOURSE OVERVIEW

This subcourse will enable you to direct the work of minefield siting, marking, laying, and recording parties and to conduct minefield reconnaissance and clearance operations. You will also learn how to install, record, and remove a hasty protective row minefield. Lesson 1 discusses minefield parties and row minefield emplacement. Lesson 2 discusses hasty protective row minefields. Lesson 3 discusses minefield reconnaissance. Lesson 4 discusses the procedures used to plan and conduct mine-clearance operations. Work must be accomplished in a manner consistent with environmental laws and regulations.

There are no prerequisites for this subcourse.

This subcourse reflects the doctrine that was current at the time when this subcourse was prepared. In your work, always refer to the latest official publications.

Unless otherwise stated, the masculine gender of singular pronouns is used to refer to both men and women.

TERMINAL LEARNING OBJECTIVE:

ACTION: You will learn to describe the procedures used to direct the work of siting, marking, laying, and recording parties; describe the procedures used to direct the installation/removal of a hasty protective row minefield; and determine the procedures required to conduct minefield reconnaissance and clearance operations.

CONDITION: You will be given the material in this subcourse.

STANDARD: To demonstrate competency of this task, you must achieve a minimum of 70 percent on the subcourse examination.

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LESSON 1

ROW MINEFIELD

Critical Tasks: 051-192-2026
051-192-3029
051-192-3030
051-192-3031

OVERVIEW

LESSON DESCRIPTION:

This lesson discusses the responsibilities and procedures of minefield siting, marking, laying, and recording parties. It provides basic information on the responsibilities and actions of minefield parties and the materials used by these parties. It discusses the steps required for each party to complete the emplacement of a row minefield.

TERMINAL LEARNING OBJECTIVE:

ACTION: You will learn to identify the requirements, responsibilities, and procedures used to direct minefield siting, marking, laying, and recording parties in the emplacement of a row minefield.

CONDITION: You will be given the material contained in this lesson.

STANDARD: You will correctly answer all practice-exercise questions at the end of this lesson.

REFERENCE: The material contained in this lesson was derived from FM 20-32.

INTRODUCTION

Minefields must be marked to prevent fratricide. Marking ensures that friendly soldiers do not accidentally enter a minefield. All obstacles must be integrated into the maneuver force's fire plan and, therefore, must be sited; minefields are no exception.

PART A - DIRECTING A SITING PARTY

1-1. General. The siting party consists of a noncommissioned officer in charge (NCOIC) and one or two soldiers with a vehicle to carry material. If a vehicle is not available, the party should consist of three soldiers. There are two phases to siting a minefield. The first phase is the siting of the individual minefield or the whole obstacle group. The same siting party should site all minefields within a certain obstacle group to ensure that the obstacle group has the intended effect. This combined arms effort is discussed extensively in FM 20-32. The second phase is the actual siting of each minefield, which is done when the platoon completes the group siting and starts individual minefield emplacement.

1-2. Siting Procedures.

a. Because siting is usually done in daylight, personnel take appropriate physical-security measures and set out all control markers well ahead of the actual laying.

b. The NCOIC obtains the minefield sketch from the officer in charge (OIC) and identifies the following:

- The location of the starting, ending, and turning points for the irregular outer edge (IOE) baseline and each row.
- The location and number of safety lanes or gaps.

c. After identifying the above information, installation of the minefield boundary can begin. Personnel lay the minefield from right to left or left to right facing the enemy and label each mine row with a capital letter. Row A is nearest the enemy, followed by Rows B, C, D, E, and so forth. Each row must have a permanent start and end marker. Intermediate markers may be necessary depending on the row's length and the terrain. Personnel install wooden stakes or steel pickets as row markers by driving them flush with the ground to mark the location of the rows. They drive metal nails into the middle of the wooden stakes to allow easy detection by mine detectors. The distance between intermediate markers in a row depends on the terrain, but it should not exceed 100 meters. Personnel should avoid using sharp turns and should mark vehicle traffic routes to and from the rows.

d. The NCOIC will start the siting at an identified Landmark 1 and site the left (or right) boundary fence and the start row markers as A1, B1, C1, and so on (Figure 1-1). Rows should be no closer than 15 meters if they contain antipersonnel (AP) mines, or 8 meters if they contain only antitank (AT) mines. The siting party measures distances and takes azimuths to use in preparing the recording form. If the tactical situation permits and the marking party is ready, fence construction may begin.

e. If the minefield is to have an IOE row, the siting-and-recording party proceeds across the IOE and establishes I1, I1E, I2, I2E, and so on, until reaching the end (discussed in Part C). FM 20-32 discusses this process is detail.

f. Siting personnel proceed down the right (or left) boundary to start row marker A1. Proceeding from A1 to A2, they place intermediate markers as required. When the siting party reaches A2, they install the end row marker. This procedure is repeated from B1 to B2, C1 to C2, and so on until they install all of the required control measures.

g. The siting party establishes Landmark 2 and the left (or right) rear fence location. The siting party sites a mine dump near the minefield.

h. When siting is complete, the siting party NCOIC transfers the information to the recording party NCOIC. The siting party then augments other parties as directed.

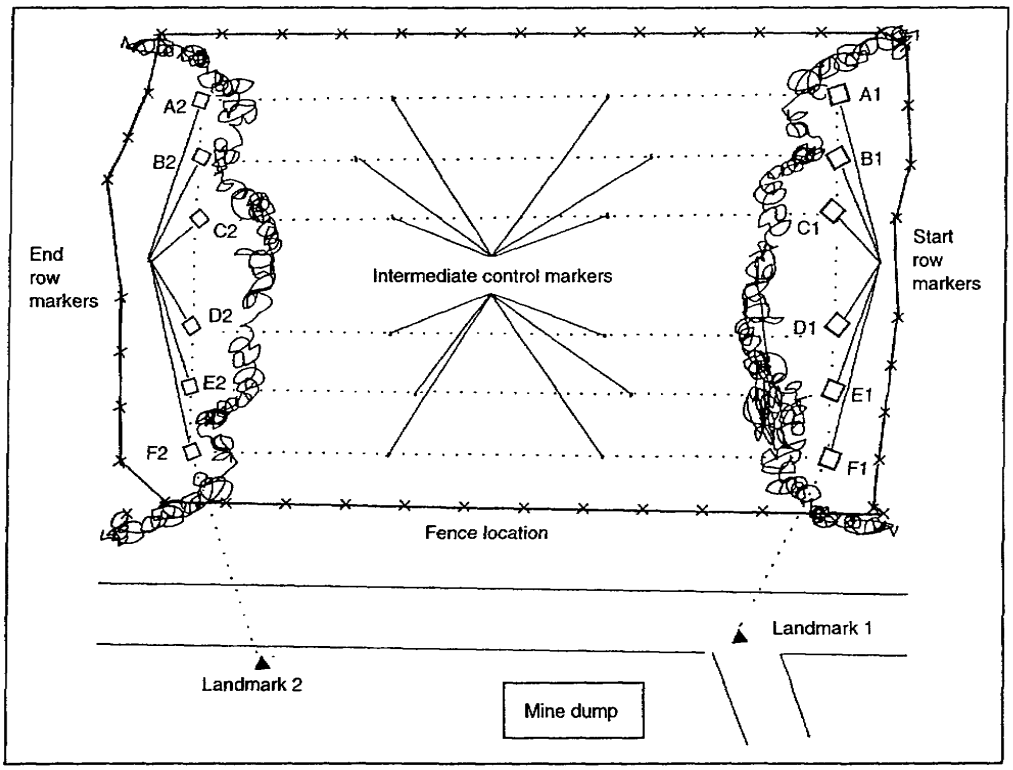

Figure 1-1. Site layout

PART B - DIRECTING A MARKING PARTY

1-3. General. A marking party consists of an NCOIC and personnel who are not working as members of other parties. When emplacing minefields behind the forward line of own troops (FLOT) (in the main battle or rear area), they mark the minefields on all four sides. This includes air-delivered Volcano minefields that are sited and emplaced before the enemy attacks. Forward of the FLOT, minefields are not generally marked before

emplacement. However, commanders must make every attempt to mark these minefields as soon as the tactical situation allows. For scatterable minefields, the commander may choose to remove markings once a mine's self-destruct (SD) time has expired but the minefield's location must still be recorded and forwarded to higher and adjacent units in case some mines did not SD.

1-4. Marking Materials. The materials used to mark minefields are in the number 2 marking set. A fully assembled set consists of a fence with one or two strands of barbwire fastened between posts, with signs indicating that mines are present (Figure 1-2). Chemical lights are included to use for warning at night.

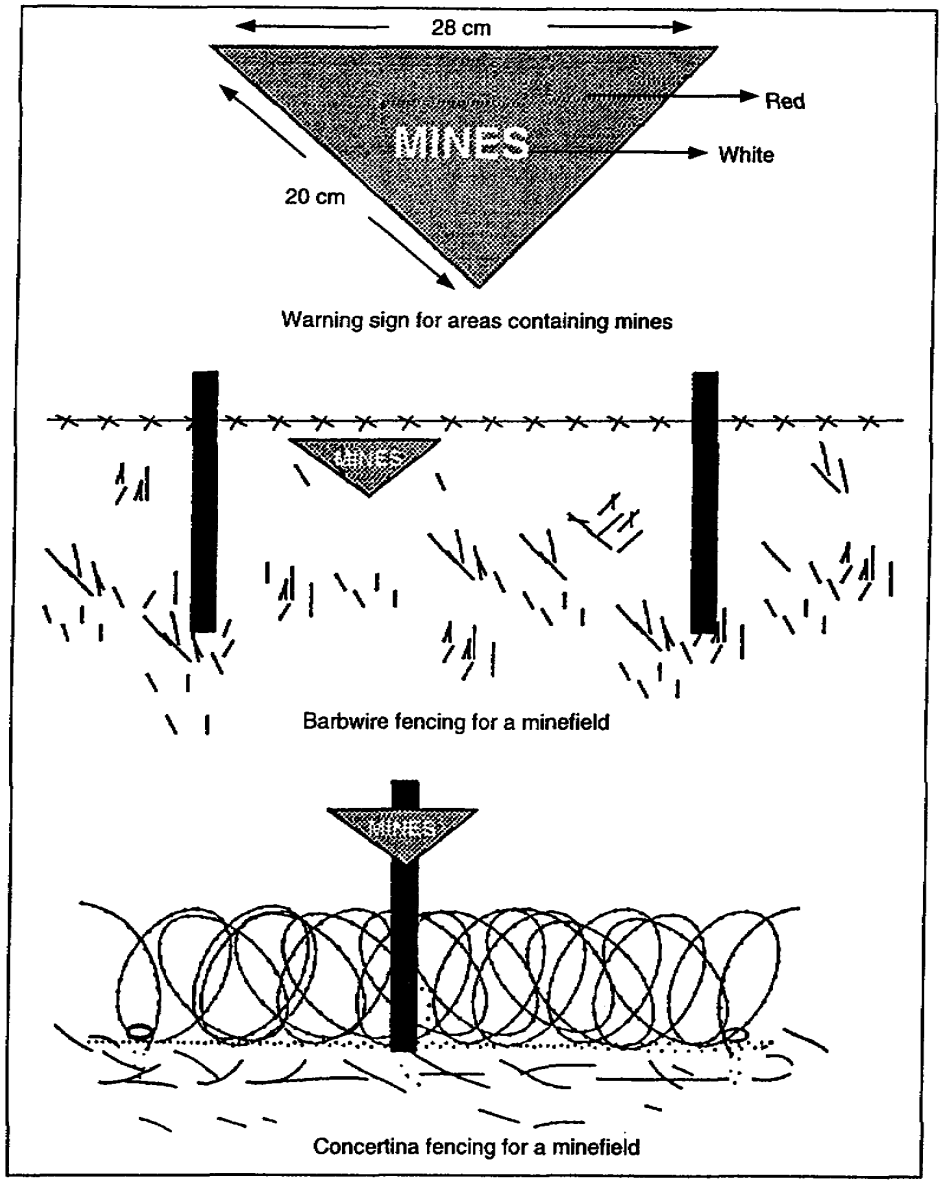

Figure 1-2. Minefield marking

1-5. Marking Techniques. The commander may decide to mark individual minefields or to mark the group as a whole obstacle group (Figure 1-3). Depending on the minefield's size and location, either technique may have the advantage of using fewer resources or labor. Normally, marking individual minefields in a fix-obstacle group requires fewer resources than marking the group in its entirety. The opposite is usually true for disrupt-, turn-, and block-obstacle groups. The commander does not base the decision to mark individual minefields or the whole obstacle group solely on logistical considerations. He considers the amount of tactical or sustainment movement required in and around the obstacle group as well as the capability of the unit's C^2 forces.

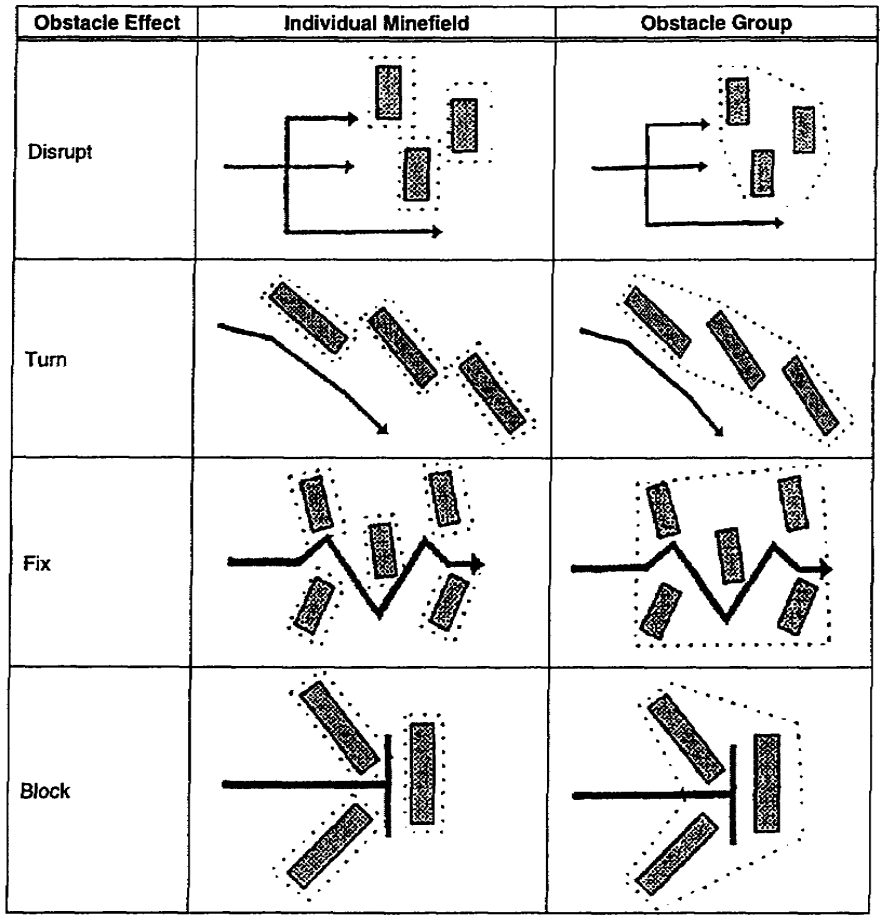

Figure 1-3. Marking of individual minefields and obstacle groups

1-6. Marking Procedures.

a. After a minefield is sited, personnel construct a perimeter fence to mark the minefield. They start emplacing the perimeter fence before emplacing mines, preferably during site layout if the tactical situation permits. For conventional minefields, they

ensure that the perimeter fence is located a minimum of 15 meters away from the nearest mine. For scatterable minefields, the area inside the perimeter fence must include the safety zone particular to the emplacement method.

b. The marking party constructs the perimeter fence as described in the following steps.

