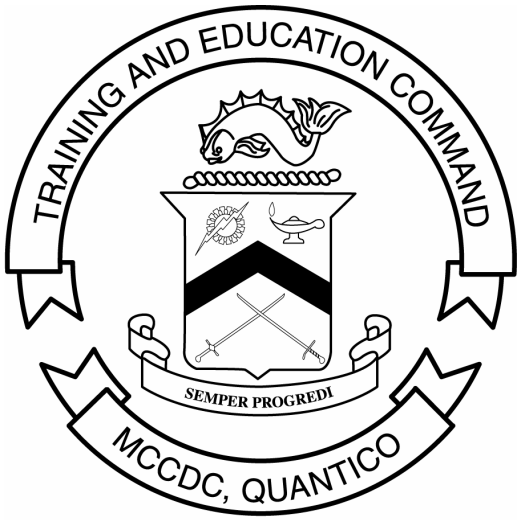
MCI 1374A

MARINE CORPS INSTITUTE



LANDMINE WARFARE

MARINE BARRACKS
WASHINGTON, DC

UNITED STATES MARINE CORPS
MARINE CORPS INSTITUTE
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IN REPLY REFER TO:
1550
Ser 1374
19 Mar 01

From: Director
To: Marine Corps Institute Student

Subj: LANDMINE WARFARE (MCI 1374)

1. Purpose. The subject course provides all marines with the general knowledge and guidelines applicable to landmine warfare.

2. Scope. This course will reinforce your knowledge of landmine operations and procedures acquired through formal training. Skills and knowledge are primarily maintained through training and this course will benefit you in this area.

3. Applicability. This course is intended for instructional purposes only. This course is designed for Marines in the ranks of private to master sergeant that are tasked with duties involving landmine operations.

4. Recommendations. Comments and recommendations on the contents of the course are invited and will aid in subsequent course revisions. Please complete the course evaluation questionnaire at the end of the final examination. Return the questionnaire and the examination booklet to your proctor.

G.E. GEARHARD
By direction

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Table of Contents

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Student Information

Number and Title	MCI 1374A LANDMINE WARFARE
Study Hours	6.5
Course Materials	Text
Review Agency	Commanding Officer Marine Corps Detachment U.S. Quartermaster Center and School Fort Lee, Virginia 23801-1726
Reserve Retirement Credits (RRC)	2
ACE	Not applicable to civilian training/education
Assistance	For administrative assistance, have your training officer or NCO log on to the MCI home page at www.mci.usmc.mil. Marines CONUS may call toll free 1-800-MCI-USMC. Marines worldwide may call commercial (202) 685-7596 or DSN 325-7596.

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Study Guide

Congratulations

Congratulations on your enrollment in a distance learning course from the Distance Learning and Technologies Department (DLTD) of the Marine Corps Institute (MCI). Since 1920, the Marine Corps Institute has been helping tens of thousands of hard-charging Marines, like you, improve their technical job performance skills through distance training. By enrolling in this course, you have shown a desire to improve the skills you have and master new skills to enhance your job performance. The distance learning course you have chosen, MCI 1374, *Landmine Warfare*, will reinforce your knowledge of landmine operations and procedures.

Your Personal Characteristics

- **YOU ARE PROPERLY MOTIVATED.** You have made a positive decision to get training on your own. Self-motivation is perhaps the most important force in learning or achieving anything. Doing whatever is necessary to learn is motivation. You have it!

- **YOU SEEK TO IMPROVE YOURSELF.** You are enrolled to improve those skills you already possess, and to learn new skills. When you improve yourself, you improve the Corps!

- **YOU HAVE THE INITIATIVE TO ACT.** By acting on your own, you have shown you are a self-starter, willing to reach out for opportunities to learn and grow.

- **YOU ACCEPT CHALLENGES.** You have self-confidence and believe in your ability to acquire knowledge and skills. You have the self-confidence to set goals and the ability to achieve them, enabling you to meet every challenge.

- **YOU ARE ABLE TO SET AND ACCOMPLISH PRACTICAL GOALS.** You are willing to commit time, effort, and the resources necessary to set and accomplish your goals. These professional traits will help you successfully complete this distance training course.

Continued on next page

Study Guide, Continued

Beginning Your Course

Before you actually begin this course of study, read the student information page. If you find any course materials missing, notify your training officer or training NCO. If you have all the required materials, you are ready to begin.

To begin your course of study, familiarize yourself with the structure of the course text. One way to do this is to read the table of contents. Notice the table of contents covers specific areas of study and the order in which they are presented. You will find the text divided into several study units. Each study unit is comprised of two or more lessons, lesson exercises, and finally, a study unit exercise.

Leafing Through the Text

Leaf through the text and look at the course. Read a few lesson exercise questions to get an idea of the type of material in the course. If the course has additional study aids, such as a handbook or plotting board, familiarize yourself with them.

The First Study Unit

Turn to the first page of study unit 1. On this page, you will find an introduction to the study unit and generally the first study unit lesson. Study unit lessons contain learning objectives, lesson text, and exercises.

Reading the Learning Objectives

Learning objectives describe in concise terms what the successful learner, you, will be able to do as a result of mastering the content of the lesson text. Read the objectives for each lesson and then read the lesson text. As you read the lesson text, make notes on the points you feel are important.

Completing the Exercises

To determine your mastery of the learning objectives and text, complete the exercises developed for you. Exercises are located at the end of each lesson, and at the end of each study unit. Without referring to the text, complete the exercise questions and then check your responses against those provided.

Continued on next page

Continuing to March

Continue on to the next lesson, repeating the above process until you have completed all lessons in the study unit. Follow the same procedures for each study unit in the course.

Seeking Assistance

If you have problems with the text or exercise items that you cannot solve, ask your training officer or training NCO for assistance. If they cannot help you, request assistance from your MCI distance learning instructor by completing the course content assistance request form located at the back of the course.

Preparing for the Final Examination

To prepare for your final examination, you must review what you learned in the course. The following suggestions will help make the review interesting and challenging.

- **CHALLENGE YOURSELF.** Try to recall the entire learning sequence without referring to the text. Can you do it? Now look back at the text to see if you have left anything out. This review should be interesting. Undoubtedly, you'll find you were not able to recall everything. But with a little effort, you'll be able to recall a great deal of the information.

- **USE UNUSED MINUTES.** Use your spare moments to review. Read your notes or a part of a study unit, rework exercise items, review again; you can do many of these things during the unused minutes of every day.

- **APPLY WHAT YOU HAVE LEARNED.** It is always best to use the skill or knowledge you've learned as soon as possible. If it isn't possible to actually use the skill or knowledge, at least try to imagine a situation in which you would apply this learning. For example make up and solve your own problems. Or, better still, make up and solve problems that use most of the elements of a study unit.

Continued on next page

Preparing for the Final Examination, continued

- **USE THE "SHAKEDOWN CRUISE" TECHNIQUE.** Ask another Marine to lend a hand by asking you questions about the course. Choose a particular study unit and let your buddy "fire away." This technique can be interesting and challenging for both of you!

- **MAKE REVIEWS FUN AND BENEFICIAL.** Reviews are good habits that enhance learning. They don't have to be long and tedious. In act, some learners find short reviews conducted more often prove more beneficial.

Tackling the Final Examination

When you have completed your study of the course material and are confident with the results attained on your study unit exercises, take the sealed envelope marked **"FINAL EXAM"** to your unit training NCO or training officer. Your training NCO or officer will administer the final examination and return the examination and the answer sheet to MCI for grading. Before taking your final examination, read the directions on the DP-37 answer sheet carefully.

Completing Your Course

The sooner you complete your course, the sooner you can better yourself by applying what you've learned! HOWEVER--you do have 2 years from the date of enrollment to complete this course.

Graduating!

As a graduate of this distance learning course and as a dedicated Marine, your job performance skills will improve, benefiting you, your unit, and the Marine Corps.

Semper Fidelis!

STUDY UNIT 1

U.S. CONVENTIONAL MINES

Overview

Introduction

On 24 February 1991, Task Force Ripper, composed primarily of the 1st Marine Division, began Operation Desert Storm and assaulted across no-man's land along the Saudi-Kuwaiti border. They breached the Iraqi defenses and spearheaded a vigorous attack that liberated Kuwait from the Iraqi invaders. This campaign is remarkable because the Allied forces moved through defended terrain and completely crushed any Iraqi resistance in less than 100 hours.

Maneuver warfare and Marine Corps doctrine rely on mobility and our ability to quickly maneuver on the battlefield and limit the ability of our enemy to do the same. Sun Tzu, the ancient Chinese military strategist, understood these concepts over a thousand years ago. Today, landmines are used to support Sun Tzu's tenet. They limit the enemy's ability to maneuver quickly on the battlefield, physically and mentally harass his forces, and force him to take the route of our choosing. Landmines are a relatively simple weapon system but think how a couple of concealed landmines could impede the mobility of Marines. Likewise, the proper employment of U.S. mines could bring our enemy's movement to a virtual halt.

Scope

This study unit describes the mechanics, characteristics, arming, and disarming procedures for U.S. conventional mines and antihandling devices. The purpose of this study unit is to provide you with the skills and knowledge necessary to safely install and remove U.S. conventional mines and antihandling devices.

In This Study Unit

This study unit contains the following lessons:

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LESSON 1

CHARACTERISTICS OF U.S. CONVENTIONAL MINES

Overview

Introduction

Mines are explosive devices emplaced for the express purpose of killing, destroying, or incapacitating enemy personnel and/or equipment. They can be employed in quantity within a specified area to form a minefield, or individually to reinforce nonexplosive obstacles.

Content

In this lesson, you learn about the terminology, types of mines, components, initiating actions, and types of fuzes.

Learning Objectives

Upon completion of this lesson, you should be able to

- Define each term used in conjunction with U.S. conventional mines.
- Match the five components of a mine with their function.
- List the 10 different types of initiating actions.
- List the four types of fuzes used in U.S. conventional mines.

In This Lesson

This lesson contains the following topics:

Terminology

Introduction

U.S. conventional mines have unique terms associated with them. As you complete your mission, remember these terms and their definitions. They will help you to complete your mission.