Step 1. The NCOIC assigns the duties for marking the minefield. Personnel are required to install the pickets and the barbwire or concertina and to place warning signs and lights.

Step 2. The NCOIC obtains the following information from the OIC:

- The location of the rear starting point.
- A sketch (if available) showing the approximate location of the boundary fence.
- Instruction on whether to use any existing fences.
- Instruction on whether the minefield's front boundary (enemy side) is to be marked.
- The number, width, and location of safe lanes or gaps.
- The type of illumination.
- The type of marking set to use.
- Any other pertinent information.

Step 3. If the rear starting point is on the right, the NCOIC directs the marking party to install pickets counterclockwise. If the rear starting point is on the left, the NCOIC directs the marking party to install pickets clockwise. They install the pickets in a manner that will not disclose the minefield's outline and at least 15 meters away from any mine.

Step 4. If laying the minefield from right to left, the NCOIC directs the marking party to install a picket at a point that is at least 15 meters to the right of the rear row marker. If laying the minefield from left to right, the NCOIC directs the marking party to install a picket at a point that is at least 15 meters to the left of the rear row marker.

Step 5. The marking party continues installing pickets 15 meters apart until the entire boundary line is completed.

Step 6. When all the pickets have been installed, the NCOIC directs the marking party to install one or two barbwire strands (as directed by the OIC) on the pickets to form the fence. The NCOIC ensures that the wires are taut and fastened securely to the pickets and that the top strand of barbwire is about waist-high and the lower strand is about ankle-high. If using concertina wire, they use a one-roll height. Personnel place additional barbwire strands or concertina rolls at the discretion of the commander. They wind the barbwire around each picket several times so that it does not come loose.

Step 7. The marking party hangs standard warning signs (triangular in shape and 20 x 28 centimeters) on the upper strand of wire. The signs should be spaced about 10 to 50 meters apart and face away from the minefield. The regular mine sign has a red background with the word MINES printed in white letters.

PART C - DIRECTING A LAYING PARTY

1-7. General. The laying party consists of an NCOIC, four soldiers, and a vehicle to carry mines. Soldiers normally lay row minefields from a vehicle to speed up emplacement. They use any tactical or wheeled vehicle for mine laying but consider the vulnerability, capacity, and trafficability when selecting a vehicle. Before preparing a vehicle for mine laying and emplacing the mines, drive the vehicle in a random pattern across the minefield. The random pattern deceives the enemy by masking the actual laying pattern. Personnel load enough mines so that each vehicle can complete an entire row or rows before reloading, but they do not stack fused mines more than two-high.

1-8. Laying Procedures. The OIC directs and controls the overall emplacement drill. Normally, several rows are laid at once. Drill procedures are as follows:

a. Vehicles arrive on site and proceed down the right (or left) boundary of the minefield to their assigned row. The OIC details a separate party to install the IOE baseline or tasks the laying party emplacing Row A. If an IOE is required, the laying party locates the baseline at least 15 meters from Row A on the enemy side. At the start row marker, the laying vehicles move into position and prepare to lay mines (Figure 1-4, page 1-8).

b. The NCOIC for Row A tells Vehicle 1 to start laying mines. Vehicle 1 lays mines on the ground at the required spacing, along the control markers previously positioned by the siting party.

c. As mines are laid, the arming party moves behind the vehicle and arms the mines. Laying party personnel remove the temporary control measures installed by the siting party.

d. When Vehicle 1 moves a safe distance (about 25 meters) down Row A, Vehicle 2 begins to lay mines in Row B.

e. When Vehicle 2 moves a safe distance down Row B, Vehicle 3 begins to lay mines in Row C.

f. As Vehicles 1 and 2 finish their assigned rows, they move past the end row marker and execute a left (or right) turn and wait for Vehicle 3 to complete its row. All vehicles move in column down the left (or right) boundary to the mine dump to load the next row's mines and then move to their next assigned row.

g. The laying party repeats the laying and arming process (Figure 1-5, page 1-9). After Vehicles 1 and 2 have completed their second row, they execute a left (or right) turn and wait for Vehicle 3 to finish its row.

h. All vehicles exit the minefield down the right (or left) boundary and out the rear.

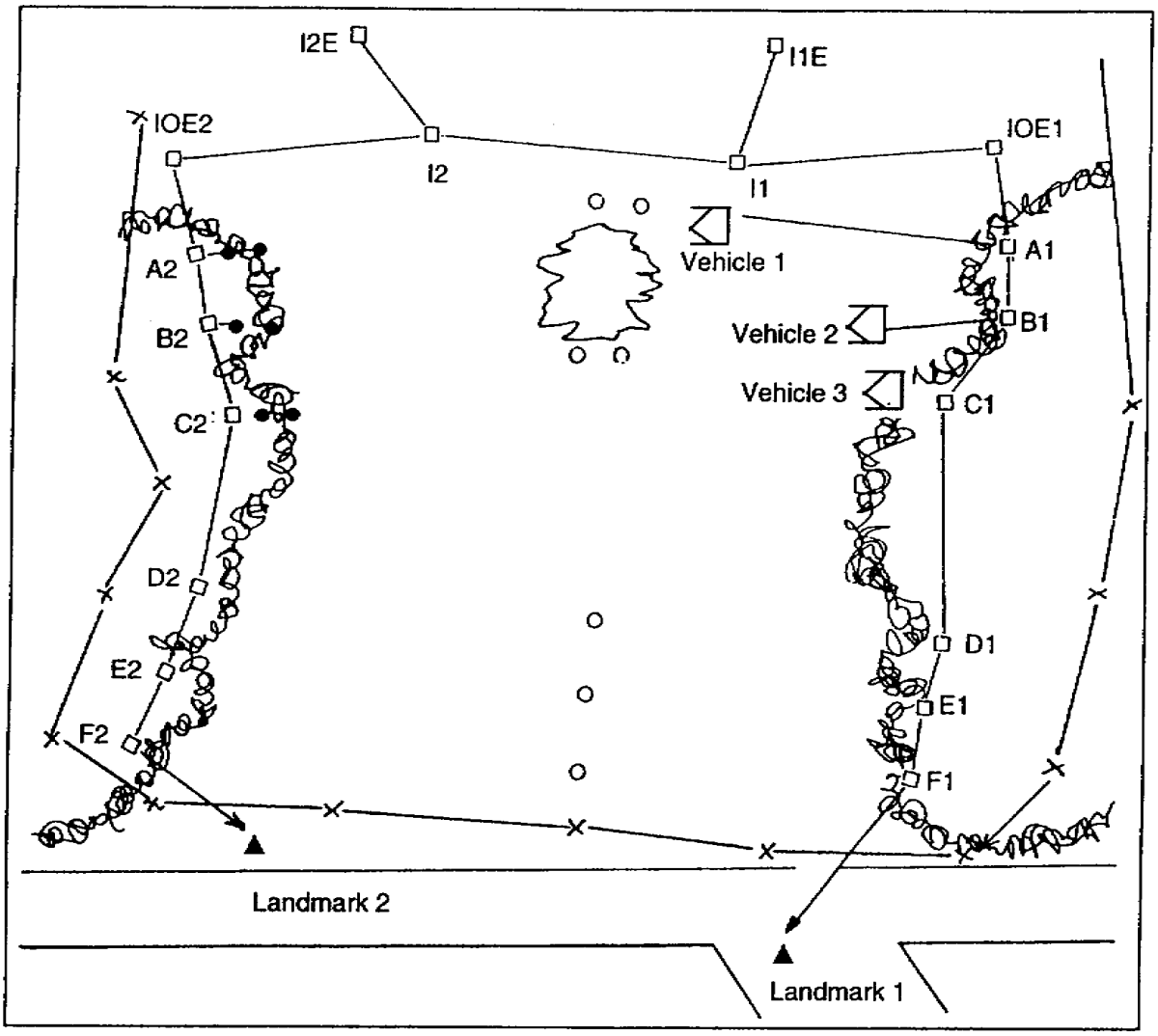

Figure 1-4. Laying Rows A, B, and C and the IOE baseline

1-9. Laying Techniques.

a. The NCOIC controls the movement of each laying vehicle, directs each vehicle to start and stop laying, and controls immediate-action drills. The NCOIC initiates a strip feeder report with the platoon sergeant (PSG) or the mine-dump NCOIC to ensure accurate accountability of mines and installed devices. After completing the row, the NCOIC transfers the strip feeder report to the PSG, the recording party NCOIC, or the mine-dump NCOIC.

b. The laying party NCOIC task-organizes his party into carrier, sapper, and digging teams. The NCOIC directs the laying party to conduct the following drill:

(1) The carrier team moves the vehicle to the row start point and lowers the armored personnel carrier (APC) ramp until it is horizontal or opens the rear door. (If using the APC ramp to distribute mines, chain the ramp open so it will support the soldier's weight.)

(2) The sapper team ties a rope to the end of the lowered ramp or tow pintle and ties a partially filled sandbag on the other end of the rope. The rope length from the end of the ramp door to the sandbag is the correct spacing between mines (Figure 1-6). The laying party NCOIC positions the team members. Soldier 1 is at the rear of the compartment, Soldier 2 sits on the edge of the APC ramp or the open door, and Soldier 3 walks behind the APC.

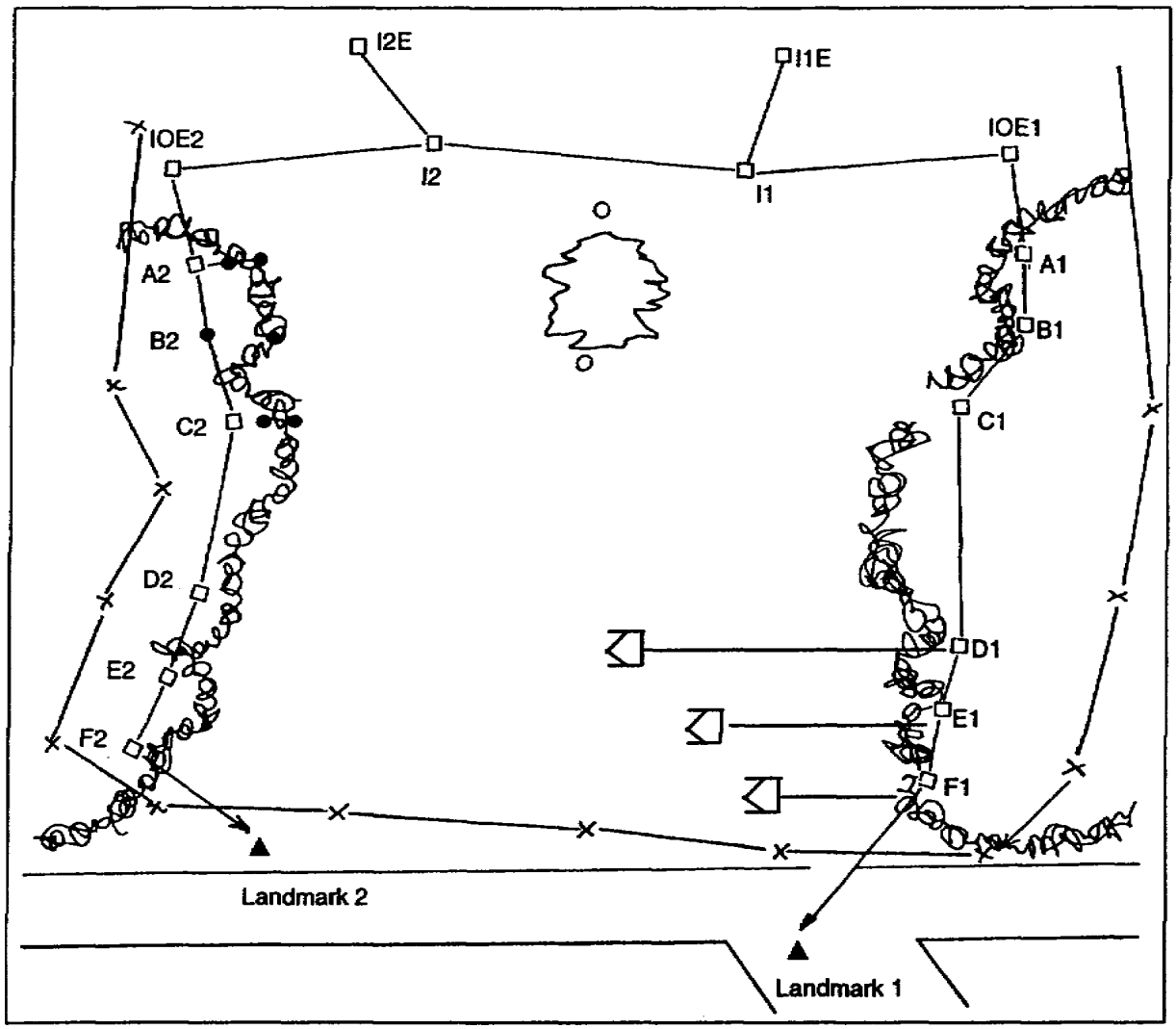

Figure 1-5. Laying Rows D, E, and F

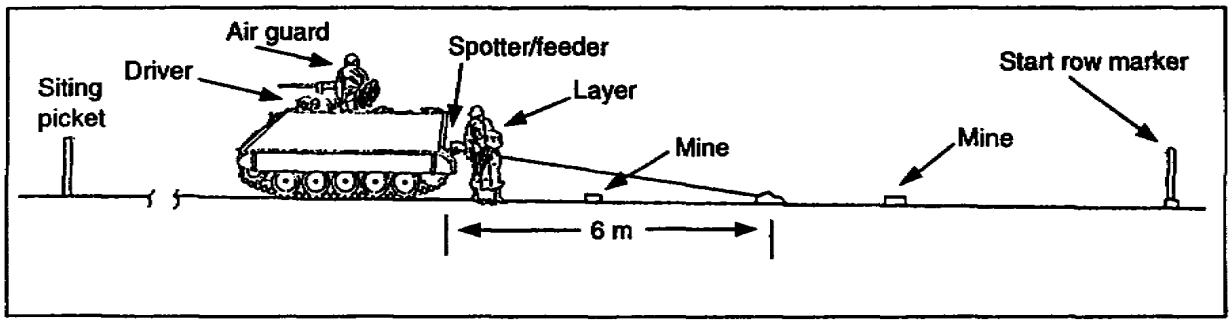

Figure 1-6. Measuring distances between mines with sandbags

(3) The carrier team moves the APC at low speed (2 to 3 miles per hour [MPH]) in a straight line toward the end row marker.

(4) The sapper and digging teams conduct the following:

- Soldier 1 (sapper team) fuses and passes a mine to Soldier 2. Soldier 2 records all issued mines on a strip feeder report.
- Soldier 2 (sapper team) places the fused mine on the ground when the sandbag tied to the rope is even with the previously laid mine.
- The digging team follows the sapper team on the friendly side of the row and digs in the mines (the mines are left exposed for the arming party) if mines are to be buried.
- Soldiers repeat the above steps until reaching the end of the row.
- Soldier 3 (arming party) walks behind the digging team and arms and camouflages all mines in the row.
- The laying party NCOIC walks behind the vehicle and supervises the mine laying.
- Soldier 4 (sapper team) buries the pins, clips, and shipping plugs 30 centimeters to the rear of each start row marker after the mine row is armed and camouflaged.

(5) After completing the row, the laying party moves to the next assigned row when directed by the OIC.

PART D - DIRECTING A RECORDING PARTY

1-10. General. The recording party consists of an NCOIC and one soldier. All minefields (except hasty protective row minefields) are recorded on Department of the Army (DA) Form 1355. Figures 1-7, 1-8 (page 1-12), and 1-9 (page 1-13) show samples of a completed DA Form 1355. The laying unit prepares the standard minefield record form. The OIC signs and forwards the form to the next higher command as soon as possible. After entering the information on the form, the form is classified as SECRET; North Atlantic Treaty Organization (NATO) SECRET; or SECRET-Republic of Korea, United States (ROKUS) depending on which countries are involved. The number of copies prepared depends on the minefield type and the unit's procedures. Unit standard operating procedures (SOPs) should provide advanced guidance on how to distribute minefield information to higher, lower, and adjacent commands. The OIC circulates minefield records only on a need-to-know basis. When a record is made, reproduce it at the lowest level having the equipment to make the copies. When used for training, the recorder marks the record SAMPLE. The recorder uses two or more DA Forms 1355 to record large minefields. When changes are made to an existing minefield, he prepares a new DA Form 1355 and marks this record REVISED. It shows the minefield as it is after the changes. The original minefield number remains unchanged.

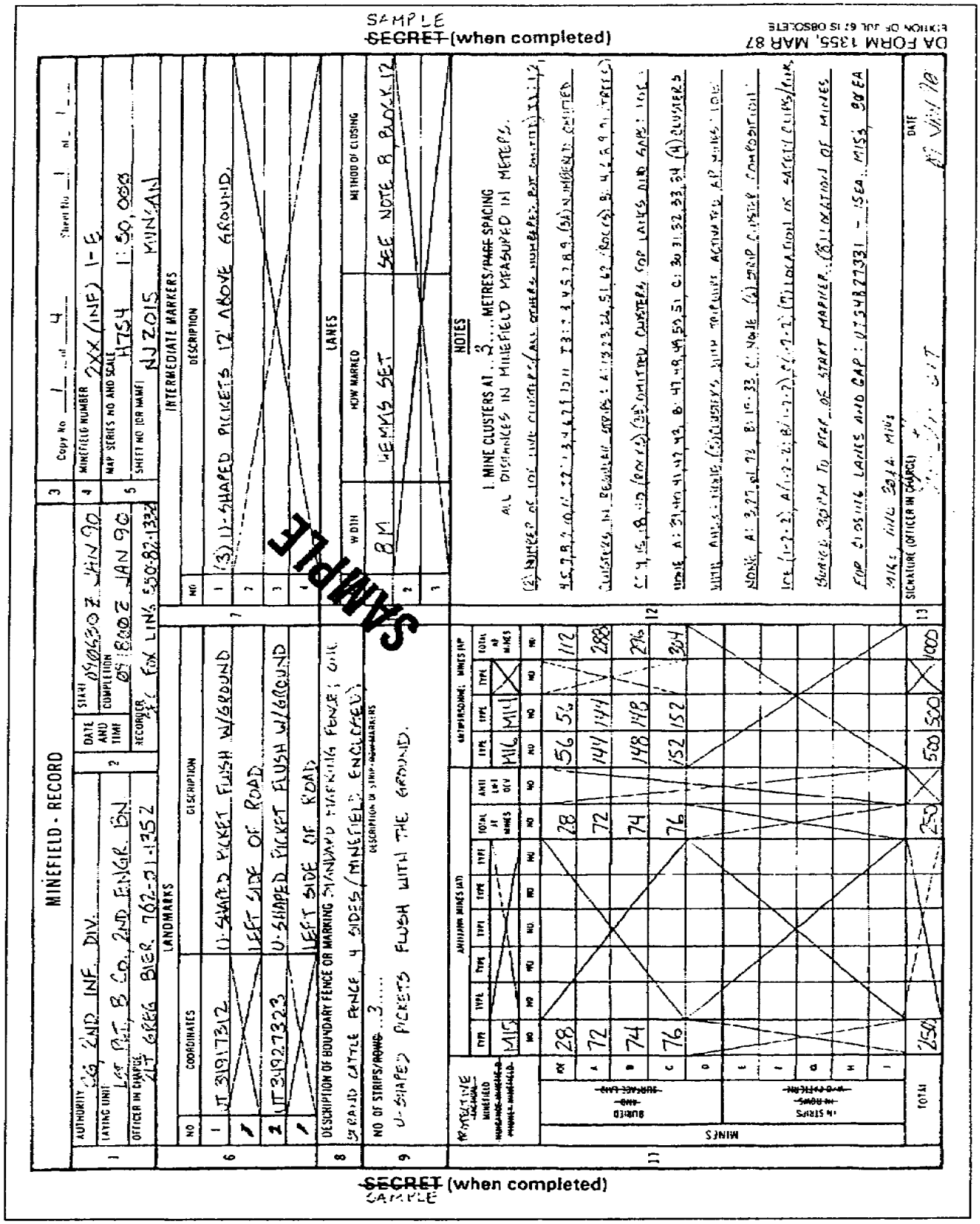

Figure 1-7. Sample DA Form 1355 (front side) for a standard-pattern minefield

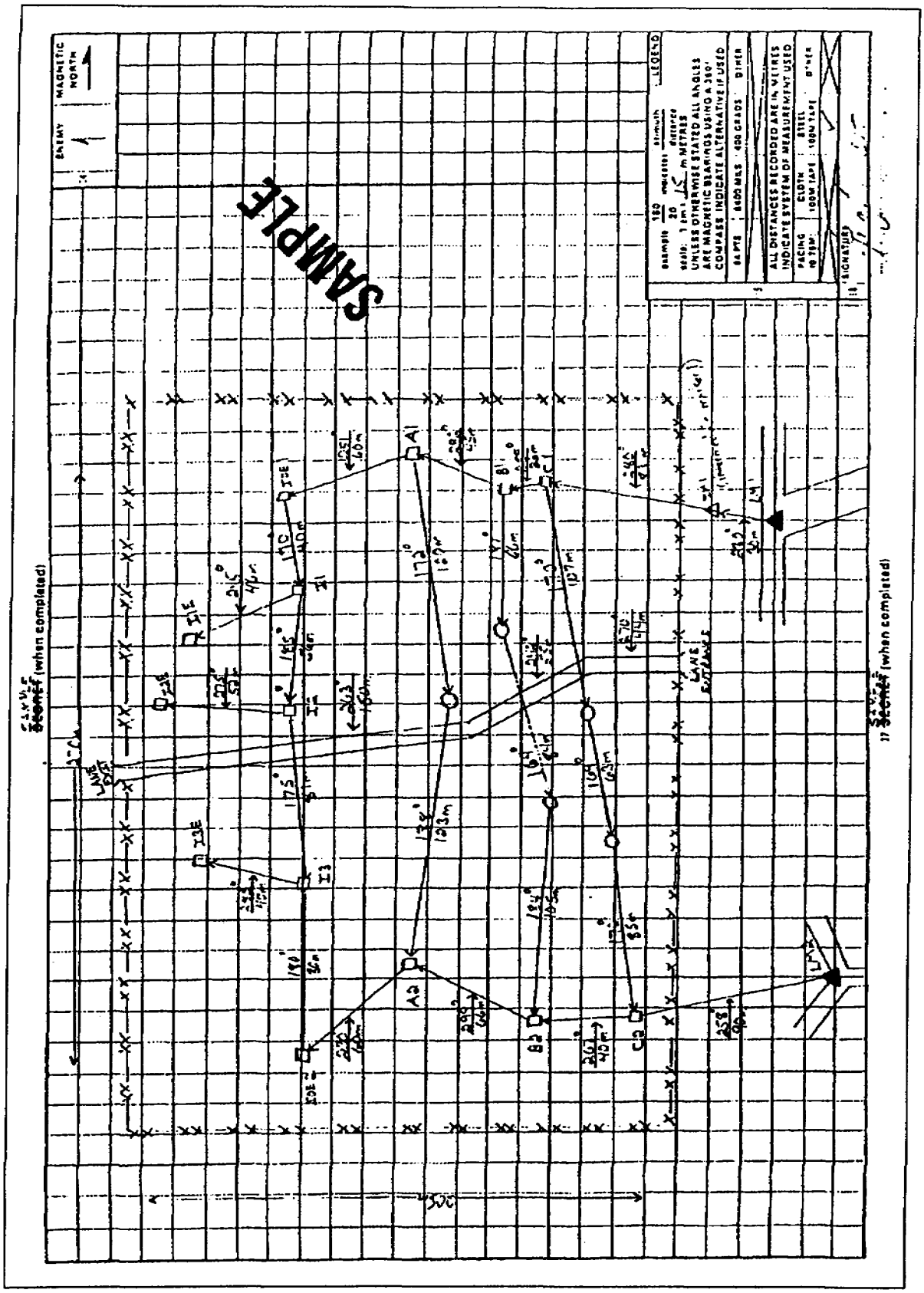

Figure 1-8. Sample DA Form 1355 (inside) for a standard-pattern minefield

Sample
~~SECRET~~ (when completed)

MINEFIELD REQUIREMENTS COMPUTATION FORMULA

		AT	APF	APB
Desired Density		a____	b____	c____
IOE Representative Cluster		a____	b____	c____
Front ____ meters				
Depth ____ meters				
AHD ____ %				
*1. No. of IOE Clusters = Front ÷ 9	____			
2. No. of IOE clusters x IOE Representative Cluster		a____	b____	c____
3. Mines in Minefield = Front x Desired Density		a____	b____	c____
4. Subtotal of Mines Required = Line 2 + Line 3		a____	b____	c____
*5. Mine Rejections, Strip Length Variances = Line 4 x .1		a____	b____	c____
6. Total AT Mines Required = Line 4 + Line 5		a____	b____	c____
7. Add a + b + c of "Desired Density" =	____			
*8. Line 7 x .6 =	____			
9. AT Mine "Desired Density" x 3 =	____			
10. No. of Regular Strips = Highest No. of Line 8 or 9	____			
*11. No. of AHD = % AHD x Total AT Mines (Line 6)	____			
12. Strip cluster Composition = Desired Density x 3		a____	b____	c____

* NOTE: Round up to the next whole number.

	STRIP	AT	APF	APB	ROW TOTAL (Cannot exceed 5)
"CLUSTER	A	a____	b____	c____	____
	B	a____	b____	c____	____
	C	a____	b____	c____	____
	D	a____	b____	c____	____
COMPOSITION	E	a____	b____	c____	____
	F	a____	b____	c____	____
	G	a____	b____	c____	____
	H	a____	b____	c____	____
TABLE"	I	a____	b____	c____	____
	J	a____	b____	c____	____
COLUMN TOTAL (Totals cannot exceed Line 12).		a____	b____	c____	____

TABULAR DATA (Numbers correspond to numbered blocks on front of form).

1. Enter complete data on authority of laying and on the laying unit. OIC blanks will include name, rank, and SSN.
2. Enter date-time groups for starting and completion times. Recorder blanks will include name, rank, and SSN.
3. Enter copy and sheet numbers. Number of copies will depend upon unit SOP and the classification of the minefield. The number of sheets will depend upon the length and the depth of the minefield versus scale.
4. Enter minefield number as follows:

   Designation of unit authorizing installation ——
   Number of obstacle ——
   Status of obstacle ——
   (E=Executed, P=Proposed, U=Under Construction). 3/147-Inf-2-E

5. Enter map data as stated on map(s) used.
6. Enter complete data on at least two landmarks with 8 digit grid coordinates. Cross out unused blocks.
7. Enter description(s) of any intermediate markers used. When a landmark is more than 200 meters from the minefield or the strip/row reference stake cannot be seen from the landmark, an intermediate marker must be used. If possible, the intermediate marker should not be closer than 75 meters to the strip/row reference stake. Cross out unused blocks.
8. Enter the word "Standard" when the standard marking fence is used as the boundary marking if other than the standard marking fence is used.
9. Enter the number of strips/rows laid other than IOE. Describe the strips/rows in meters (Line out words not applicable).
10. Enter the width, marking, and closing provisions for each lane; when appropriate, give the type and number of mines for closing. The location of these mines is described in the "Notes" (Line 12). Patrol lanes are 1 meter wide, one-way vehicular lanes are 8 meters and two-way vehicular lanes are 16 meters. Cross out unused blocks.
11. Enter type of minefield by crossing out lines not needed. Indicate method of laying by marking out incorrect descriptions. Enter types of mines as AT, APF, APB. (Enter chemical mines under AT mines). For each type of mine, enter number of mines and antihandling devices installed in the IOE and in each Strip or Row. Strips or Rows will be lettered serially, starting with the first one laid. Enter totals. Cross out unused blocks.
12. Enter under Notes information which would be useful to personnel clearing the minefield. Appropriate items include location of chemical mines, location of AT mines with antihandling devices, location AP mines with tripwires, clusters in IOE which contain mines, where safety devices are buried, strip cluster composition and numbered omitted clusters in regular strips.
13. OIC enters signature, rank and date.
14. Enter arrows for the direction of the enemy and magnetic north. The enemy arrow should always point within the top 180 degrees of the paper; the north arrow should follow one of the lines of the graph.
15. Enter scale of sketch for standard pattern minefields the sketch should be drawn to a scale of about 1cm=10 meters.
16. Sketch in the following, as applicable.
    a. Show directional arrows as follows:
       (1) Landmarks (or intermediate markers) to strip markers at starting and finishing points of the last strip laid or to the nearest or farthest mine in a group.
       (2) From landmarks (or intermediate markers) to fence or boundary markers.
       (3) From landmarks to intermediate markers, if used.
       (4) For each straight line section of a lane centerline.
       (5) Between markers of starting points of adjacent strips, including IOE, and between finishing points of adjacent strips, including (IOE).
       (6) For each segment of a strip or of the IOE, label all directional arrows with magnetic azimuth in degrees and distance in meters. Express as a fraction (247 degrees/90 meters). Recorded from friendly to enemy side and from right to left/or left to right.
    b. Show approximate location of protective fence or boundary markers.
    c. Show length and depth of minefield in meters. These dimensions indicate the extremities of the minefield.
    d. Show a grid intersection and give grid coordinates.
    e. Show trace of shoreline and direction and approximate rate in meters per second of water current, for mines laid underwater.
17. Enter security classification of the form. (If the form is used for training, enter the word SAMPLE.)
18. OIC enters signature and rank.