Definitions

The following list of terms and definitions are used in conjunction with mines:

Term	Definition
Initiating Action	The physical process required to trigger the mine.
Fuze	A complete assembly issued with a mine to complete the firing chain. The initiating action causes the fuze to function. The fuze produces a flame or concussion that sets off the detonator. The detonator sets off the booster (if present) or a main charge.
Fuzing	The act of installing a fuze into a mine.
Firing Devices (FDs) and Antihandling Devices (AHDs)	When assembled with a nonelectric detonator or activator, these devices may be attached and used as • A mine fuze • A boobytrap • To set off prepared explosive charges
Arming	The removal of all safety devices so the mine will detonate when an initiating action occurs.
Disarming	The installation of all safety devices that prevents the mine from detonating accidentally or when an initiating action occurs.
Neutralizing	The disarming or destruction of a mine by using explosives to destroy the mine in place. Note: Chemical mines are an exception to the use of explosives, as this would release the lethal gases they contain, so they must be disarmed.

Continued on next page

Definitions, continued

<table>
<tr><th>Term</th><th>Definition</th></tr>
<tr><td>Safety</td><td>A device found in fuzes, firing devices, and related components to help prevent accidental functioning. The three types of safeties are listed in the table below:
<table>
<tr><th>Type</th><th>Function</th></tr>
<tr><td>Locking Safety</td><td>Blocks any action or movement of moving parts.</td></tr>
<tr><td>Positive Safety</td><td>Prevents the striker from hitting the percussion cap.</td></tr>
<tr><td>Interlocking Safety</td><td>Blocks the removal of the positive safety until the locking safety has been removed.</td></tr>
</table></td></tr>
<tr><td>Boobytrapping</td><td>The installation of firing devices that causes detonation when the mine is tampered with or moved.</td></tr>
</table>

Types of Mines

Types of Mines

There are two types of conventional mines:

- Antipersonnel (AP) mines
- Antitank (AT) mines

Components of Mines

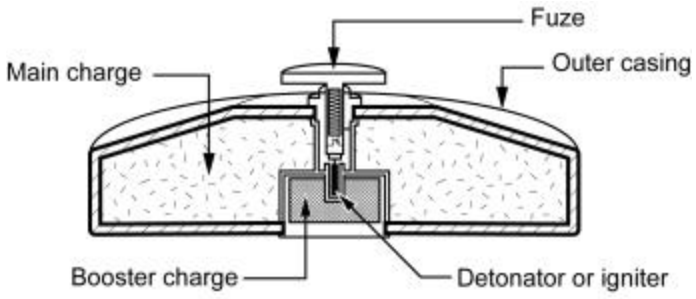
Components and Functions

Mines generally consist of the components listed in the table below:

Component	Function
Fuze or firing mechanism	Sets off the detonator or igniter charge
Detonator or igniter	Sets off the booster charge
Booster charge	Sets off the main charge, and may be attached to the fuze or igniter train or be part of the main charge
Main charge	Causes the mine to produce its desired affect and usually forms the body of the mine
Outer casing	Contains all of the components

Diagram

The components of a mine are identified in the diagram below:



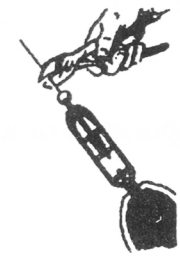
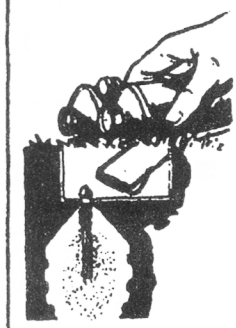
Initiating Actions

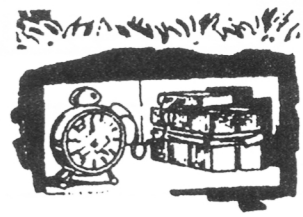
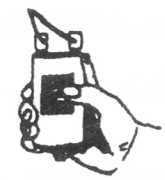
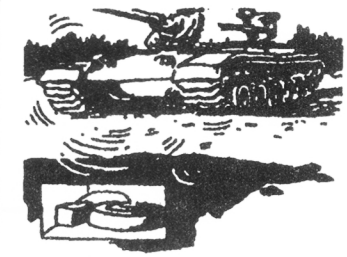
Introduction

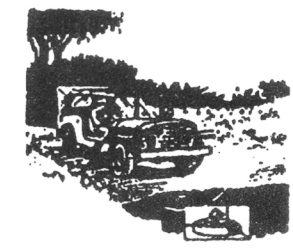
Once the mine has been armed, an initiating action is required to detonate the mine. There are several types of initiating actions. Any one or a combination of these is sufficient to trigger the mine for detonation.

Methods of Initiating Actions

The 10 methods of initiating actions are illustrated in the tables below:

Pressure	Pull	Tension Release	Pressure Release
			

Timer Rundown	Electrical	Vibration
		

Magnetic-Influence	Frequency Induction	Radio-Frequency
		

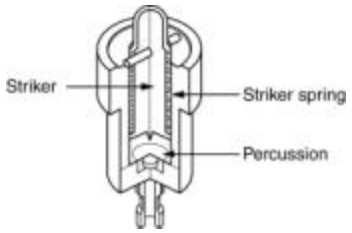
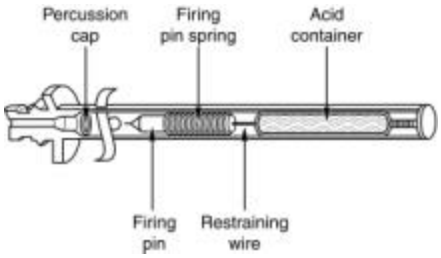
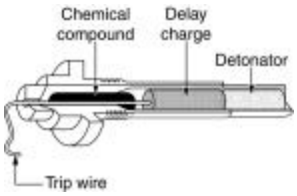
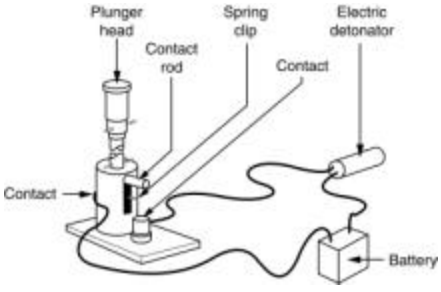
Fuzes

Introduction

The fuze is the initial component in the firing chain. It has low explosive power but is highly sensitive. Different fuzes are activated by specific initiating actions.

Types of Fuzes

The four types of fuzes, their function, and components are listed in the table below:

Fuze	Function	Illustration
Mechanical	The striker spring drives a striker against the percussion cap, which fires the detonator.	
Chemical	A small container of a chemical compound, such as an acid, is broken by the initiating action. The chemical compound reacts with another substance within the fuze to dissolve the restraining wire, which releases the firing pin.	
Friction	The initiating action ignites substances inside the fuze by friction. The resulting flame then fires the detonator.	
Electrical	The initiating action completes an electrical circuit that detonates an electrical detonator.	

Lesson 1 Exercise

Directions

Complete exercise items 1 through 19 by performing the action required. Check your answers against those listed at the end of the lesson.

Item 1 Through Item 3

Matching: For items 1 through 3, match the type of safety in column 1 with its function in column 2. Place your responses in the spaces provided.

Column 1	**Column 2**
Type	**Function**
___ 1. Interlocking safety	a. Blocks any action or movement of moving parts
___ 2. Locking safety	b. Blocks the removal of the positive safety until the locking safety has been removed.
___ 3. Positive safety	c. Prevents the striker from hitting the percussion cap.

Continued on next page

Item 4 Through Item 12

Matching: For items 4 through 12, match the term in column 1 with its definition in column 2. Place your responses in the spaces provided.

Column 1	**Column 2**
Term	**Definition**
___ 4. Arming	a. A complete assembly issued with a mine to complete the firing chain. Initiating action causes the fuze to function. The fuze produces a flame or concussion that sets off the detonator. The detonator sets off the booster (if present) or a main charge.
___ 5. Fuzing	b. The act of installing a fuze into a mine.
___ 6. Disarming	c. When assembled with a nonelectric detonator or activator, this device may be attached to a mine and used as a mine fuze, a boobytrap device, or to set off prepared explosive charges.
___ 7. Firing devices and antihandling devices	d. The removal of all safety devices so the mine will detonate when an initiating action occurs.
___ 8. Fuze	e. Installation of all safety devices that prevents the mine from detonating accidentally or when an initiating action occurs.
___ 9. Initiating action	f. The disarming or destruction of a mine by using explosives to destroy the mine in place.
___ 10. Neutralizing	g. The physical process required to trigger the mine.
___ 11. Boobytrapping	h. The installation of firing devices that causes detonation when the mine is tampered with or moved.
___ 12. Safety	i. A device found in fuzes, firing devices, and related components to help prevent accidental functioning.

Continued on next page

Item 13 Through Item 17

Matching. For items 13 through 17, match the component in column 1 with its function in column 2. Place your responses in the spaces provided.

Column 1	**Column 2**
Component	**Function**
___ 13. Outer casing	a. Sets off the detonator or igniter charge
___ 14. Booster charge	b. Sets off the booster charge
___ 15. Detonator or igniter	c. Sets off the main charge
___ 16. Fuze or firing mechanism	d. Causes the mine to produce its desired affect
___ 17. Main charge	e. Contains all of the components

Continued on next page

Item 18 List the 10 types of initiating actions.

(1) _____

(2) _____

(3) _____

(4) _____

(5) _____

(6) _____

(7) _____

(8) _____

(9) _____

(10) _____

Continued on next page

Item 19 List the four types of fuzes used in U.S. conventional mines.

(1) _____

(2) _____

(3) _____

(4) _____

Continued on next page

Solutions

The table below lists the answers to the exercise items. If you have questions about these items, refer to the reference page.

Item Number	Answer	Reference
1	b	1-5
2	a	1-5
3	c	1-5
4	d	1-4
5	b	1-4
6	e	1-4
7	c	1-4
8	a	1-4
9	g	1-4
10	f	1-4
11	h	1-5
12	i	1-5
13	e	1-7
14	c	1-7
15	b	1-7
16	a	1-7
17	d	1-7
18	(1) Pressure (2) Pull (3) Tension Release (4) Pressure Release (5) Timer Rundown (6) Electrical (7) Vibration (8) Magnetic-Influence (9) Frequency Induction (10) Radio-Frequency	1-8
19	(1) Mechanical (2) Chemical (3) Friction (4) Electrical	1-9

Lesson Summary

In this lesson, you learned the terminology, types, components, initiating actions, and fuzes of the U.S. conventional mines.

In the next lesson, you will learn about antipersonnel (AP) mines.

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LESSON 2

ANTIPERSONNEL (AP) MINES

Overview

Introduction

Antipersonnel (AP) mines are designed to cause casualties to enemy personnel. They come in various shapes and sizes and are detonated by one or more initiating actions.