SAMPLE

Sample
~~SECRET~~ (when completed)

Figure 1-9. Sample DA Form 1355 (back side) for a standard-pattern minefield

1-11. Recording Process.

a. The recording party's primary duty is to complete DA Form 1355. This form consists of a single sheet printed on both sides. One side contains information about the minefield and the other side is a graph consisting of 1-centimeter squares for a scaled sketch of the field. The scale for plotting minefields depends on the minefield's size. To avoid using two sheets for the sketch, the recorder adjusts the scale so that one form will support the sketch. FM 20-32 provides instructions for completing a DA Form 1355.

b. The NCOIC obtains the following information from the siting, marking, and laying parties:

- The types of stakes used as boundaries and the minefield's layout from the siting party's NCOIC.
- The measurements and azimuth readings from the siting party. At a minimum, the location of the following items must be provided:
  - First landmark to right (or left) rear boundary stake.
  - Intermediate markers, if used.
  - Right (or left) boundary toward enemy.
  - IOE short rows and IOE row.
  - Each row's centerline, starting from the one nearest the enemy side.
  - Right (or left) rear boundary stake.
- The location of the following from the marking party's NCOIC:
  - Boundary fence or markers.
  - Marking signs.
  - Safety lanes or gaps.
- The strip feeder reports from the laying party's NCOIC.

c. The NCOIC verifies that the measurements taken are accurate and recorded in meters. The NCOIC transfers the information obtained from the other parties to a DA Form 1355 according to the instructions given in FM 20-32.

d. The OIC or the NCOIC draws a sketch on the DA Form 1355 showing the following:

- The basic pattern of the minefield (to scale).
- Safety lanes or gaps.

- Arrows indicating the direction the azimuths are plotted.

- The location of the boundary fence and any important landmarks (roads or rivers).

e. The OIC forwards minefield records through operational channels to the theater army headquarter (TAHQ) where the theater engineer will maintain them on file. If a TAHQ has not been established, the unit maintains minefield records with the assistant corps engineer in whose area of operation (AO) the minefield is located.

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LESSON 1

PRACTICE EXERCISE

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

1. A minefield located in the rear of the battle area must be marked_____.

   A. only on the rear side
   B. on all sides
   C. on the enemy side
   D. only on the friendly side

2. The perimeter fence should be at least_____meters from the nearest mine.

   A. 10
   B. 15
   C. 20
   D. 25

3. The top strand of barbwire in a standard perimeter fence should be about high.

   A. waist
   B. head
   C. ankle
   D. knee

4. If an IOE is required, what is the distance (in meters) between the IOE baseline and Row A?

   A. 10
   B. 8
   C. 15
   D. 20

5. All vehicles must exit the minefield down the right (or left) boundary and out the_____.

   A. right side
   B. left side
   C. front
   D. rear

6. Which team is required to fuse, lay, and record each mine?

A. Carrier
B. Sapper
C. Digging
D. Arming

7. Record conventional minefields on DA Form_____.

A. 204
B. 1355
C. 1355-1-R
D. 13

8. Which of the following locations is not obtained by the recording party?

A. Intermediate markers
B. IOE short rows
C. Row centerline
D. Mine dump

9. If a TAHQ has not been established, who maintains the DA Form 1355?

A. The divisional engineer brigade headquarters
B. The unit
C. The assistant corps engineer in whose AO the minefield is located
D. The engineer battalion headquarters

10. The distance between intermediate markers in a row depends on the terrain, but it should not exceed_____meters.

A. 50
B. 75
C. 100
D. 125

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LESSON 1

PRACTICE EXERCISE

ANSWER KEY AND FEEDBACK

Item	Correct Answer and Feedback
1.	B. on all sides (Part B, paragraph 1-3)
2.	B. 15 (Part B, paragraph 1-6a)
3.	A. waist (Part B, paragraph 1-6b, step 6)
4.	C. 15 (Part C, paragraph 1-8a)
5.	D. rear (Part C, paragraph 1-8h)
6.	B. Sapper (Part C, paragraph 1-9b[4])
7.	B. 1355 (Part D, paragraph 1-10)
8.	D. Mine dump (Part D, paragraph 1-11b)
9.	C. The assistant corps engineer in whose AO the minefield is located (Part D, paragraph 1-11e)
10.	C. 100 (Part A, paragraph 1-2c)

LESSON 2

HASTY PROTECTIVE ROW MINEFIELD

Critical Task: 051-192-3032

OVERVIEW

LESSON DESCRIPTION:

This lesson discusses the procedures used to emplace, record, and remove a hasty protective row minefield. Part A provides basic information on the procedures and requirements for emplacing and recording a hasty protective row minefield. Part B provides basic information on the procedures for removing a hasty protective row minefield.

TERMINAL LEARNING OBJECTIVE:

ACTION: You will learn to identify the requirements and describe the procedures used to emplace, record, and remove a hasty protective row minefield.

CONDITION: You will be given the material contained in this lesson.

STANDARD: You will correctly answer all practice-exercise questions at the end of this lesson.

REFERENCE: The material contained in this lesson was derived from FM 20-32.

INTRODUCTION

Hasty protective row minefields are temporary in nature and are used as part of a unit's defensive perimeter. Units usually lay hasty protective row minefields using mines from their basic load.

PART A - EMPLACING AND RECORDING A HASTY PROTECTIVE ROW MINEFIELD

2-1. General. If time permits, mines are buried to increase their effectiveness; but they may be surface-laid. Minefield recovery is easy because antihandling devices (AHDs), nonmetallic mines, and low-metallic mines are not used. Employ mines outside the

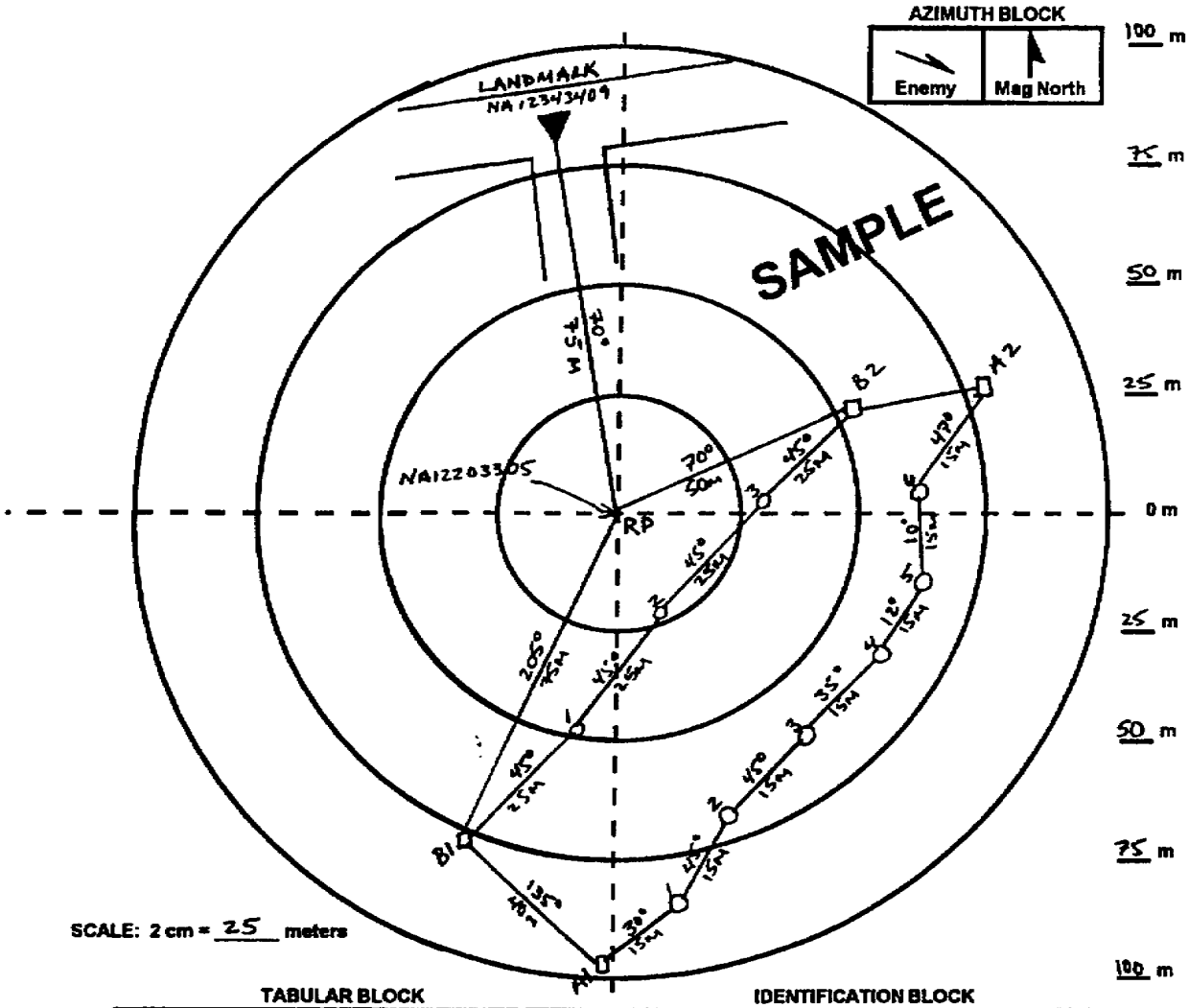
hand-grenade range but within the range of small caliber weapons. Unless the minefield is being transferred to a relieving commander, the emplacing unit will pick up all mines (unless enemy pressure prevents mine retrieval) upon leaving the area.

2-2. Rules. The brigade commander has the initial authority to employ hasty protective row minefields. This authority may be delegated to the battalion or company commander. Marking rules are the same for hasty protective row minefields as for other row minefields. A summary of those rules is shown below:

- Rows.
  - Rows are marked and recorded. Designate each row with a capital letter (A, B, and so forth) with Row A being closest to the enemy.
  - The minimum distance between AT mine rows is 8 meters.
  - The distance between the start row marker and the first mine in a row is the mine spacing for that row.
  - An IOE row is not used.
  - Start and end row markers are permanent markers and must be made of detectable material.
- General.
  - The spacing between mines is at least 4 meters to prevent sympathetic detonation. There is no maximum distance between mines within a row.
  - Mines are at least 15 meters from the perimeter fence.
  - The minefield must be fenced on all sides if M18A1 AP mines are employed and the minefield will be in place for over 72 hours.
  - The minefield has at least one landmark that is located to the rear, never to the extreme side or front.
  - The minefield has an easily identifiable reference point (RP) (tree, stump, stake).
  - Back azimuths are not used to record the minefield.
  - Measurements are recorded in meters.
  - AHDs, nonmetallic mines, or low-metallic mines are not used.
  - Hasty protective row minefields are recorded on DA Form 1355-1-R (Figure 2-1).

HASTY PROTECTIVE ROW MINEFIELD RECORD

For use of this form, see FM 20-32; the proponent agency is TRADOC.



TABULAR BLOCK

Row	Type	Actuation	Mine Number
A	M16A1	Tripwire	1, 2, 6
A	M21	Pressure	3, 4, 5
B	M16A1	Tripwire	1, 3
B	M18A1	Controlled	2

Remarks: Points A1, B1, A2, B2 are marked with orange tent pegs flush with ground.

IDENTIFICATION BLOCK

Unit: 2nd Platoon, Dco, 16th Engr Bn	
Reference Point(s): Tree stump side of road with white engr tape at NA 12203305	
Remarks: Landmark is road junction at NA 12343409.	
Map & Sheet No. TALBOT 5568	
Name of OIC: 2LT ALLAN SSN: 123-45-6789	
Signature: A J Allan	Time & Date: 2000 16 Jul 96
Mines Removed	
Mines Transferred	

DA Form 1355-1-R, Jul 96 (This form supersedes all previous forms)

Figure 2-1. Sample DA Form 1355-1-R

2-3. Site Layout.

a. Requesting and receiving permission to lay mines is the first step when emplacing a hasty protective row minefield. Conducting a thorough leader's reconnaissance of the proposed minefield area is next. Mine locations that cover likely avenues of approach (AAs), enhance key weapon systems, and cover dead space are identified. Establish an easily identifiable RP between the minefield and the unit's position. After the reconnaissance, mines are emplaced but not armed. From the RP, visualize the mines as running in rows parallel to the unit position (Figure 2-2). After establishing a RP and visualizing the minefield, complete a record and emplace the mines concurrently. This procedure simplifies recording and makes retrieval quicker and safer.

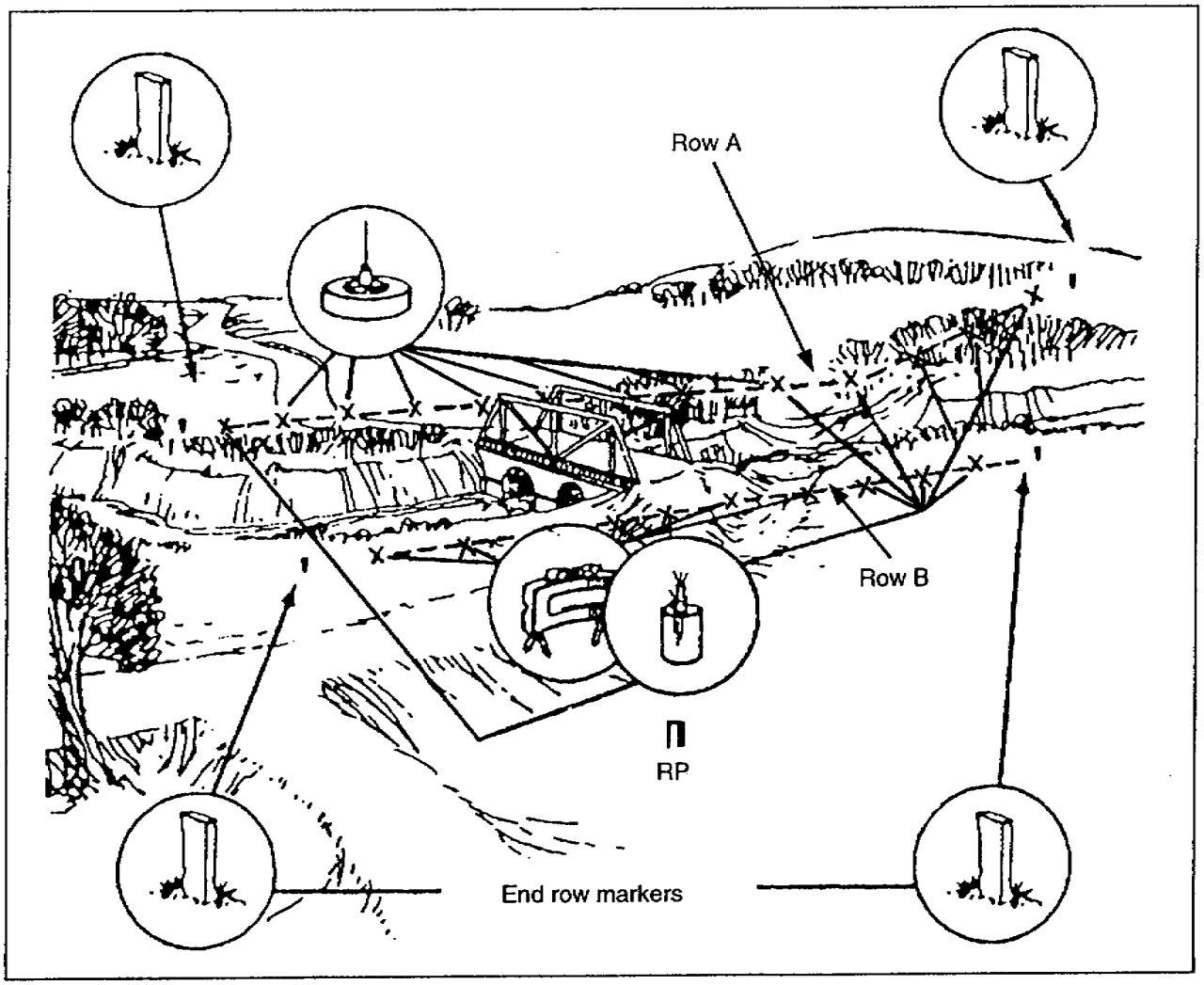


Figure 2-2. Site layout

b. Designate the row closest to the enemy as Row A; designate succeeding rows as B, C, D, and so on. Show the ends of rows by two end row markers. Label them with the letter of the row and the number 1 for the right end of the row or the number 2 for the left end of the row. Number the rows from right to left facing the enemy. The marker should be an easily identifiable object, such as a wooden stake with a nail or a steel picket, so that it can be found with the AN/PSS-12 mine detector.

2-4. Emplacement and Recording Procedures.

a. From the RP, the NCOIC measures the magnetic azimuth in degrees to a selected point on the right side (facing the enemy) of the tentative minefield. Pace off the distance and record it in meters. Identify the measurement method in the remarks block on a DA Form 1355-1-R (for example, pace out distances and multiply by 0.75 to convert the measurement to meters). This point, called B1 (if there are two rows), marks the beginning of the second row. Place a marker at B1 and record the azimuth and the distance on DA Form 1355-1-R (Figure 2-3).

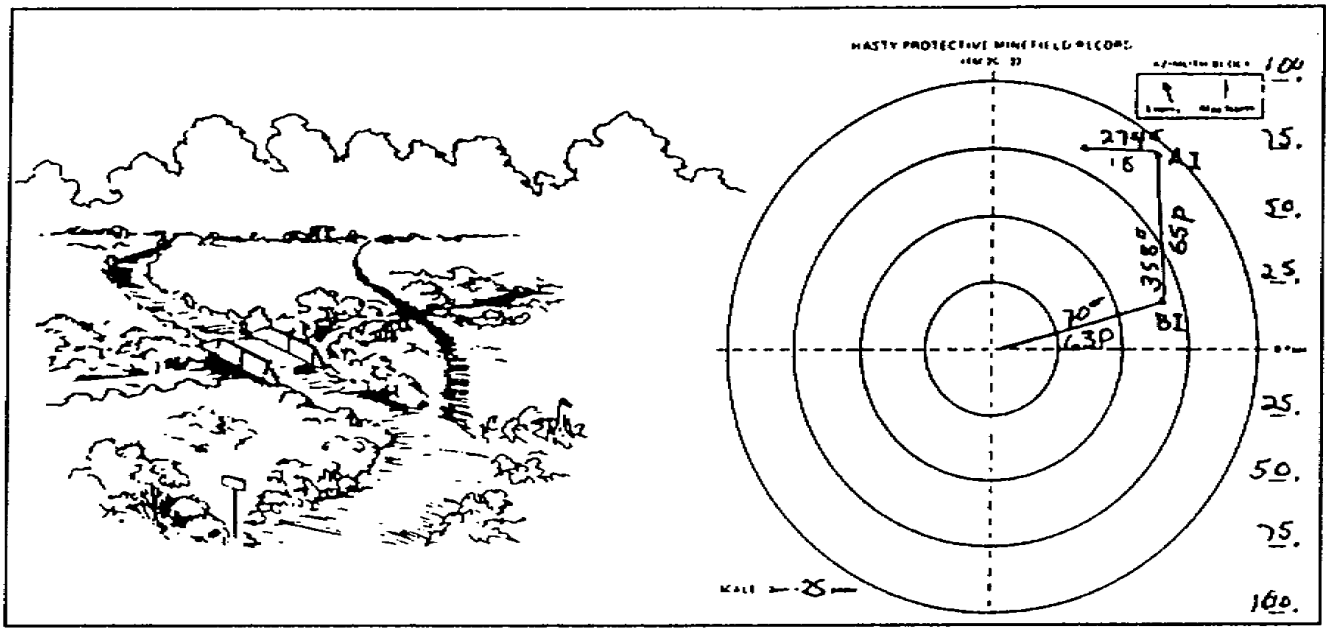


Figure 2-3. Hasty protective row minefield record

b. From B1, the NCOIC measures the azimuth and distance to a second point on the right side of the minefield (facing the enemy). Place a marker at this point and record it as A1.

c. The NCOIC measures and records the distance and azimuth from A1 to the location of the first mine in that row. The distance from the end row marker to the first mine is the distance between all mines in that row. After recording the location, the mine is emplaced but not armed.

d. The NCOIC measures the azimuth and the distance from the first mine to the second, and so on, until all mines are emplaced and the locations are recorded. Repeat this procedure for the second row.

e. As each mine is recorded, the NCOIC assigns it a number to identify it in the minefield record. When the last mine location is recorded for a row, measure the azimuth and the distance from that point to another arbitrary point, A2 or B2. Place a marker here in the same manner as A1 and B1. Next, record the distance and the azimuth from the RP to B2 and from B2 to A2.

f. When all the mines have been placed and recorded, the NCOIC measures the azimuth and the distance between the RP and a permanent landmark that can be found on the map. Record this information on DA Form 1355-1-R. The landmark is used to assist others in locating the minefield if it is transferred or unexpectedly abandoned.

g. Mines can be armed after recording is complete. The NCOIC directs the soldiers to arm the mines starting at the mine nearest the enemy first. This will allow the soldiers to safely work their way back to the unit's position. Pins and clips can be buried 30 centimeters behind row markers, the RP, or any easily identifiable, accessible location. Record the location of the pins and clips in the remarks section on DA Form 1355-1-R. The NCOIC then reports the completion of the minefield to higher headquarters.

h. If the minefield is transferred to another unit, the gaining unit leader is briefed by the transferring unit leader. The gaining unit leader signs and dates the mines-transferred block on the DA Form 1355-1-R. Destroy the form when the minefield is removed. If the minefield is abandoned unexpectedly, forward the DA Form 1355-1-R to higher headquarters.

PART B - REMOVING A HASTY PROTECTIVE ROW MINEFIELD

2-5. General. Before removing mines, the NCOIC must first determine which of the following two methods to use:

- If the minefield has been under constant observation from the time it was laid and has not been tampered with, the NCOIC directs the personnel who laid the mines to pick up the same mines. Use DA Form 1355-1-R, preceded by a mine detector, to determine the types of mines to be removed and where they are located.

- If the minefield has not been under constant observation, may have been tampered with, or the personnel who laid the mines are not available (or do not remember the location of the mines), the NCOIC uses DA Form 1355-1-R and a clearance team (outlined in FM 20-32) to locate and remove mines.

2-6. Removal Procedures.

a. The NCOIC retrieves the safety clips, shipping plugs, and any other items that accompanied the emplaced mines.

b. The removal team starts at the RP, moves to B1 (using the azimuth and distance measurements provided on the DA Form 1355-1-R), and then moves from B1 to the mine and removes the mine. If B1 is destroyed, the team moves from the RP to B2 using the same azimuth and distance measurements. The team then shoots a back azimuth from B2 to the first mine and removes the mine. Continue this process until all mines are removed.

c. The removal team observes basic safety precautions by maintaining a 30-meter dispersion between removal personnel, not running, and only moving around in cleared areas. Starting with the row closest to the defender and working toward the enemy, they--

- Check the sides and bottoms for AHDs and then disarm or mark the mines.
- Replace all pins, clips, or other safety devices before the mine is removed from the ground.
- Turn any arming dials to SAFE or UNARMED; or if the mine has a screw-type fuse, remove the fuse and take it away from the mine.
  - If the mine was placed and kept in sight by the individual who removes it, lift it directly from the hole after rendering it safe.
  - If the mine has not been kept in sight, attach a 60-meter-long rope or wire around the mine, take cover, and pull the mine from the hole.
- Place a tick mark beside each mine on the DA Form 1355-1-R as it is removed.
- Assemble all the mines in one location for accountability.

NOTE: AHDs are not used in hasty protective row minefields. However, as a safety precaution, consider all mines to be equipped with AHDs until proven otherwise.

d. The NCOIC confirms the removal of the mines and accounts for the number of mines, by type, as recorded on the DA Form 1355-1-R. The NCOIC may find it necessary to confirm an exploded mine to account for all the mines. To confirm a mine explosion that was not witnessed, identify the crater or traces of burnt soil made by the detonated mine. Place a tick mark beside the mine number on the DA Form 1355-1-R. Make sure any craters found in the vicinity of a mine were caused by a land mine and not by artillery. A mine crater (depending on the mine's size) is normally shallow and circular and shows burnt-soil traces. The impact and soil dispersion of artillery is generally elongated.

e. After the squad leader confirms that each mine is disarmed and safe, the removal team cleans the serviceable mines for future use and destroys the others. Mines are then packed in their original containers and stored according to the unit's SOP. The removal team removes and stores the row markers. The NCOIC submits a report to higher headquarters stating that the minefield has been removed and that the area is clear.

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LESSON 2

PRACTICE EXERCISE

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

1. What form is used to record a hasty protective row minefield?

   A. DA Form 721-1
   B. DA Form 1553-1
   C. DA Form 1368
   D. DA Form 1355-1-R

2. A minefield must be fenced on all sides if M18A1 AP mines are employed and the minefield will be in place for over____hours.

   A. 24
   B. 48
   C. 72
   D. 96

3. Mines farthest from the enemy are armed first.

   A. True
   B. False

4. The spacing between mines is at least_____meters to prevent sympathetic detonation.

   A. 5
   B. 12
   C. 6
   D. 4

5. The_____has the initial authority to employ hasty protective row minefields.

   A. brigade commander
   B. battalion commander
   C. company commander
   D. platoon leader

6. What is the minimum distance (in meters) between AT mine rows in a hasty protective row minefield?

A. 10
B. 8
C. 15
D. 20

7. During removal procedures, the removal team moves from the RP to B1 and finds that B1 is destroyed. What is the next course of action?

A. Move from the RP to B2 using the same azimuth and distance measurements.
B. Shoot the azimuth to Al and then to the first mine in Row A.
C. Shoot the azimuth to the first mine after reaching where B1 was supposed to be.
D. Wait for the person who installed the B1 marker to verify its location.

8. What is the minimum distance (in meters) required between personnel removing mines?

A. 25
B. 30
C. 35
D. 40

9. What is the first step for the removal team?

A. Turn the dials to SAFE or UNARMED.
B. Place a tick mark beside each mine on the DA Form 1355-1-R.
C. Replace all pins, clips, and other safety devices.
D. Check the sides and bottoms for AHDs and then disarm or mark the mines.

10. Once a hasty protective row minefield has been removed, the servicable mines are_____.

A. destroyed
B. turned in to the ammunition supply point
C. cleaned and packed in their original containers and stored according to the unit's SOP
D. transferred to another unit to use in their defensive position

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LESSON 2

PRACTICE EXERCISE

ANSWER KEY AND FEEDBACK

Item	Correct Answer and Feedback
1.	D. DA Form 1355-1-R (Part A, paragraph 2-4a)
2.	C. 72 (Part A, paragraph 2-2)
3.	B. False (Part A, paragraph 2-4g)
4.	D. 4 (Part A, paragraph 2-2)
5.	A. brigade commander (Part A, paragraph 2-2)
6.	B. 8 (Part A, paragraph 2-2)
7.	A. Move from the RP to B2 using the same azimuth and distance measurements. (Part B, paragraph 2-6b)
8.	B. 30 (Part B, paragraph 2-6c)
9.	D. Check the sides and bottoms for AHDs and then disarm or mark the mines. (Part B, paragraph 2-6c)
10.	C. cleaned and packed in their original containers and stored according to the unit's SOP (Part B, paragraph 2-6e)

LESSON 3

MINEFIELD RECONNAISSANCE

Critical Task: 051-192-3034

OVERVIEW

LESSON DESCRIPTION:

This lesson discusses the procedures used to conduct a minefield reconnaissance. These procedures include the planning; the gathering of technical information; the proper recording of this information on the reconnaissance form; and finally, the techniques used on a reconnaissance.

TERMINAL LEARNING OBJECTIVE:

ACTION: You will learn to identify the requirements and describe the procedures used to conduct a minefield reconnaissance and to prepare the supporting report.

CONDITION: You will be given the material contained in this lesson.

STANDARD: You will correctly answer all practice-exercise questions at the end of this lesson.

REFERENCE: The material contained in this lesson was derived from FM 20-32.

INTRODUCTION

Successful combined arms reconnaissance requires extensive training. Engineers train alone to hone their individual and collective skills. They also train with scouts, which fosters habitual integration of engineers with maneuver forces for reconnaissance missions.

3-1. General.

a. The information gained from minefield reconnaissance assists a commander in refining a scheme of maneuver, in planning, and in task-organizing for breaching operations. Engineers are trained to evaluate the technical aspects of a minefield. Normally, engineers supporting heavy forces reconnoiter enemy tactical minefields and light engineers infiltrate to reconnoiter protective minefields. Scouts concentrate on other intelligence requirements.

b. The staff engineer integrates engineers into a maneuver reconnaissance and surveillance (R&S) plan and coordinates the plan with other R&S plans, artillery fires, infiltration lanes, and follow-on missions. Engineer company and platoon R&S plans include-

- Issuance of a warning order to subordinates that contains tentative minefield locations and specific requirements for information, equipment, and coordination.

- Early connection and coordination with scout elements.

- Maximum time for leaders to prepare for the mission.

c. Early connection of engineers, scouts, and maneuver personnel is critical for planning and preparation. Engineers participate in planning the passage of lines, routes, the R&S mission and objective, reports, consolidation, and minefield extraction. At a minimum, conduct rehearsals for actions on contact, at unexpected obstacles, and at the reconnaissance objective.

d. During movement, the R&S team avoids enemy contact by using concealed routes and limited visibility. The patrol establishes an objective rally point (ORP) short of the minefield. The R&S leader issues a contingency plan prior to R&S teams leaving the ORP.

e. Engineer R&S teams then move to the R&S locations and establish security. R&S team NCOICs ensure that patrolling activity does not compromise selected breaching locations. The amount of patrolling should be similar at all possible attack points. Do not leave behind evidence of patrolling activities.