Content

In this lesson, you learn about AP mines, initiating actions of AP mines, types of warheads, the M18A1 (Claymore) AP mine, and the installation and removal procedures for the M18A1 (Claymore) AP mine.

Learning Objectives

Upon completion of this lesson, you should be able to

- List the three methods of initiating actions for AP mines.
- Match the three types of warheads of AP mines to their effect on the target.
- List the eight components of the M18A1 (Claymore) AP mine.
- List the inventory components and accessories of the M7 bandoleer.
- List in sequence the tasks for installing the M18A1 (Claymore) AP mine.
- List in sequence the steps for removing the M18A1 (Claymore) AP mine.

Continued on next page

Overview, Continued

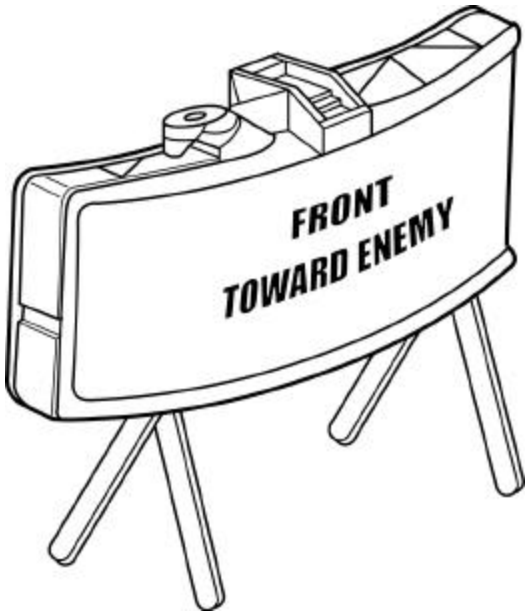
In This Lesson This lesson contains the following topics:

M18A1 (Claymore) AP Mines

Introduction AP mines are designed to cause casualties to enemy personnel.

Diagram The only AP mine used in the U.S. Marine Corps is identified in the diagram below:

M18A1 (Claymore) AP mine



Initiating Actions of AP Mines

Introduction

AP mines are detonated by various initiating actions and designed to cause casualties to enemy personnel.

Methods of Initiating Actions

The methods of initiating actions are listed in the table below:

Method	Definition
Pressure	Activated when a person steps on the fuze.
Trip wire	Activated when a person disturbs the trip wire.
Command-detonated	Activated by the person(s) that emplaced the mine. Usually an electrical firing system, as used with the M18A1 (Claymore) AP mine.

Types of Warheads

Warheads

The three types of warheads used in AP mines are listed in the table below.

Type	Effect
Blast	Pressure from wheeled vehicles initiates detonation, causing tires to burst. Designed to cripple the enemy by inflicting a severe or fatal injury.
Bounding fragmentation (frag)	Detonation launches a canister into the air. The canister then bursts and scatters shrapnel throughout the immediate area.
Directed fragmentation	Propels fragments in the direction of the target.

Characteristics of the M18A1 (Claymore) AP Mine

Introduction

The M18A1 (Claymore) AP mine is used primarily for the security of defensive positions, outposts, and short security halts. In addition to its effects on personnel, the mine also causes significant damage to "thin-skinned" vehicles such as jeeps, High Mobility Multipurpose Wheeled Vehicles (HMMWVs), and trucks.

Items and Characteristics

The items and characteristics of the M18A1 (Claymore) AP mine are listed in the table below:

Item	Characteristic
Body	Fiberglass case
Warhead	• Directed fragmentation • 700 steel balls
Main charge	1.5 pounds of C4
Dimensions	• 8.5 inches long • 1.38 inches wide • 3.25 inches high
Total weight	3.5 pounds
Function	• Electrical • Nonelectrical • Command-detonated • Trip wire
Frontal casualty zone	• 100-meter depth in a 60-degree radius • 2 meters high
Danger zones for friendly troops	• 250 meters forward • 16 meters rear and sides

Installing the M18A1 (Claymore) AP Mine

Tasks

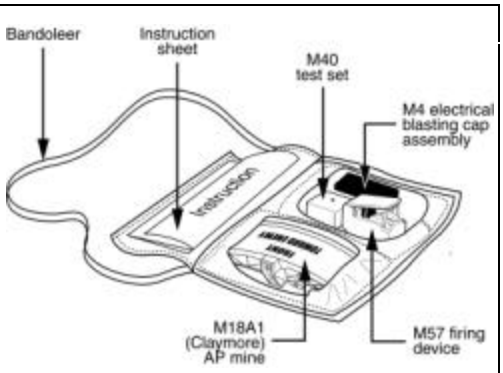
There are nine tasks listed below you must perform for installing the M18A1 (Claymore) AP mine:

Task	Description
1	Conduct Inventory
2	Inspect Mine
3	Test Circuit
4	Place Mine
5	Aim Mine
6	Arm Mine
7	Camouflage Mine
8	Retest Circuit
9	Detonate the Mine

Task 1: Conduct Inventory

Make sure the M7 bandoleer contains the following components and accessories.

Quantity	Components/Accessories
1	Bandoleer
1	Instruction sheet
1	M18A1 (Claymore) AP mine
1	M40 test set per six mines in a crate
1	M4 electrical blasting cap assembly
1	M57 firing device



Task 2: Inspect Mine

Inspect the mine and accessories for cracks and damage.

WARNING: Never use the mine if any defects are found.

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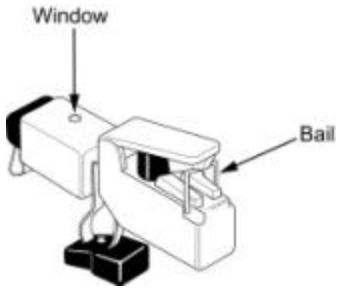
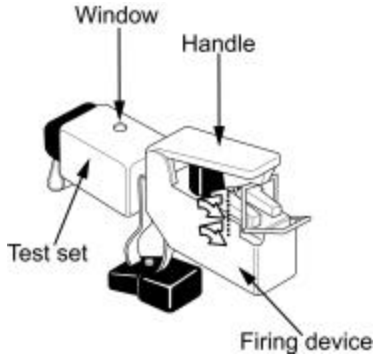
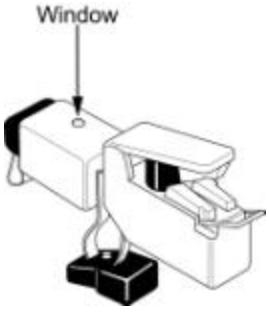
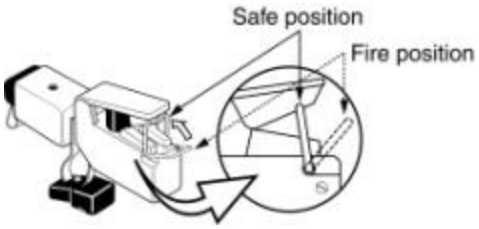
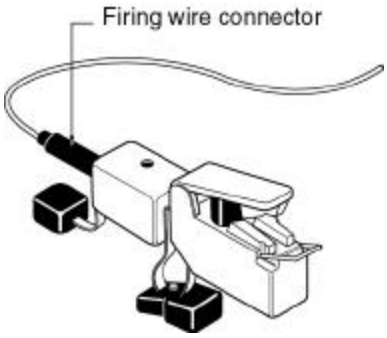
Task 3: Test Circuit

To test the circuit, complete the steps listed in the table below:

Step	Action
1	Mate the firing device and test set. The shorting plug cap must be pushed into the test set. 
2	From the safe position, the bail must travel left, then down to properly unlock. Set the bail to the firing position. 
3	Test the firing device and test set. As the handle on the firing device is depressed, a light should show in the window of the test set, indicating a positive test.  For testing at night, use a poncho to maintain light discipline.

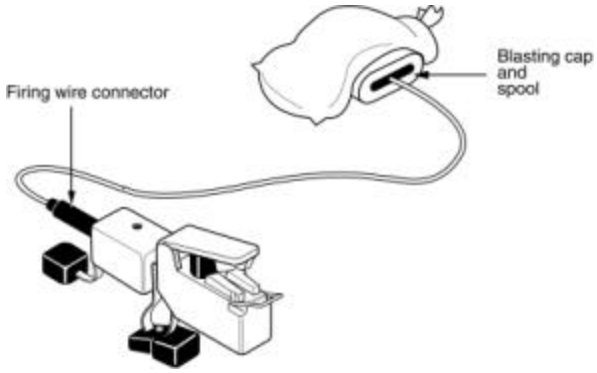
Continued on next page

Task 3:
Test Circuit, continued

<table>
<tr><th>Step</th><th>Action</th></tr>
<tr><td>3, cont.</td><td>If the test light fails to light, refer to the table below:
<table>
<tr><th>If…</th><th>And…</th><th>Then…</th></tr>
<tr><td>The light does not flash</td><td>The firing device, test set, and shorting plug are fully seated</td><td>Retest.</td></tr>
<tr><td>The light continues to flash</td><td>A component is not functioning</td><td>Isolate each part, replace with a serviceable component, inspect each part, and retest after each part is replaced until the test light flashes.</td></tr>
</table></td></tr>
<tr><td>4</td><td>Return bail to the safe position.
 
</td></tr>
<tr><td>5</td><td>Mate the firing wire connector with the test set.
 
</td></tr>
</table>

Continued on next page

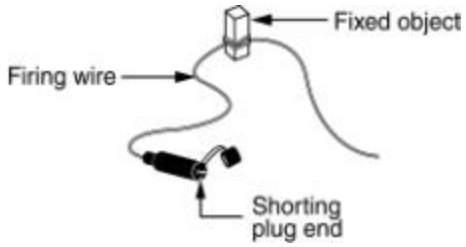
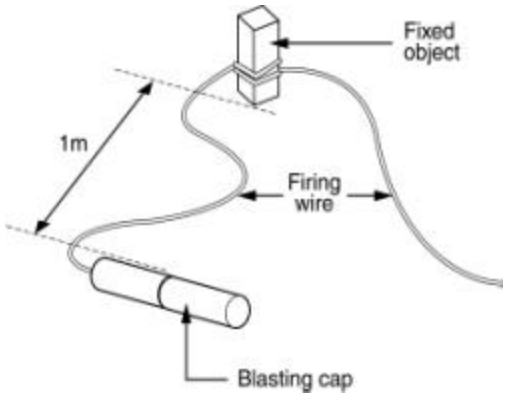
Task 3:
Test Circuit, continued

Step	Action
6	Place the blasting cap and spool under a sandbag or in a hole to protect against detonation. 
7	Depress the handle and check for a light in the test set window. Note: The presence of a light indicates a good system.
8	Return the bail to the *safe* position.
9	Remove the firing wire connector and replace the shorting plug to the firing device.
10	Return components to bandoleer until required. Note: Firing devices will be maintained at all times by the individual installing the mine.