3-2. Technical Information. R&S team NCOICs direct their teams to gather the following information from the reconnaissance:

- Minefield location. Plot the perimeter location on a large-scale map, and refer to recognizable landmarks.

- Perimeter description. Describe how the perimeter is fenced. If it is unfenced, describe how it is marked. If it is unmarked, describe how it was recognized.

- Nuisance-mines location. Indicate the location of nuisance mines. If you discover a nuisance mine forward of the minefield's outer edge, there may be others. Assembly areas might also be mined.

- Mine types. Indicate whether mines are AT, AP, or have unknown fuses (self-neutralized or SD). If possible, recover unknown or new mine specimens and note the details.

- Other devices. Describe the approximate location of booby traps, trip wires, flares, and antidisturbance devices that are observed on the reconnaissance.

- Laying method. Indicate whether mines are buried or surface-laid.

- Mine density and pattern. Indicate the mine spacing and the number of mine rows.

- Minefield depth. Provide the distance between strips or rows, and describe the markers.

- Safe lanes or gaps. Plot the location of suspected safe lanes or gaps, and describe their markings.

- Ground conditions. Include information on general soil and terrain conditions.

- Other obstacles. Plot the location and the construction of other obstacles.

- Enemy defenses. Describe the enemy's location and size. Include the location of enemy direct-fire weapons.

NOTE: Do not use engineers who are engaged in reconnaissance for obstacle intelligence (OBSTINTEL) to reduce obstacles during the reconnaissance.

3-3. Reconnaissance Technique. A minefield R&S team normally consists of an NCOIC and two soldiers (a prober and a detector operator). When several collocated sites require reconnaissance, several teams might be formed into a reconnaissance group. There is no established reconnaissance drill, but the following technique is convenient and ensures that each team's results are consistent and accurate:

a. The R&S team removes all equipment except flak vests, Kevlar helmets, and weapons. The team uses stealth and available cover during movement to the reconnaissance site. The reconnaissance is normally conducted when visibility is limited. Depending on the mine types likely to be encountered, the prober or the detector operator enters the minefield first.

b. The leading soldier (Soldier 1) enters the mined area and dispenses a cord or tape. Soldier 1 feels for trip wires and feels and probes for mines or other devices in a path about 1 meter wide. Soldier 1 marks located mines and reports their location to the NCOIC. The NCOIC stays about 5 meters behind Soldier 1 and ensures that Soldier 1 stays on the correct azimuth.

c. Distances from the start point can be recorded in several ways. After locating the mines, one method is for the NCOIC to tie a knot or a loop code in the cord or tape being dispensed by Soldier 1. When necessary, the NCOIC rotates Soldier 1 and Soldier 2. The relief soldier (Soldier 2) stays about 5 meters behind the NCOIC and uses a mine detector to search for deeply buried AT mines. The advance rate (depending on the terrain and soil conditions) is about 35 to 50 meters per hour. After gathering all of the information, the R&S team returns along the cord or tape and removes evidence of its activities.

d. The R&S team moves back to the ORP. The reconnaissance team conducts a debrief to eliminate redundant information. The team uses established unit procedures to report the information.

e. During extraction back to friendly lines, the team must again avoid enemy contact. The patrol communicates with the friendly passage point unit, exchanges far and near recognition signals, and conducts a passage of lines.

f. The engineer staff officer and the Intelligence Officer (United States Army)(S2) debrief the R&S units.

3-4. Reconnaissance Report. Each R&S team NCOIC will submit a detailed intelligence report to the next higher headquarters when the reconnaissance is complete. Figure 3-1 shows a sample OBSTINTEL report for a minefield.

Letter Designation	Explanation
A	Map sheet(s).
B	Date and time the information was collected.
C	Type of minefield (AT, AP, or mixed).
D	Grid references of minefield extremities, if known.
E	Depth of minefield.
F	Estimated time required to clear the minefield.
G	Estimated material and equipment required to clear the minefield.
H	Routes for bypassing the minefield, if any.
I-Y	Grid reference of lanes (entry and exit) and width of lanes, in meters.
Z	Additional information such as types of mines used, unknown mines, or types of booby traps.

Figure 3-1. Sample obstacle intelligence (OBSTINTEL) report

LESSON 3

PRACTICE EXERCISE

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

1. The advance rate (depending on the terrain and soil conditions) for a minefield R&S team is about_____to_____meters per hour.

   A. 20, 55
   B. 25, 45
   C. 30, 60
   D. 35, 50

2. Engineers who are in support of light forces reconnoiter_____minefields.

   A. tactical
   B. nuisance
   C. phony
   D. protective

3. Engineers who are engaged in reconnaissance for OBSTINTEL should be used to reduce obstacles during the reconnaissance.

   A. True
   B. False

4. Where is the NCOIC located during a minefield reconnaissance?

   A. Behind the prober
   B. Behind the detector operator
   C. Behind Soldier 1
   D. In front of Soldier 1

5. What are some "other devices" that R&S teams gather information about during a reconnaissance?

   A. Booby traps
   B. Mine signs
   C. Pickets
   D. Dead animals

LESSON 3

PRACTICE EXERCISE

ANSWER KEY AND FEEDBACK

Item	Correct Answer and Feedback
1.	D. 35, 50 (paragraph 3-3c)
2.	D. protective (paragraph 3-1a)
3.	B. False (paragraph 3-2)
4.	C. Behind Soldier 1 (paragraph 3-3b)
5.	A. Bobby traps (paragraph 3-2)

LESSON 4

MINE-CLEARANCE OPERATION

Critical Task: 051-192-3050

OVERVIEW

LESSON DESCRIPTION:

This lesson discusses the procedures used to plan and conduct a mine-clearance operation. This discussion includes the three elements of a company/team (security/assault, support, and sweep); the three route-clearance methods (linear, combat, and combined); the two types of sweep operations (deliberate and hasty); and mine threats, locations, disposition, and removal techniques.

TERMINAL LEARNING OBJECTIVE:

ACTION: You will learn to identify and describe the procedures used to plan and conduct a mine-clearance operation. You will identify the requirements for each task. You will understand the task organization, clearance methods, clearance types, and mine removal techniques and will recognize the disposition of suspected mines.

CONDITION: You will be given the material contained in this lesson.

STANDARD: You will correctly answer all practice-exercise questions at the end of this lesson.

REFERENCES: The material contained in this lesson was derived from FMs 5-250 and 20-32.

INTRODUCTION

Moving forces and material to any point in an AO is basic to combat power and often determines the combat operation's outcome. Maneuverability relies on the availability of lines of communication (LOC) within the AOs. During stability and support operations, clear LOC are essential to the movement of forces within the AOs. It is necessary to conduct clearance operations to ensure that LOC enable safe passage of combat, combat support, and combat service support organizations.

4-1. General. A mine-clearance operation is a combined arms operation. To conduct clearance operations, a battalion task force (TF) will normally focus a company/team as the main effort on the route proposed as the main supply route (MSR). The company/team is task-organized into three elements to ensure effective clearance operations:

- Security/assault. This element is comprised of two maneuver platoons and the maneuver company/team executive officer (XO). This element's mission is to provide flank security, rear security, and protection to the sweep element. It also neutralizes any hostile forces encountered by the clearance element. Additionally, this element has the responsibility to search for any suspected off-route mines.

- Support. This element is comprised of a maneuver platoon, an engineer squad, a mortar section, a medical team, a psychological operations (PSYOP) team, an explosive ordnance disposal (EOD) element (or one that is on call), and a forward observer. This element's mission is to control fires and fix the hostile force for the security/assault element to neutralize.

- Sweep. This element is comprised of a maneuver platoon, an engineer platoon (minus), and the maneuver team commander. The sweep element's mission is to sweep the route and reduce any mine or explosive threat.

4-2. Sweep Teams.

a. Within the sweep element, the engineer platoon (minus) is further task-organized into sweep teams. A sweep team is a trained detection team that searches for mines and explosive devices. A sweep team's organization depends on the type of sweep mission and the dimensions and condition of the road. A platoon-size sweep team can normally clear a 6-meter-wide path and a squad-size sweep team can normally clear a 2-meter-wide path. Additional engineer assets are necessary if the route is wider or if time does not permit multiple passes. Table 4-1 outlines a sweep team's personnel and equipment requirements.

Table 4-1. Personnel and equipment requirements for a sweep team

Personnel	Support Personnel	Equipment
NCOIC Mine-detector operators Probers/markers Radio operator Demolition teams	Medics Vehicle operator	One panel marker Operational map with required maneuver graphics Four smoke grenades (minimum) Six mine detectors (includes three backups) and extra batteries Two grappling hooks with 60 meters of rope each One demolition kit or bag for each demolition technician Six probes Mine marking material

b. The normal configuration for a squad-size sweep team is seven soldiers in a modified column (Figure 4-1). The squad leader supervises the entire sweep team's operation. This configuration is best-suited for sweeping routes in friendly territory that are not under constant surveillance.

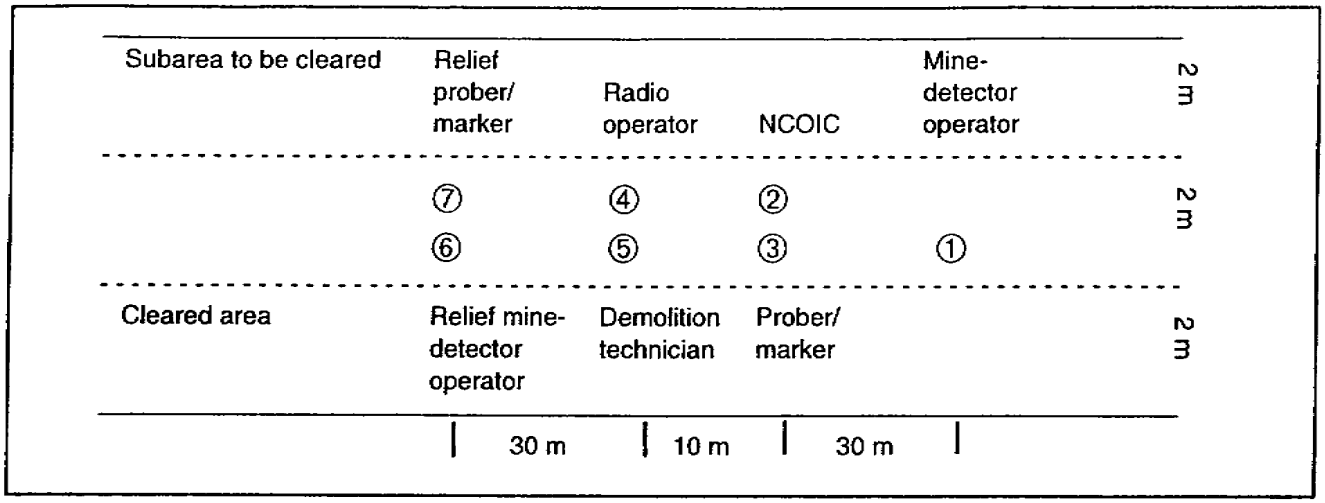

Figure 4-1. Squad-size sweep team

c. The NCOIC (or squad leader) will task-organize his element into the following configuration to conduct sweep operations.

(1) Soldier 1 (mine-detector operator) leads the sweep team and covers a 2-meter-wide path.

(2) Soldiers 2 (NCOIC) and 3 (prober/marker) follow 30 meters behind Soldier 1 and are centered in the cleared lane. The prober/marker is responsible for marking the cleared lane on both sides.

(3) Soldiers 4 (radio operator) and 5 (demolition technician) follow 10 meters behind Soldiers 2 and 3 and are centered in the cleared lane.

(4) Soldiers 6 (relief mine-detector operator) and 7 (relief prober/marker) follow 30 meters behind Soldiers 4 and 5 and are centered in the cleared lane. If the squad is not capable of filling all seven positions, the relief marker/prober position can be eliminated from the formation.

d. The engineer platoon leader has the option to configure the platoon into squad-size sweep teams and place them in echelon to clear a route (Figure 4-2, page 4-4) or to use the platoon-size configuration.

4-3. Clearance Methods.

a. The information gathered from the intelligence preparation of the battlefield (IPB) and the reconnaissance effort determines the clearance method and the type of sweep operation to conduct. The clearance method and the type of sweep depend on the situation, the available time, the threat level, and the available assets. Generally, the platoon leader or PSG will determine the clearance method and the type of sweep to be conducted. In all cases, the maneuver force should establish static security positions at critical locations following completion of route clearance.

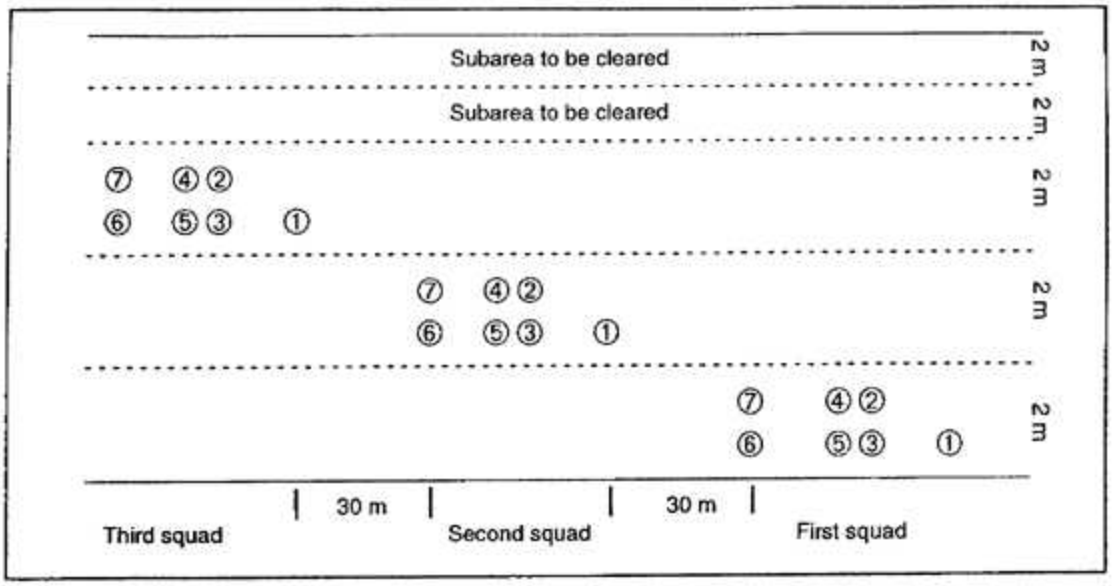

Figure 4-2. Sweep teams in echelon

b. There are three route-clearance methods-linear, combat, and combined:

- Linear. Sweep and security teams begin clearing from Point A and complete it at Point B (Figure 4-3). This method provides the best route coverage. Although this is an effective method, it is not the most secure method in a high-threat environment. It is time intensive and constrains the maneuver commander's flexibility.