Continued on next page

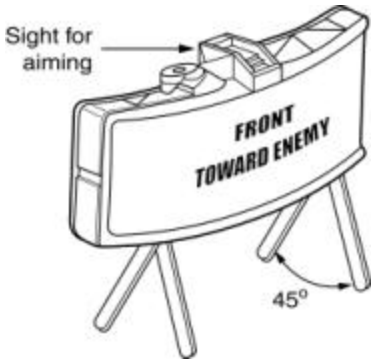
Task 4: Place Mine

To place the mine, complete the steps listed in the table below:

Step	Action
1	At your fighting position, tie shorting plug end of firing wire to a fixed object (stake, tree, etc.) and unroll the firing wire out to the desired location where the mine is to be detonated.  **WARNING:** Make sure there are no friendly troops at least 16 meters to the rear of the mine. If friendly troops are within 16 and 100 meters to the rear of the mine, make sure cover is available.
2	Tie the blasting cap end of the firing wire to a stake or fixed object. Leave enough slack so there is 1 meter of wire from the stake to the blasting cap. 

Continued on next page

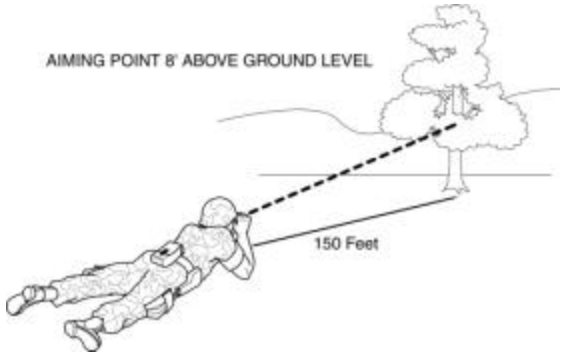
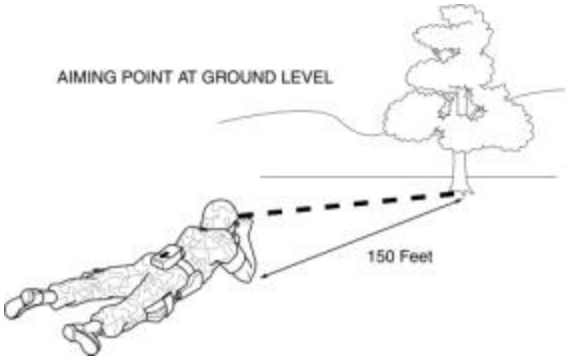
Task 4: Place Mine, continued

Step	Action
3	Remove the mine from the bandoleer and open its legs to a 45-degree angle. 
4	Position the mine on the ground with the raised letters *FRONT TOWARD ENEMY* pointing towards the kill zone.

Continued on next page

Task 5: Aim Mine

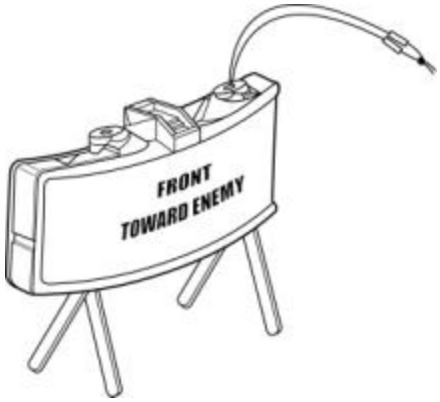
To aim the mine, complete the steps listed in the table below:

Step	Action
1	Using the *SLIT-TYPE SIGHT*, • Select an aiming point (tree, rock, etc.) about 150 feet to the front of the mine with a height of 8 feet.  • Position your eye about 6 inches to the rear of the sight and aim the mine toward the center of the target area.
2	Using the *KNIFE-EDGE SIGHT*, • Select an aiming point at ground level about 150 feet in front of the mine.  • Position your eye about 6 inches to the rear of the sight and align the two edges of the sight with the aiming point.

Continued on next page

Task 6: Arm Mine

Unscrew one of the shipping plug priming adapters from the mine and install the blasting cap.



Task 7: Camouflage Mine

To camouflage the mine, complete the steps listed in the table below:

Step	Action
1	Recheck your aiming point.
2	Camouflage the mine and firing wire with leaves, sticks, etc.

Task 8: Retest Circuit

Once you have returned to your fighting position, retest the firing system with the M40 test set.

Task 9: Detonate the Mine

To detonate the mine, complete the steps listed in the table below:

Step	Action
1	Mate the firing device and firing wire connector.
2	Set the bail to the firing position and depress the handle.

CAUTION: Whenever equipment is not in use, make sure all dust covers are attached and the firing device bail is in the safe position.

Removing the M18A1 (Claymore) AP Mine

Remove the Mine

To remove the mine, complete the steps listed in the table below:

Step	Action
1	Place the firing device safety bail in the *safe* position.
2	Disconnect the firing wire from the firing device and replace dust covers. **WARNING:** Keep the firing device with you throughout the recovery process.
3	Unscrew and remove the shipping plug priming adapter from the mine.
4	Remove the blasting cap from the shipping plug priming adapter.
5	Screw the shipping plug priming adapter back into the detonating well.
6	Remove the firing wire from the stake. Reroll the firing wire and place the firing wire and blasting cap inside the cardboard container.
7	Remove the mine. Repack the mine and accessories into the M7 bandoleer.

Lesson 2 Exercise

Directions Complete exercise items 1 through 8 by performing the action required. Check your answers against those listed at the end of this lesson.

Item 1 List the three methods of initiating actions for AP mines in the spaces provided below.

(1) _____

(2) _____

(3) _____

Item 2 Through Item 4 Matching: For items 2 through 4, match the type of warhead in column 1 to its effect in column 2. Place your responses in the spaces provided.

Column 1	**Column 2**
Type of Warhead	**Effect**
___ 2. Blast	a. Propels fragments in the direction of the target.
___ 3. Bounding fragmentation (frag)	b. Pressure from wheeled vehicles initiates detonation, causing tires to burst. Designed to cripple the enemy by inflicting a severe or fatal injury.
___ 4. Directed fragmentation	c. Detonation launches a canister into the air. The canister then bursts and scatters shrapnel throughout the immediate area.

Continued on next page

Item 5 List the eight components of the M18A1 (Claymore) AP mine.

(1) _____

(2) _____

(3) _____

(4) _____

(5) _____

(6) _____

(7) _____

(8) _____

Item 6 List the components and accessories of the M7 bandoleer when conducting inventory.

(1) _____

(2) _____

(3) _____

(4) _____

(5) _____

(6) _____

Continued on next page

Item 7

List the tasks in sequence to install the M181A (Claymore) AP mine.

(1) _____

(2) _____

(3) _____

(4) _____

(5) _____

(6) _____

(7) _____

(8) _____

(9) _____

Item 8

List the steps in sequence to remove the M181A (Claymore) AP mine.

(1) _____

(2) _____

(3) _____

(4) _____

(5) _____

(6) _____

(7) _____

Continued on next page

Solutions

The table below lists the answers to the exercise items. If you have questions about these items, refer to the reference.

Item Number	Answer	Reference
1	(1) Pressure (2) Trip wire (3) Command-detonated	1-20
2	b	1-21
3	c	1-21
4	a	1-21
5	(1) Body (2) Warhead (3) Main charge (4) Dimensions (5) Total weight (6) Function (7) Frontal casualty zone (8) Danger zones for friendly troops	1-22
6	(1) Bandoleer (2) Instruction sheet (3) M18A1 (Claymore) AP mine (4) M40 test set per six mines in a crate (5) M4 electrical blasting cap assembly (6) M57 firing device	1-23
7	(1) Conduct inventory (2) Inspect mine (3) Test circuit (4) Place mine (5) Aim mine (6) Arm mine (7) Camouflage mine (8) Retest circuit (9) Detonate the mine	1-23

Continued on next page

Solutions, continued

Item Number	Answer	Reference
8	(1) Place the firing device safety bail in the *safe* position. (2) Disconnect firing wire from the firing device and replace dust covers. (3) Unscrew and remove the shipping plug priming adapter from the mine. (4) Remove the blasting cap from the shipping plug priming adapter. (5) Screw the adapter back into the detonating well. (6) Remove the firing wire from the stake. Reroll the firing wire and place the firing wire and the blasting cap inside the cardboard container. (7) Remove the mine. Repack the mine and accessories into the M7 bandoleer.	1-31

Lesson Summary

In this lesson, you learned about AP mines, initiating actions of AP mines, types of warheads, the M18A1 (Claymore) AP mine, and the installation and removal procedures for the M18A1 (Claymore) AP mine.

In the next lesson, you will learn about antitank (AT) mines.

LESSON 3

ANTITANK (AT) MINES

Overview

Introduction

AT mines are designed to immobilize or destroy enemy tracked and wheeled vehicles along with their crews and passengers.

Content

In this lesson, you learn about different AT mines, characteristics, installation, and removal procedures.

Learning Objectives

Upon completion of this lesson, you should be able to

- List the three different AT mines used in the U.S. Marines Corps.
- Identify the effects of the two AT mine kills.
- Identify the three methods used to activate AT mines.
- Identify the two types of warheads used with AT mines.
- List the tasks for installing the M15 AT mine.
- List the steps to remove the M15 AT mine.
- List the tasks for installing the M19 AT mine.
- List the steps to disarm the M19 AT mine.
- List the tasks for installing the M21 AT mine.
- List the steps to remove the M21 AT mine.

Continued on next page

Overview, Continued

In This Lesson This lesson contains the following topics:

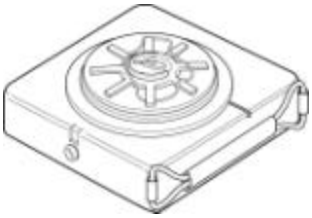
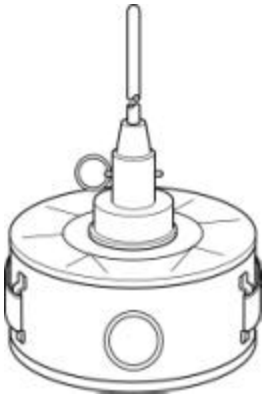
Different AT Mines

Introduction

Conventional AT mines are available in various shapes and sizes. They are distinguished by their warheads and methods of activation.

Types

The three different AT mines used in the U.S. Marine Corps are identified in the diagram below:

M15 AT mine	M19 AT mine	M21 AT mine
		

Types of Kills

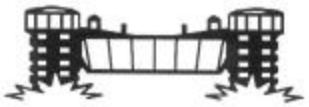
The effects of the two types of AT mine kills are listed in the table below:

Type	Effect
Mobility kill (M-kill)	Destroys the vehicle's vital drive components (for example, a track of a tank). It immobilizes the vehicle, even though the weapon may still function.
Complete kill (K-kill)	Destroys the weapon system and the crew. It disables the vehicle to perform its mission.

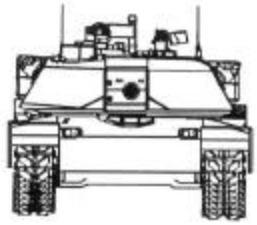
Activating AT Mines

Methods of Activation

The methods used to activate AT mines are listed in the table below:

Method	Activation	Illustration
Track-width	• Activated by pressure, requiring contact with the wheels or tracks of a vehicle • Normally produces M-kill	

Full-width	• Activated by several methods
	  • Acoustics
	  • Magnetic
	  • Tilt rod
	  • Radio frequency
	  • Vibration
	• Designed to be effective across the entire target width for a M-kill or K-kill
		

Wide-area	• Activated by acoustic and seismic signals • Designed to produce a M-kill	 

AT Mine Warheads

Types of Warheads

The types of warheads used with AT mines are listed in the table below:

Type	Effect
Blast	• Derives its effectiveness from the force generated by high explosive (HE) detonation • Produces the usual M-kill • Immobilizes target • May cause a K-kill depending on the location of the blast on the target
Direct energy	• Uses a shaped charge warhead for self-forging fragmentation (SFF) mines • Penetrates the armor of the target • Produces a K-kill • Destroys target—yields casualties

M15 AT Mine Characteristics

Introduction The M15 AT mine contains primary and secondary fuze wells. When the primary fuze well is installed with the M603 fuze, it functions as a track-width activated mine. When installed with the M624 fuze, it functions as a full-width activated mine.

Characteristics The characteristics of a M15 AT mine are listed in the table below:

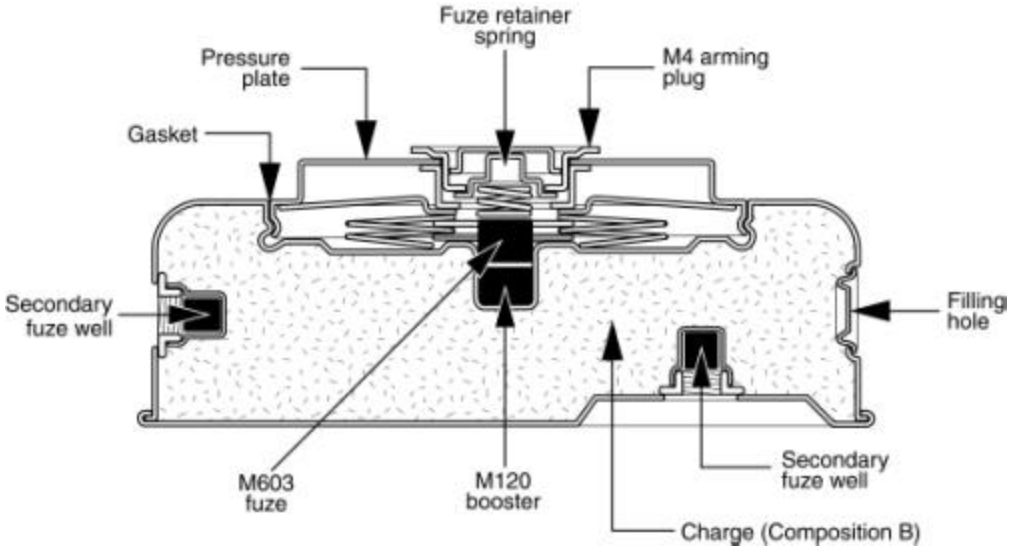
<table>
<tr><th colspan="2">Characteristic</th></tr>
<tr><td>Body</td><td>Steel case</td></tr>
<tr><td>Warhead</td><td>Blast</td></tr>
<tr><td>Main charge</td><td>22 pounds Comp B</td></tr>
<tr><td>Booster</td><td>M120</td></tr>
<tr><td>Total weight</td><td>30 pounds</td></tr>
<tr><td>Dimensions</td><td>• Diameter: 13.12 inches
• Height: 4.87 inches</td></tr>
<tr><td>Function</td><td><table><tr><th>Type</th><th>Weight</th></tr><tr><td>Pressure</td><td>350 to 750 lbs</td></tr><tr><td>Tilt rod</td><td>3.75 lbs of force</td></tr></table></td></tr>
<tr><td>Fuzes</td><td><table><tr><th>Type</th><th>Fuze</th></tr><tr><td>Pressure</td><td>M603</td></tr><tr><td>Trainer</td><td>M604</td></tr><tr><td>Tilt rod</td><td>M624</td></tr></table></td></tr>
</table>

Continued on next page

M15 AT Mine Characteristics, Continued

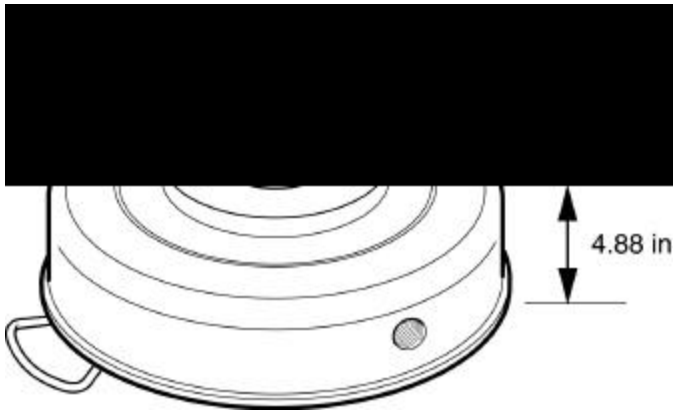
Internal View

The internal components of the M15 AT mine are identified in the diagram below:



External View

The dimensions of the M15 AT mine are identified in the diagram below:



Installing the M15 AT Mine

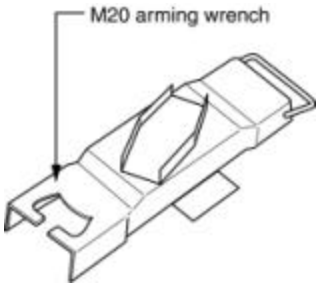
Tasks

There are seven tasks listed below you must perform to install the M15 AT mine:

Task	Description
1	Inspect Mine
2	Function Check M4 Arming Plug
3	Dig Hole
4	Place Mine
5	Fuze Mine
6	Arm Mine
7	Camouflage Mine

Task 1: Inspect Mine

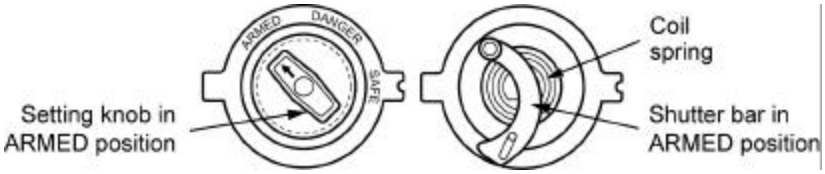
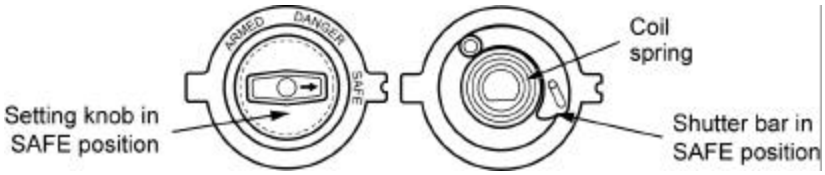
To inspect the mine, complete the steps listed in the table below:

Step	Action
1	Check the mine for dents, cracks, and damage. **WARNING:** Do not use if any defects are found.
2	Use the M20 arming wrench to unscrew and remove the arming plug from the mine.  Note: Remove retaining spring from arming plug and discard.
3	Examine the fuze well for foreign material. If foreign material is present, turn the mine upside down and gently tap the bottom with your hand to dislodge it. If it cannot be removed, replace the arming plug. **DO NOT USE THE MINE.**
4	Make sure the booster retainer ring is seated in the fuze well. **WARNING:** Do not use the mine if the retainer ring is missing.

Continued on next page

Task 2: Function Check M4 Arming Plug

To perform the arming plug function check, complete the steps listed in the table below:

Step	Action
1	Turn the setting knob to the ARMED position. Make sure the shutter bar moves across the bottom of the M4 arming plug. 
2	Turn the setting knob to the SAFE position. Make sure the shutter bar moves back across the bottom of the M4 arming plug.  **WARNING:** If the shutter bar does not go into the SAFE or ARMED position, **DO NOT USE THE MINE**.

Task 3: Dig Hole

To dig a hole to fit the mine, complete the steps listed in the table below:

Step	Action
1	Dig a hole deep enough so the top of the mine pressure plate will be about 1.5 inches below ground level.
2	Dig the sides of the hole at a 45-degree angle to prevent vehicles from bridging the mine. 

Continued on next page

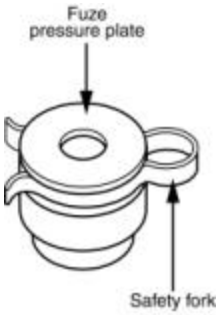
Task 4: Place Mine

To place the mine, complete the steps listed in the table below:

Step	Action
1	Place the mine in the hole.
2	Cover the mine with soil until it is leveled with the top of the pressure plate.