- Combat Whereas linear clearance focuses on a specific route, combat clearance focuses on specific points along a route (Figure 4-4, page 4-6). IPBs and engineer battlefield assessments (EBAs) of a route can identify high-threat areas for likely mine and ambush locations. These areas become named areas of interest (NAIs), or objectives, for combat clearance missions. This method divides a route into sections according to the number of suspected high-threat areas. Once the sweep element (maneuver and engineer forces) secures and sweeps these areas, the route is considered dear. Combat forces can patrol the route from these objectives to ensure that the route is secure, and if necessary, the sweep element can sweep the surrounding area if a minefield is found. Following the seizure of these objectives, the commander must assume a moderate risk that the high-threat areas identified by his S2 and force engineer and cleared by the sweep teams might still contain mines. Combat clearance is ideal for dismounted (light) forces since it provides the maximum use of surprise and concealment.

- Combined. This method combines the complete clearance capabilities of the linear clearance method with the security and surprise element of the combat clearance method. This is a two-phased, force-intensive operation and may require a battalion-size effort, depending on the route's length.

IPBs and EBAs identify high-threat areas and target them as NAIs and/or objectives to secure. Then clear obstacles and enemy forces prior to the movement of the sweep elements. The sweep team then moves down the road and clears any obstacles missed or not identified during the planning process. This method's main advantage is that the TF commander has immediately secured his MSRs and can push out to find the enemy with a high degree of confidence that follow-on forces will be much safer.

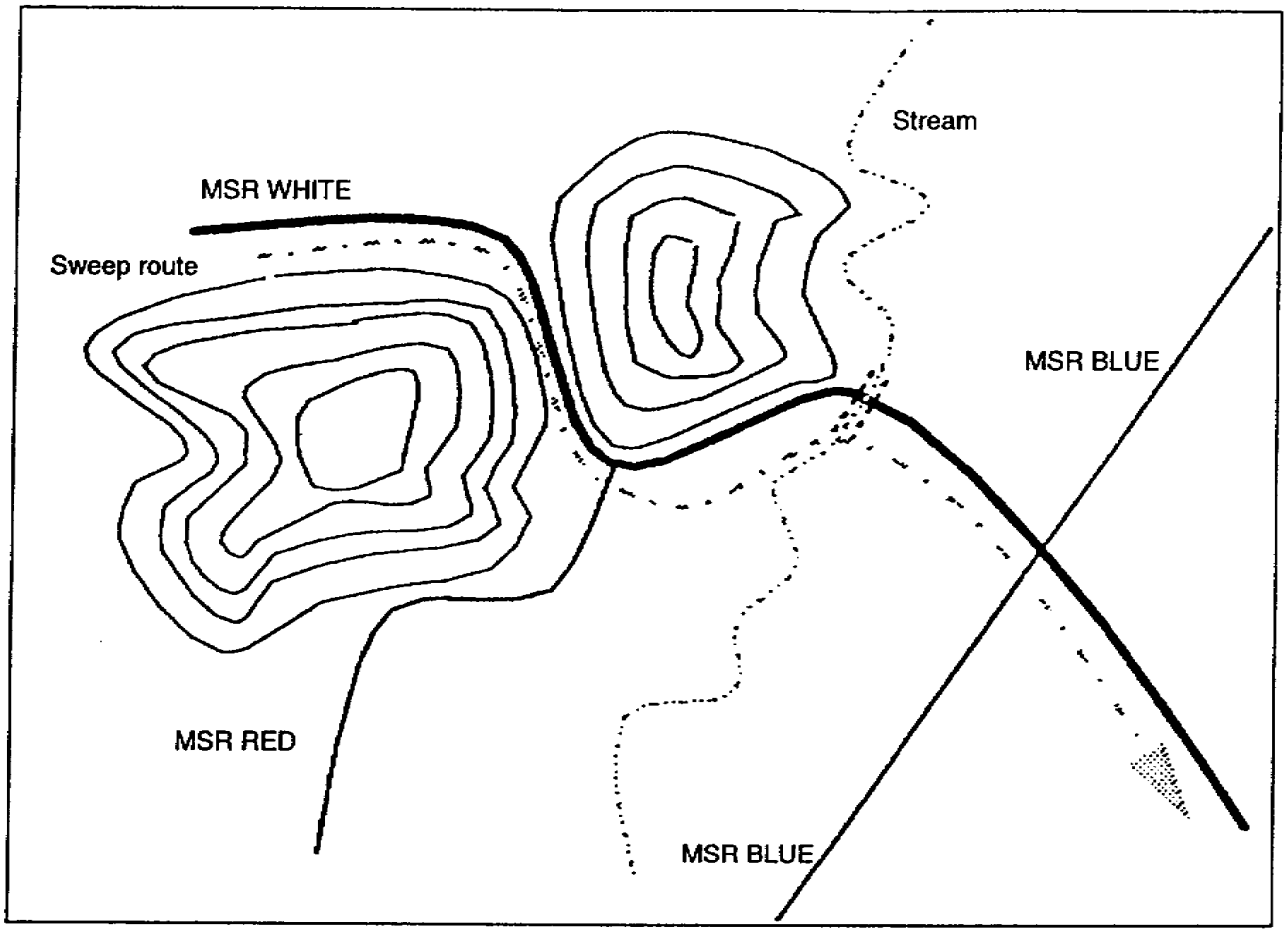

Figure 4-3. Linear clearance method

4-4. Sweep Operations. There are two types of sweep operations-deliberate and hasty. These clearance operations can be modified to meet the TF's time and equipment limitations. The commander assumes a greater risk when modifying the clearance type.

a. Deliberate sweep.

(1) A deliberate sweep (Figure 4-5, page 4-7) is very thorough and includes a complete sweep of the entire road (shoulders, culverts, ditches, and bridges). It is the most time-consuming sweep operation and relies on electronic (primary) and visual (secondary) detection systems. The sweep element is dismounted to focus its attention on the entire length of the route.

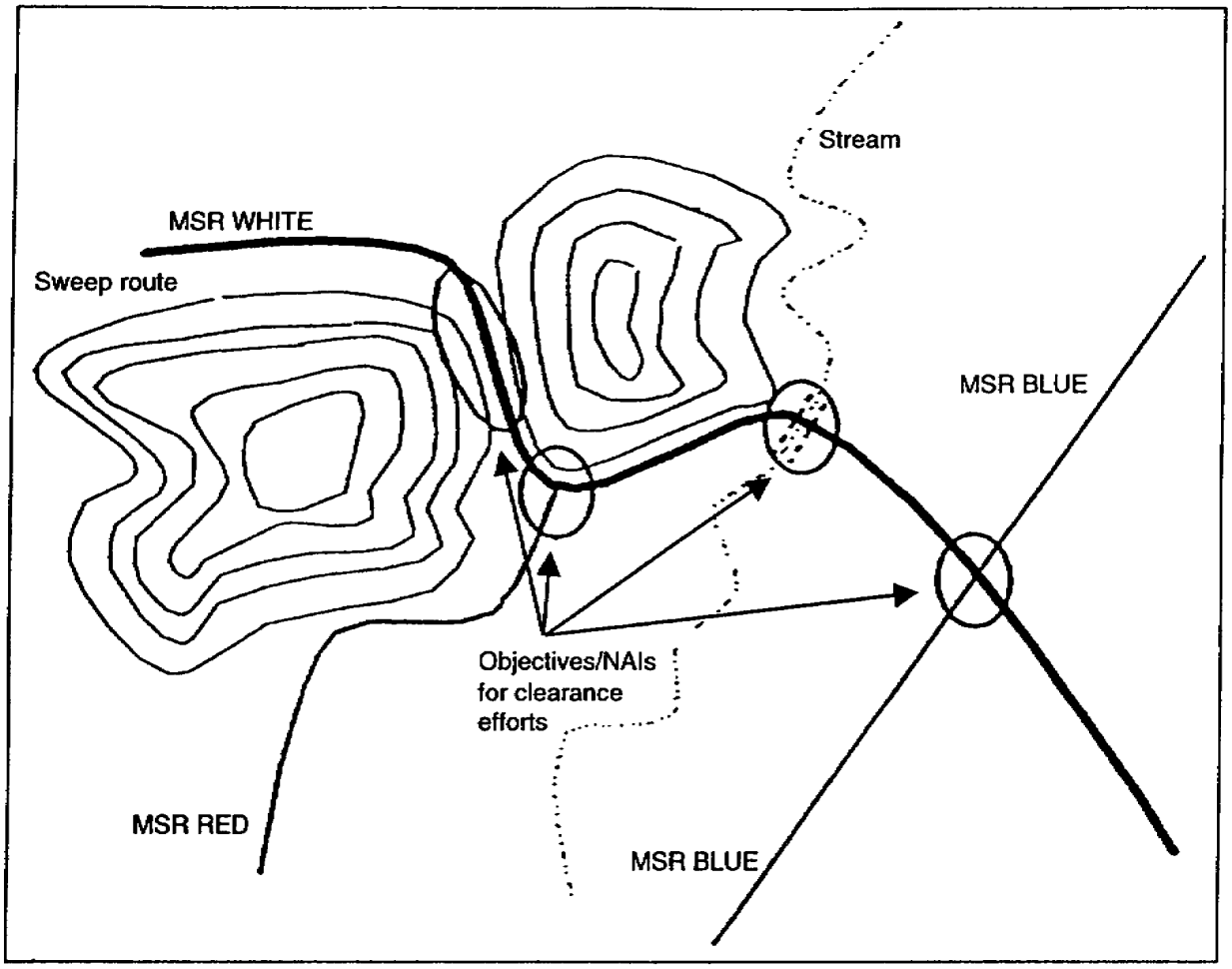

Figure 4-4. Combat clearance method

(2) The security/assault element (company-size) clears and secures at least 100 meters on the flank and 100 meters forward to clear possible enemy direct-fire systems and possible overwatch elements in front of the sweep element. This not only allows the sweep element to focus solely on the route but also clears the area of off-route and command-detonated mines. If enemy contact is made, the support force fixes the threat while the security/assault force reacts. The sweep element withdraws to a location that provides concealment and/or security.

(3) Mechanical detection provides a third detection means and is the only method used to proof the route after the sweep team has passed through the area. The deliberate sweep includes a route reconnaissance and looks at all route areas to include bypasses. The deliberate sweep focuses on thoroughness rather than speed. This method is very slow and tedious (an average of 80 to 100 meters can be covered per hour) and should only be used when time is not a factor.

b. Hasty sweep.

(1) A hasty sweep (Figure 4-6) consists of visual inspection, physical search or probing, and the use of mine detectors. It is the fastest, most risky method and is suited for an armored or mechanized team. It relies primarily upon visual detection (thermal sights or the naked eye) for minefield identification. The sweep element looks for mines, wire, or

other minefield indicators (such as disturbed earth and obstacles). The road surface, culverts, ditches, and bridges are inspected and searched. Visual detection is accompanied by a mechanical proofing system, such as the mine-clearing roller (MCR), as an additional detection system. Sweep teams use electronic mine detectors to check all suspected areas. The security/assault and support teams consist of a maneuver platoon to provide overwatching fire and/or security.

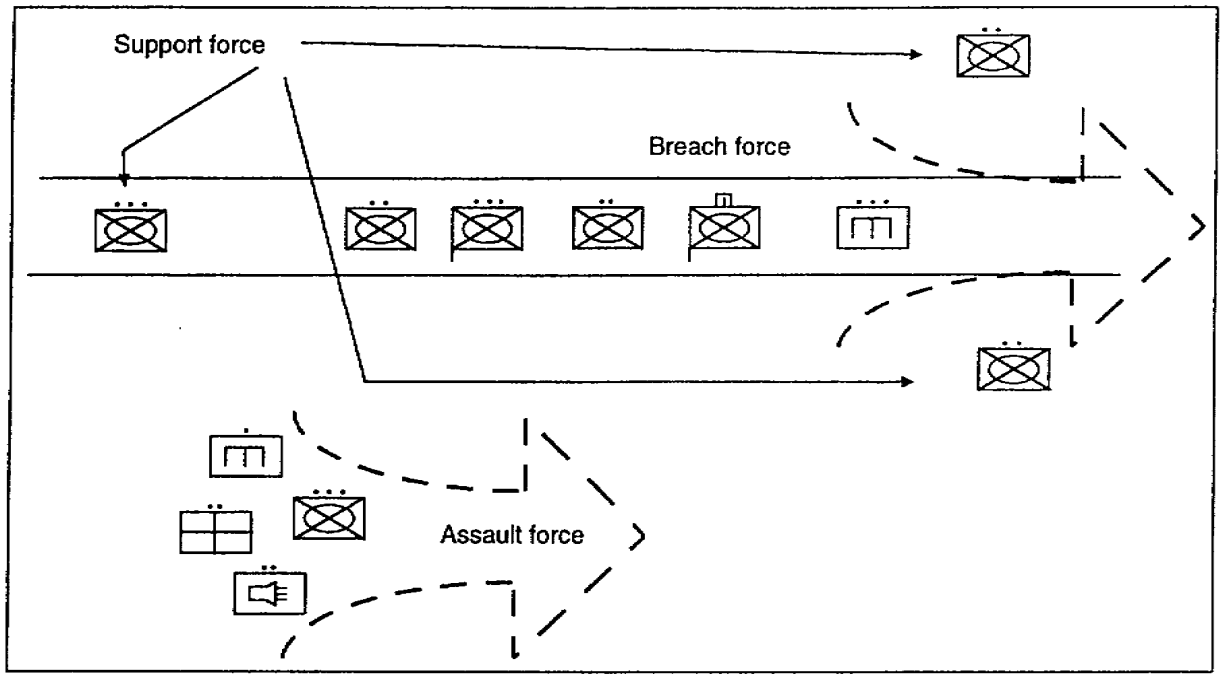

Figure 4-5. Deliberate route clearance

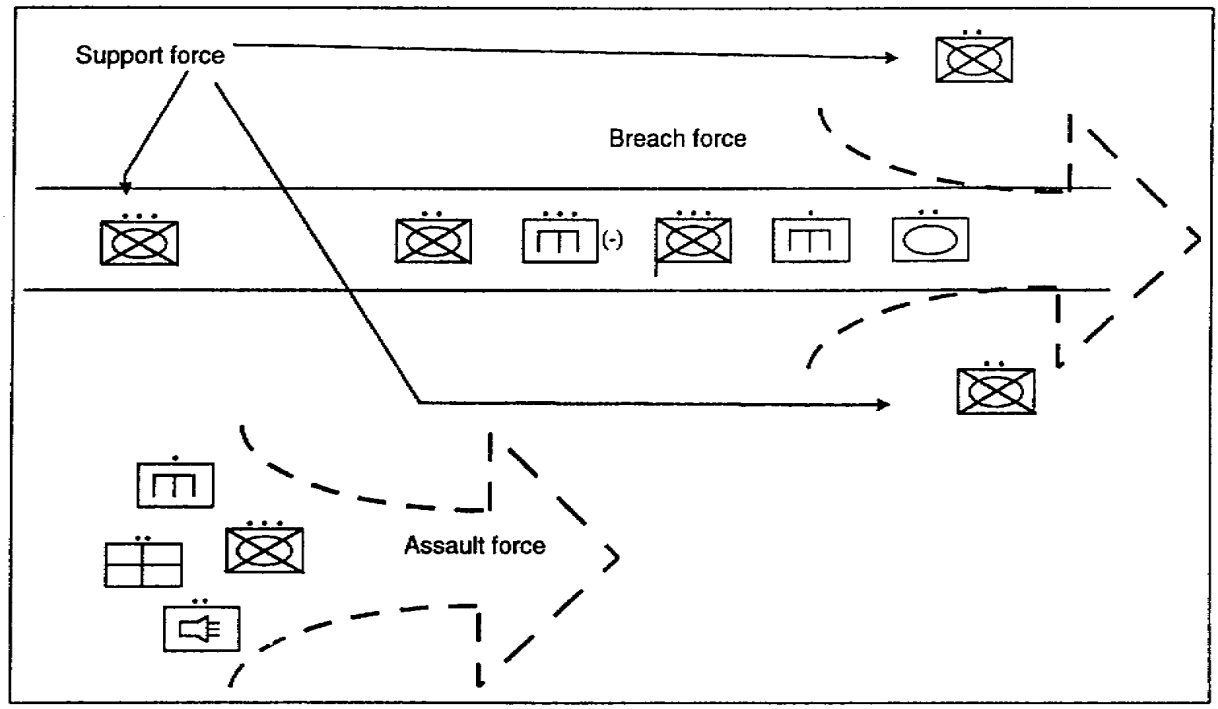

Figure 4-6. Hasty route clearance

(2) Actions upon enemy contact are the same as in a deliberate sweep. This technique's primary objective is speed, moving at about 3 to 5 kilometers per hour (kph). This method is extremely similar to the instride breach method when encountering minefields. The sweep team focuses on identifying immediate risks to traffic, neutralizing those risks, and continuing on with the mission. A hasty sweep is used during the combat clearance method to validate the areas that were not deliberately cleared by the sweep team. It is also used if the mission, enemy, terrain, troops, and time available (METT-T) analysis does not permit a deliberate sweep or if the need for a road to be opened is urgent. Additional time and distance factors may be imposed.