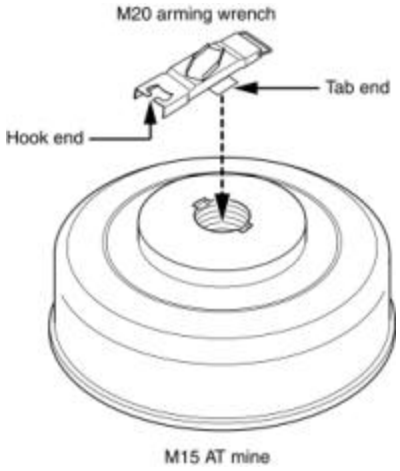
Task 5: Fuze Mine

To fuze the mine, complete the steps listed in the table below:

Step	Action
1	Remove the M603 fuze from its metal shipping container, then inspect it for serviceability. Note: The green end of the detonator must show in the bottom of the fuze.
2	Remove the safety fork. If necessary, use the hooked end of an M20 wrench.  **WARNING:** Do not carry fuze without safety fork in place, and do not place pressure on fuze pressure plate.
3	Insert the fuze carefully into the fuze well until it seats securely on top of the booster retaining ring. 

Continued on next page

Task 5: Fuze Mine, continued

Step	Action
4	Perform a clearance test using the end of the M20 arming wrench by aligning the tabs on the wrench with the cut-outs in the fuze well. If the wrench does not fully seat in the cut-out, do not use the fuze, replace it.  Note: For long term emplacement, smear a thin layer of silicone grease or similar lubricant on the arming plug, threads, and gasket.
5	Make sure the setting knob is in the SAFE position. 
6	Screw the arming plug into the mine and tighten by hand. Note: Do not use the M20 arming wrench to tighten arming plug. Over-tightening may cause distortion of the seal and create a leak.

Continued on next page

Task 6: Arm Mine

Use the M20 arming wrench to arm the mine by turning the setting knob from the SAFE position to the ARMED position.

Task 7: Camouflage Mine

To camouflage the mine, complete the steps listed in the table below:

Step	Action
1	Cover the mine with 1 to 2 inches of soil.
2	Place excess soil in sandbags and remove the sandbags from the area.
3	Give the safety clip to your NCOIC upon completion of camouflaging the mine.

Removing the M15 AT Mine

Tasks

There are two tasks listed below you must perform to remove the M15 AT mine:

Task	Description
1	Disarm Mine
2	Remove Mine

Task 1: Disarm Mine

To disarm the mine, complete the steps listed in the table below:

Step	Action
1	Clear the soil carefully from the top of the mine.
2	Hold the mine firmly in place with one hand, without putting pressure on the pressure plate.
3	Feel for AHDs by digging around the sides and underneath the mine with the other hand.
4	Use the M20 arming wrench to turn the setting knob to the SAFE position.

Task 2: Remove Mine

To remove the mine, complete the steps listed in the table below:

Step	Action
1	Use the M20 arming wrench to turn the arming plug counterclockwise and remove it.
2	Remove the M603 fuze from the fuze well and replace the safety fork.
3	Install the M4 arming plug finger tight.
4	Remove the mine from the hole.

M19 AT Mine Characteristics

Introduction

The M19 AT mine can be buried or surface laid in any type of minefield. The fuze body contains the pressure plate, belleville spring, setting knob, step plate, firing pin assembly, and detonator.

Characteristics

The components and characteristics of the M19 AT mine are listed in the table below:

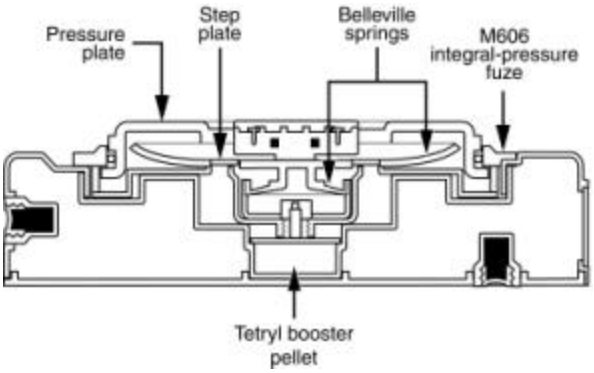
Component	Characteristic
Body	Plastic
Warhead	Blast
Main charge	21 pounds Comp B
Booster	Tetryl booster pellet
Detonator	M50
Total weight	28 pounds
Dimensions	• Size: 13.09 inches by 13.09 inches • Height: 2.95 inches
Function	300 to 500 pounds of pressure
Fuze	M606 integral pressure
Secondary fuze well locations	• One on the side • One on the bottom

Continued on next page

M19 AT Mine Characteristics, Continued

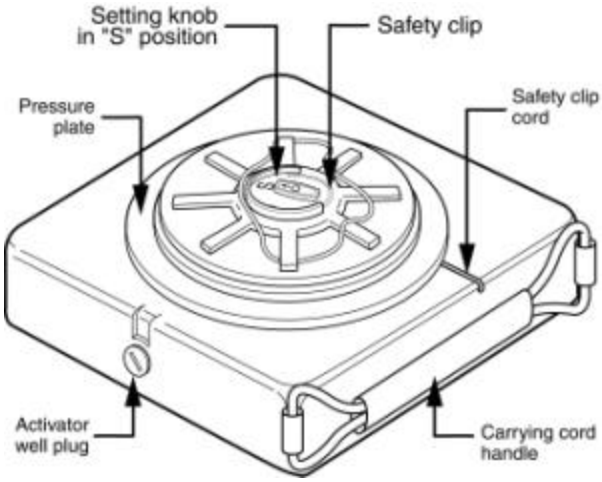
Internal View

The internal components of the M19 AT mine are identified in the diagram below:



External View

The external components of the M19 AT mine are identified in the diagram below:



Installing the M19 AT Mine

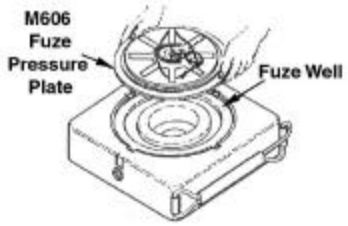
Tasks

There are eight tasks listed below you must perform to install the M19 AT mine:

Task	Description
1	Inspect Mine
2	Test Firing Pin Position
3	Dig Hole
4	Install Detonator
5	Install Fuze
6	Place Mine
7	Arm Mine
8	Camouflage Mine

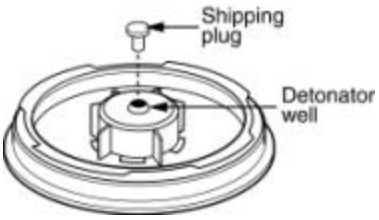
Task 1: Inspect Mine

To inspect the mine, complete the steps listed in the table below:

Step	Action
1	Check the mine for dents, cracks, or damage. **<u>WARNING</u>:** Do not use if any defects are found.
2	Remove the M606 fuze from the fuze well by turning it counterclockwise one fourth of a turn. 
3	Make sure the rubber gasket is on the M606 fuze.
4	Remove any foreign material found in the fuze well.
5	Make sure the setting knob is in the "S" position and the safety clip is in place. 

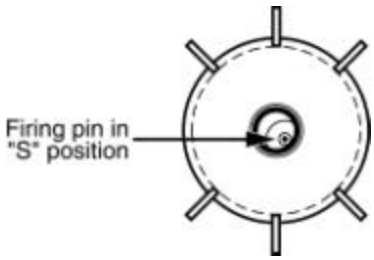
Continued on next page

Task 1: Inspect Mine, continued

Step	Action
6	Remove the shipping plug from the detonator well. 
7	Examine the detonator well for foreign material. If foreign material is present, gently tap the pressure plate with your hand to dislodge it.

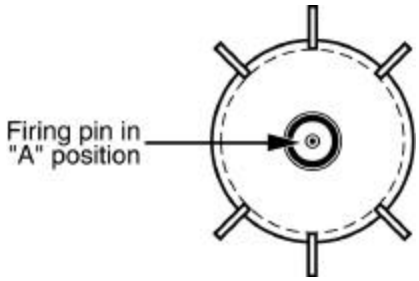
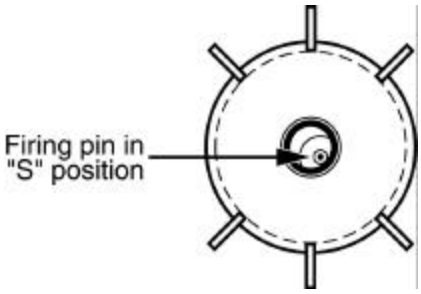
Task 2: Test Firing Pin Position

To test the position of the firing pin, complete the steps listed in the table below:

Step	Action
1	Check the position of the firing pin. Make sure the firing pin is at the edge of the well when the setting knob is in the "S" position.  **<u>WARNING</u>**: Notify the NCOIC if the firing pin is in the middle of the fuze well.
2	Remove the safety clip.

Continued on next page

Task 2: Test Firing Pin Position, continued

Step	Action
3	Use the M22 wrench to turn the setting knob to the armed "A" position. Make sure the firing pin is in the center of the well. 
4	Use the M22 wrench to turn the setting knob back to the "S" position. Make sure the firing pin moves back to the side of the well.  **WARNING:** If the firing pin is not in the correct position when the setting knob is in either the "A" or "S" position, notify the NCOIC.
5	Replace the safety clip.

Continued on next page

Task 3: Dig Hole

To dig a hole to fit the mine, complete the steps listed in the table below:

Step	Action
1	Dig a hole deep enough so the top of the mine pressure plate will be even or slightly below ground level.
2	Dig the sides of the hole at a 45-degree angle to prevent vehicles from bridging the mine.

Task 4: Install Detonator

Use the M22 arming wrench to screw the M50 detonator into the detonator well.

Task 5: Install Fuze

Use the M22 arming wrench to tighten the M606 fuze into the fuze well.

Task 6: Place Mine

To place the mine in the hole, complete the steps listed in the table below:

Step	Action
1	Place the mine in the hole.
2	Cover the mine with soil until it is leveled with the top of the pressure plate.

Task 7: Arm Mine

To arm the mine, complete the steps listed in the table below:

Step	Action
1	Remove the safety clip.
2	Use the M22 arming wrench to turn the setting knob from the "S" to the "A" position.

Continued on next page

Task 8: Camouflage Mine

To camouflage the mine, complete the steps listed in the table below:

Step	Action
1	Cover the mine with 1.5 inches of soil.
2	Place excess soil in sandbags and remove the sandbags from the area.
3	Give the safety clip and the shipping plug to your NCOIC upon completion of camouflaging the mine.