(3) A light force may not have an MCR but can conduct the same sweep method with an improvised roller system, or the force can use a sandbagged, 5-ton truck moving backwards as a last resort. Using MCRs or their equivalent is absolutely imperative due to the high risk of encountering a minefield. The mine rake or mine plow is not a satisfactory substitute because it destroys road surfaces.

4-5. Improvised Mine Threat.

a. Mines are employed conventionally by military forces organic to the host nation or its enemies and also by terrorists against allied forces or the host-country populace. In these cases, the threat increases due to the improvised methods in which the mines were emplaced. In conventional mine emplacement, a pattern emerges from the emplacing force's doctrine, and the threat can easily be reduced by this knowledge. There is less of a pattern in improvised mining methods, which makes detection and removal very difficult.

b. Improvised mining has many different employment techniques. In most of the techniques described below, an unexploded ordnance (UXO) can easily be employed in place of a mine. It is extremely important that the sweep team's NCOIC ensures that the team members understand and recognize these techniques.

(1) Coupling mines. Coupling is done by linking one mine to another, usually with a detonating cord. When the initial mine is detonated, it detonates the linked mine. This technique is used to defeat countermine equipment.

(2) Boosting mines. Buried mines are stacked atop one another, and the farthest mine from the surface is fused. This reduces the probability of detection and increases the blast force.

(3) Sensitizing antitank mines. On some nonmetallic AT mines, the pressure plate can be cracked and the spring removed or the mine's explosive can be cut into smaller blocks and be employed as powerful AP mines. Metallic AT mines can have the pressure plate removed and be employed in the same manner. Alternatively, a pressure-fused AP mine can be placed atop an AT mine.

(4) Mixing training mines with live mines. Training mines can be employed at the start of a minefield with live mines emplaced toward the end. The sweep element believes that the minefield is phony and becomes complacent in its reduction activities. When using this technique, live mines are painted to resemble training mines.

(5) Daisy-chaining mines. Command-detonated and AP mines are commonly used in daisy chaining. The mines are linked with trip wires or detonating cord. As in coupling, all the mines will detonate when the initial mine is detonated.

4-6. Mine Locations. Whether using conventional or improvised mining, hostile forces normally place more than one mine in each mined area. The NCOIC must ensure that the team members do not focus detection efforts solely on a horizontal mine threat (such as on the ground or in culverts). The mine threat is also vertical (such as in trees or attached to an overpass). Clearance efforts must accommodate the three-dimensional battlefield. Mines may be placed in-

- Frequently used roadways and road junctions.
- Brush and other traffic obstructions placed on roadways.
- Bridge bypasses and fording sites.
- Obvious turnarounds, bypasses, culverts, ditches, and shoulders.
- Key logistic points (water, fuel, food).
- Debris along a route.

4-7. Mine Disposition.

a. The sweep team's NCOIC will direct the team to take the following actions after finding a suspected mine:

- Pinpoint the suspected mine and mark the location. Do not leave any mine unmarked.
- Search for electric wires or trip wires in the immediate area. Trace the wires in both directions to determine if items are attached to them. If nothing is attached and the IPB does not state otherwise, cut loose trip wires and electric wires.

DANGER

Never cut taut trip wires. Alert the security element to search for an enemy who is overwatching a command-detonated mine. Keep troops away from the mine until all wires are traced and cut. Be alert for booby traps and ambush. If booby traps are found, use the clearance procedures outlined in FM 20-32.

- Conduct probing as follows (all other personnel should stay at least 30 meters away):
  - Roll up your sleeves and remove your jewelry to increase sensitivity. Wear a Kevlar helmet, with the chin strap buckled, and a protective fragmentation vest.

- Use a slender, nonmetallic object as a probe.

- Visually inspect the area to be probed.

- Stay close to the ground and move in a prone position to reduce the effects of an accidental blast.

- Scan forward up to 2 meters and to the sides up to 3 meters for mine indicators.

- Probe the suspected location, and uncover the object for identification, exposing only enough of the object to see whether it is a mine or debris.

- Use sight and touch to detect trip wires, fuses, and pressure prongs.

- Probe every 5 centimeters across a 1-meter front.

- Gently push the probe into the ground at an angle less than 45 degrees.

DANGER

Pushing the probe’s tip straight down may detonate a pressure fuse.

- Apply just enough pressure on the probe to sink it slowly into the ground.

- If the probe encounters resistance and does not go into the ground freely, carefully pick the soil away with the probe's tip and remove the loose dirt by hand. Care must be taken to prevent detonating a mine.

- If a solid object is touched, stop probing and carefully remove the surrounding soil with two fingers from each hand to determine what the object is.

  - If the object is a mine, remove enough soil to show the mine type. Mark its location and then notify the NCOIC. Do not attempt to remove or disarm the mine. Use explosives to destroy detected mines in place or use a grapnel hook and rope to cause mines to self-detonate. Do not use metal grappling hooks on magnetic-fused mines.

  - If the object is debris, get in a protected position and carefully remove the debris with a grapnel hook and a rope. Be alert for booby traps or AHDs wired to the debris.

b. Probing is extremely stressful and tedious. The NCOIC must limit the time a prober is actually probing the minefield. To determine a reasonable time, consider METT-T factors, the weather, the threat level, the unit's stress level, and the prober's fatigue level and state of mind. As a general rule, 20 to 30 minutes is the maximum time an individual can probe effectively.

4-8. Mine-Removal Techniques.

a. After locating and marking a mine, it can be bypassed, detonated in place, pulled out by a rope or a wire, or neutralized and removed by hand. The OIC decides the method to use depending on the mine's location, the mine type, the fuse type, and the tactical situation. The operation order (OPORD) addresses mine removal methods and actions, which are rehearsed prior to executing the mission. The team NCOIC assesses the situation and directs the team members to remove the mines.

b. Detonate trip-wire and tilt-rod mines by throwing a grapnel (with a rope attached) past the trip wire or tilt rod and pulling the grapnel back. Improvise grapnels from any available material such as a bent drift pin or scrap. Attach a 60-meter-long, light rope to the grapnel for hand throwing. Throw the grapnel and seek cover before it touches the ground in case its impact detonates a mine.

c. Hand-placed charges are the standard demolition materials used to destroy mines in place (see FM 5-250). A 1-pound block of explosive placed next to a mine is sufficient to detonate most mines. A charge must be placed next to each mine in a group, then the charges can be connected and detonated simultaneously.

d. Use rope or wire to pull a mine out of its emplaced position. This is a safe method and only detonates mines equipped with AHDs. It also reduces noise and cratering. A tripod (Figure 4-7, page 4-12) designed to obtain vertical lift on a mine makes it easier to pull a mine out of a hole on the first attempt. Use the following procedures to remove mines:

- Uncover only enough of the mine to expose a handle or a projection. Attach a 60-meter-long rope or wire to the mine or engage a grapnel. If there is no projection, engage a grapnel hook on the bottom side of the mine, opposite the direction of pull.

- Wait at least 30 seconds before leaving cover and approaching the mine if the mine type is unknown. This guards against the possibility of a delay firing mechanism.

- Ensure that the covered area is not mined. Take cover and lie in a prone position at least 50 meters from the mine. Pull the rope to remove the mine from the hole.

- Dispose of the mine according to the unit directive or SOP.

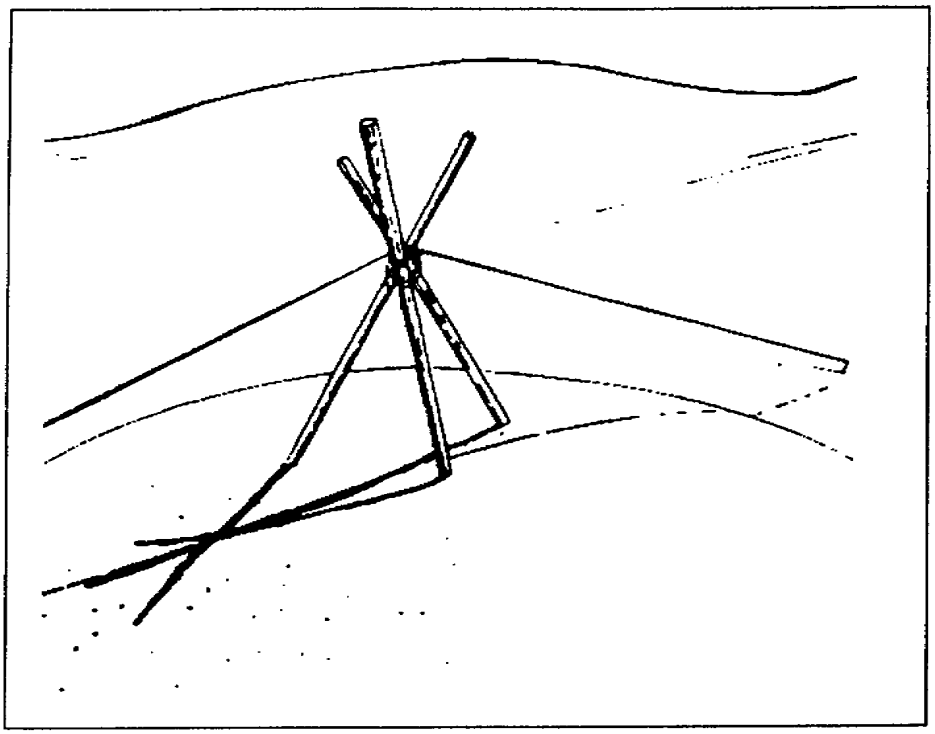

Figure 4-7. Tripod

4-9. Safety. The NCOIC ensures observation of the following safety procedures:

- Wear helmets and flak jackets to protect you from fragmentation. Sweep team members should wear Improved Body Armor System, Individual Countermine (IBASIC) protective garments if available.

- Sandbag all vehicle floorboards.

- Disperse vehicles at 50-meter intervals. This ensures that if one vehicle detonates a mine it will not cause casualties in other vehicles.

- Allow only one person at a time at a suspected mine location.

- Assume that mines and explosive devices have been equipped with AHDs until proven otherwise.

- Do not run and move in previously cleared areas only.

- Open the hatches on armored vehicles to vent the pressure pulse from a mine detonation.

- Wear ballistic and laser protective spectacles (BLPS) or lightly tinted, protective eyewear to reduce eye fatigue and improve your ability to recognize mine indicators.

4-10. Reports. The NCOIC submits progress and completion reports until the clearance operation is complete. Progress reports must be timely and accurate. Report format and frequency is established in the OPORD prior to the execution of the clearance mission.

LESSON 4

PRACTICE EXERCISE

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

1. What are the three route-clearance methods?

   A. Route, area, and combat
   B. Linear, route, and combined
   C. Combat, combined, and linear
   D. Combat, linear, and route

2. What are the two types of sweep operations?

   A. Route and hasty
   B. Deliberate and hasty
   C. Route and area
   D. Combat and deliberate

3. A squad-size sweep team can clear a____-meter-wide path.

   A. 6
   B. 4
   C. 2
   D. 1

4. A_____-meter-long, light rope is attached to a grapnel for hand-throwing.

   A. 3O
   B. 40
   C. 50
   D. 60

5. Detection efforts should be focused solely on a horizontal mine threat (such as on the ground or in culverts).

   A. True
   B. False

6. What is the distance (in meters) between the prober and the other personnel on a sweep team?

A. 30
B. 35
C. 40
D. 45

7. What is the maximum amount of time that an individual can probe effectively?

A. 10 to 20 minutes
B. 20 to 30 minutes
C. 30 to 40 minutes
D. 40 to 50 minutes

8. When using hand-placed charges, one 1-pound block of explosive must be placed next to each mine that must be destroyed.

A. True
B. False

9. In clearance operations, the company/team is task-organized into three elements. What are these three elements called?

A. Sweep, clearance, and support
B. Security/assault, sweep, and clearance
C. Support, combined, and deliberate
D. Sweep, support, and security/assault

10. When the NCOIC for a squad-size sweep team task-organizes his element, which soldiers follow 10 meters behind the prober/marker?

A. Mine-detector operators
B. Mine-dump operators
C. Relief prober/marker and mine-detector operator
D. Radio operator and demolition technician

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LESSON 4

PRACTICE EXERCISE

ANSWER KEY AND FEEDBACK

Item	Correct Answer and Feedback
1.	C. Combat, combined, and linear (paragraph 4-3b)
2.	B. Deliberate and hasty (paragraph 4-4)
3.	C. 2 (paragraph 4-2a)
4.	D. 60 (paragraph 4-8b)
5.	B. False (paragraph 4-6)
6.	A. 30 (paragraph 4-7a)
7.	B. 20 to 30 minutes (paragraph 4-7b)
8.	A. True (paragraph 4-8c)
9.	D. Sweep, support, and security/assault (paragraph 4-1)
10.	D. Radio operator and demolition technician (paragraph 4-2c[3])