Removing the M19 AT Mine

Tasks

There are two tasks listed below you must perform to remove the M19 AT mine:

Task	Description
1	Disarm Mine
2	Remove Mine

Task 1: Disarm Mine

To disarm the mine, complete the steps listed in the table below:

Step	Action
1	Clear the soil carefully from the top of the mine.
2	Hold the mine firmly in place with one hand without putting pressure on the pressure plate.
3	Feel for AHDs by digging around the sides and underneath the mine with the other hand.
4	Use the M22 wrench to turn the setting knob to the safe "S" position.
5	Replace the safety clip on the M606 fuze.

Task 2: Remove Mine

To remove the mine, complete the steps listed in the table below:

Step	Action
1	Remove the mine from the hole.
2	Use the M22 wrench to remove the detonator from the detonator well.
3	Replace the shipping plug in the detonator well.
4	Replace the pressure plate in the mine.

M21 AT Mine Characteristics

Introduction

The M21 AT mine is the only mine that uses a direct energy warhead designed to produce a K-kill. When used with a tilt rod, the mine should be buried. If the mine is surface-laid and used with the tilt rod, the mine must be staked to prevent it from being knocked over and causing the warhead to be directed away from the target.

Characteristics

The components and characteristics of the M21 AT mine are listed in the table below:

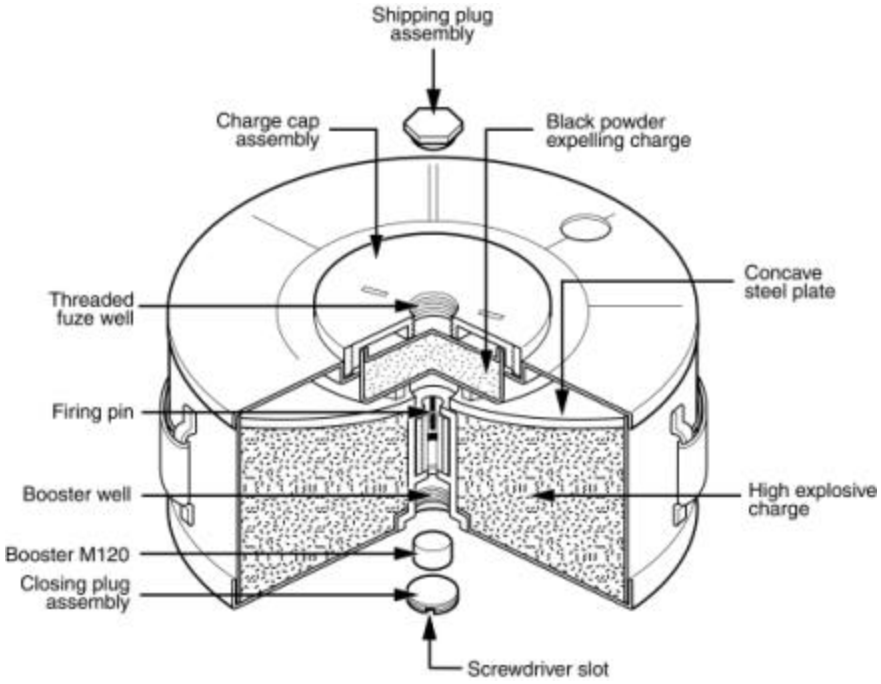
Component	Characteristic
Body	Steel case
Warhead	Direct energy
Main charge	11 pounds Comp H6
Booster	M120
Total weight	17.25 pounds
Dimensions	• Diameter: 9 inches • Height: 4.5 inches
Function	• Pressure: 290 pounds • Tilt rod pressure: 3.75 pounds with a 20-degree deflection • Tilt rod lengths: 18 to 24 inches
Fuze	M607

Continued on next page

M21 AT Mine Characteristics, Continued

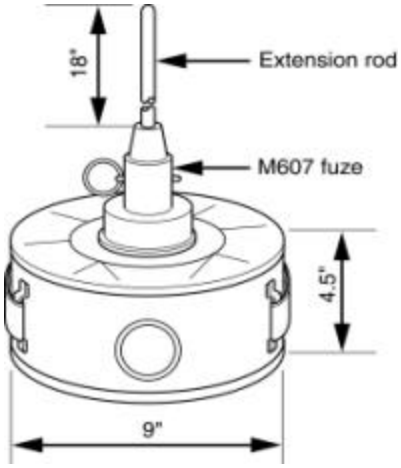
Internal View

The internal components of the M21 AT mine are identified in the diagram below:



External View

The components and dimensions of the M21 AT mine are identified in the diagram below:



Installing the M21 AT Mine

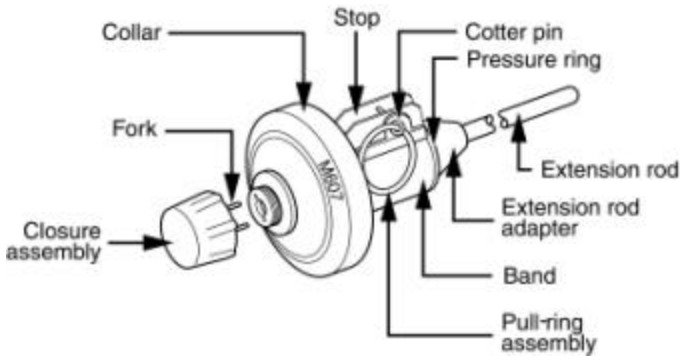
Tasks

There are nine tasks listed below you must perform to install the M21 AT mine:

Task	Description
1	Inspect Mine
2	Dig Hole
3	Insert Booster
4	Place Mine
5	Fuze Mine
6	Make Decision
7	Assemble Extension Rod
8	Arm Mine
9	Camouflage Mine

Task 1: Inspect Mine

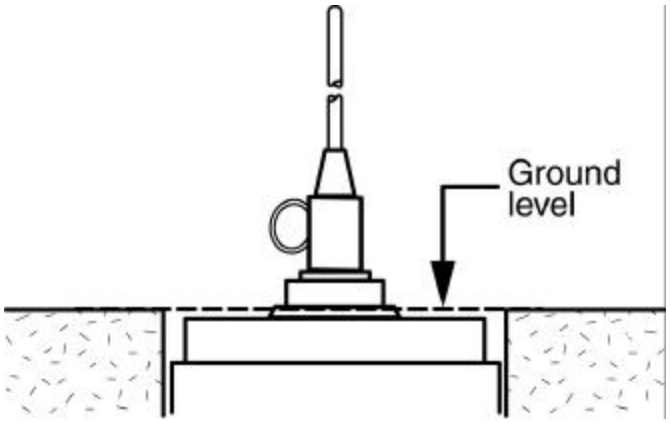
To inspect the mine, complete the steps listed in the table below:

Step	Action
1	Check the mine for dents, cracks, or damage. **<u>WARNING</u>:** Do not use if any defects are found.
2	Make sure the cotter pin of the fuze pull-ring assembly and fuze closure assemblies are securely in place. 
3	Inspect the fuze to make sure the neck portion behind the collar is not cracked.

Continued on next page

Task 2: Dig Hole

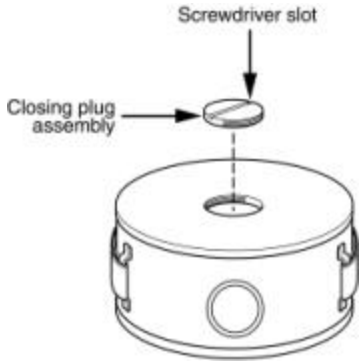
To dig a hole to fit the mine, complete the steps listed in the table below:

Step	Action
1	Dig a hole deep enough so the top of the mine will be at ground level. 
2	Check the bottom of the hole to make sure the ground is solid enough to support the mine. If necessary, place a flat object under the mine to provide a firm foundation. Allow additional depth for the object.

Continued on next page

Task 3: Insert Booster

To insert the booster, complete the steps listed in the table below:

Step	Action
1	Use the screwdriver end of an M26 wrench to remove the closing plug from the bottom of the mine. 
2	Examine the booster well for foreign material. If foreign material is present, gently tap the top of the mine with your hand to dislodge it. **WARNING:** Do not use if material cannot be removed.
3	Insert the M120 booster with the washer side toward the fuze into the booster well.
4	Use the M26 wrench to replace the closing plug.

Task 4: Place Mine

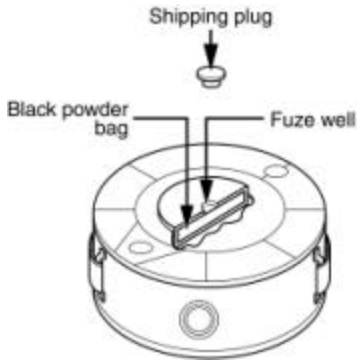
To place the mine, complete the steps listed in the table below:

Step	Action
1	Place the mine in the hole.
2	Cover the mine until soil is level with the top of the mine.
3	Press the soil firmly around the sides of the mine. CAUTION: Make sure no soil falls around or under the plastic collar.

Continued on next page

Task 5: Fuze Mine

To fuze the mine, complete the steps listed in the table below:

Step	Action
1	Use the M26 wrench to remove the shipping plug from the fuze well on top of the mine. 
2	Examine the fuze well for foreign material. If foreign material is present, gently shake the mine to dislodge it. **WARNING:** If black powder falls out of the fuze well or foreign material cannot be removed, do not use the mine.
3	Use the M26 wrench to remove the closure assembly from the M607 fuze. Make sure the gasket remains in place on the fuze.
4	Screw the fuze hand tight into the fuze well.

Task 6: Make Decision

Use the table below to decide on your next step when installing the M21 AT mine.

If arming for...	Then continue with...
Tilt rod activation	Assemble extension rod
Pressure activation	Arm mine

Task 7: Assemble Extension Rod

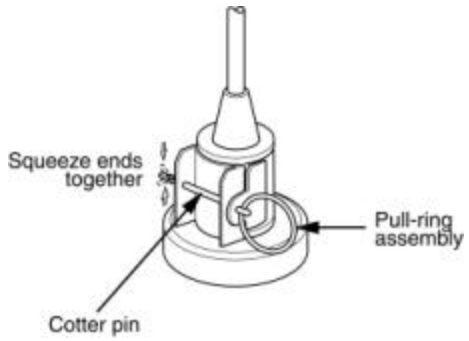
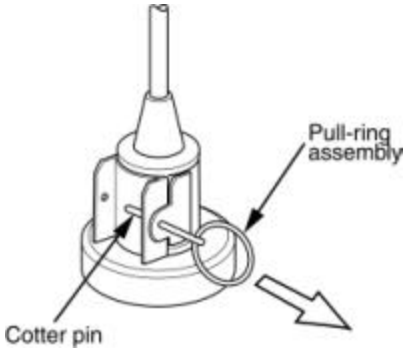
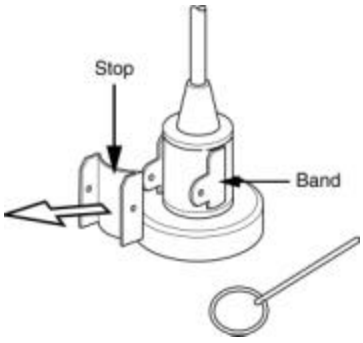
To assemble the extension rod, complete the steps listed in the table below:

Step	Action
1	Screw the extension rod into the M607 fuze.
2	Make sure the extension rod is pointing straight up.

Continued on next page

Task 8: Arm Mine

To arm the mine, complete the steps listed in the table below:

Step	Action
1	Squeeze the ends of the cotter pin together on the pull-ring. 
2	Remove the cotter pin by holding the fuze firmly in one hand and removing the pull-ring with the other hand. 
3	Remove the band and stop assembly slowly and carefully from the neck of the fuze. 

Continued on next page

Task 9: Camouflage Mine

To camouflage the mine, complete the steps listed in the table below:

Step	Action
1	Add twigs, grass, or other material natural to the area. Make sure no pressure is applied to the tilt rod or the fuze.
2	Place the excess soil in sandbags. Remove the sandbags from the area.
3	Give the band, stop, pull ring assembly, shipping plugs, and closure assemblies to your NCOIC.

Removing the M21 AT Mine

Tasks

There are three tasks listed below you must perform to remove the M21 AT mine:

Task	Description
1	Disarm Mine
2	Check for AHDs
3	Remove Mine

Task 1: Disarm Mine

To disarm the mine, complete the steps listed in the table below:

Step	Action
1	Clear camouflage carefully away from the mine.
2	Attach the band and stop at the fuze.
3	Insert the cotter pin into the band and stop. Spread the ends of the cotter pin.
4	Unscrew and remove the extension rod.

Task 2: Check For ADHs

To check for AHDs, complete the steps listed in the table below:

Step	Action
1	Hold the mine firmly in place with one hand without putting pressure on the fuze.
2	Feel for AHDs with the other hand by digging around the sides and underneath the mine. **WARNING:** If AHDs are found, do not attempt to disarm. Blow the mine in place with a nonelectrically primed 1-pound block of TNT.

Continued on next page

Task 3: Remove Mine

To remove the mine, complete the steps listed in the table below:

Step	Action
1	Remove the mine from the hole.
2	Remove the fuze from the mine.
3	Install the closure assembly on the fuze.
4	Install the shipping plug into the fuze well of the mine.
5	Remove the closing plug from the bottom of the mine.
6	Remove the booster from the mine.
7	Install the closing plug into the booster.

Lesson 3 Exercise

Directions Complete exercise items 1 through 22 by performing the action required. Check your answers against those listed at the end of this lesson.

Item 1 List the three different AT mines used in the U.S. Marine Corps.

(1) _____

(2) _____

(3) _____

Item 2 What are the effects of an M-kill?

_____

_____

_____

Item 3 What are the effects of a K-kill?

_____

_____

_____

Continued on next page

Item 4 Through Item 13

Matching: For items 4 through 13, match the kind of activation in column 1 to the kind of method in column 2. Place your responses in the spaces provided. The kind of method can be used more than once.

Column 1	**Column 2**
Activation	**Method**
___ 4. Acoustics	a. Full-width
___ 5. Activated by acoustics and seismic signals	b. Track-width
___ 6. Activated by pressure, requiring contact with the wheels or tracks of a vehicle	c. Wide-area
___ 7. Designed to be effective across the entire target width for an M-kill or K-kill	
___ 8. Designed to produce an M-kill	
___ 9. Magnetic	
___ 10. Normally produces an M-kill	
___ 11. Radio frequency	
___ 12. Tilt rod	
___ 13. Vibration	

Item 14

When using the M15 AT mine for training, which fuze is used?

a. M624
b. M606
c. M604
d. M603

Continued on next page

Item 15

The seven tasks necessary to install the M15 AT mine are listed below in scrambled order.

(1) Inspect mine
(2) Fuze mine
(3) Dig hole
(4) Function check M4 arming plug
(5) Place mine
(6) Camouflage mine
(7) Arm mine

What is the correct sequence for installing the M15 AT mine?

a. 1, 2, 4, 5, 3, 7, 6
b. 1, 4, 2, 3, 7, 5, 6
c. 1, 4, 5, 2, 7, 3, 2
d. 1, 4, 3, 5, 2, 7, 6

Item 16

The four steps necessary to remove the M15 AT mine are listed below in scrambled order.

(1) Install the M4 arming plug finger tight.
(2) Remove the mine from the hole.
(3) Use the M20 arming wrench to turn the arming plug counterclockwise and remove it.
(4) Remove the M603 fuze from the fuze well and replace the safety fork.

What is the correct sequence for removing the M15 AT mine?

a. 3, 4, 2, 1
b. 2, 1, 3, 4
c. 3, 4, 1, 2
d. 2, 4, 3, 1

Continued on next page

Item 17

How many pounds of pressure are required to detonate the M19 AT mine?

a. 100 to 200
b. 250 to 500
c. 300 to 500
d. 350 to 700

Item 18

The eight tasks to install the M19 AT mine are: inspect mine, test firing pin position, dig hole, _____, _____, _____, _____, and camouflage mine.

a. install detonator, install fuze, place mine, arm mine
b. place mine, install fuze, install detonator, arm mine
c. place mine, install detonator, install fuze, arm mine
d. install fuze, install detonator, arm mine, place mine

Item 19

The five steps necessary to disarm the M19 AT mine are listed below in scrambled order.

(1) Clear the soil carefully from the top of the mine.
(2) Feel for AHDs by digging around the sides and underneath the mine with the other hand.
(3) Hold the mine firmly in place with one hand without putting pressure on the pressure plate.
(4) Replace the safety clip on the M606 fuze.
(5) Use the M22 wrench to turn the setting knob to the "S" position.

What is the correct sequence for removing the M19 AT mine?

a. 1, 3, 2, 5, 4
b. 1, 5, 2, 3, 4
c. 1, 3, 5, 4, 3
d. 1, 4, 2, 4, 5

Continued on next page

Item 20

What type of warhead is used in the M21 AT mine?

a. Blast
b. Direct energy
c. Fragmentation
d. K-kill

Item 21

The nine tasks necessary to install the M21 AT mine are listed below in scrambled order.

(1) Arm mine
(2) Assemble extension rod
(3) Camouflage mine
(4) Dig hole
(5) Fuze mine
(6) Insert booster
(7) Inspect mine
(8) Make decision
(9) Place mine

What is the correct sequence for installing the M21 AT mine?

a. 2, 5, 4, 8, 7, 9, 1, 6, 3
b. 6, 3, 1, 8, 7, 9, 2, 5, 4
c. 8, 7, 9, 2, 5, 4, 1, 6, 3
d. 7, 4, 6, 9, 5, 8, 2, 1, 3

Item 22

List the tasks in proper sequence to remove the M21 AT mine.

(1) _____

(2) _____

(3) _____

Continued on next page

Solutions

The table below lists the answers to the exercise items. If you have questions about these items, refer to the reference page.

Item Number	Answer	Reference
1	(1) M15 (2) M19 (3) M21	1-39
2	Destroys the vehicle's vital drive components (for example, a track of a tank). It immobilizes the vehicle, even though the weapon may still function.	1-39
3	Destroys the weapon system and the crew. It disables the vehicle to perform its mission.	1-39
4	a	1-40
5	c	1-40
6	b	1-40
7	a	1-40
8	c	1-40
9	a	1-40
10	b	1-40
11	a	1-40
12	a	1-40
13	a	1-40
14	c	1-42
15	d	1-44
16	c	1-49
17	c	1-50
18	a	1-52
19	a	1-57
20	b	1-58
21	d	1-60
22	(1) Disarm mine (2) Check for AHDs (3) Remove mine	1-66

Continued on next page

Lesson Summary

In this lesson, you learned about the type of AT mines used in the U.S. Marine Corps, the types of AT mine kills, how to activate an AT mine, type of AT mine warheads, and how to install and remove AT mines.

In the next lesson, you will learn about the firing devices (FDs) and antihandling devices (AHDs).

LESSON 4

FIRING DEVICES (FDs) AND ANTIHANDLING DEVICES (AHDs)

Overview

Introduction

The FD performs the function of a mine fuze by providing an alternate means to detonate the mine. It is normally used in conjunction with a standard fuze so a mine will have two separate explosive chains. The second firing chain prevents the enemy from disarming or removing mines after placement. When used for this purpose, the FD is called an AHD.

Content

In this lesson, you learn about the various types of FDs, characteristics, installation, and removal procedures.

Learning Objectives

Upon completion of this lesson, you should be able to

- Identify the two types of FDs.
- Identify FD accessories.
- Identify characteristics of the M5 Pressure Release FD.
- List the tasks for installing the M5 Pressure Release FD.
- Identify the tasks for removing the M5 Pressure Release FD.
- Identify the characteristics of the M142 Multipurpose FD.
- List the tasks for the installing the M142 Multipurpose FD.
- Identify the tasks for removing the M142 Multipurpose FD.

Continued on next page

Overview, Continued

In This Lesson This lesson contains the following topics:

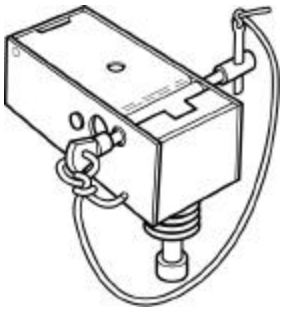
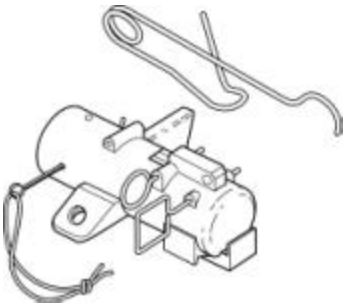
Types of FDs

Introduction

One or more FDs may be used on a mine. It is up to the individual's imagination on how he or she chooses to employ the device. Some mines are provided with extra fuze wells, making it easier to install AHDs. Each FD utilizes a spring loaded striker and standard base. When employed with certain AT mines, they require the use of the M1 or M2 activator.

Types

The two types of FDs used in the U.S. Marine Corps are identified in the diagram below:

M5 Pressure Release	M142 Multipurpose
	

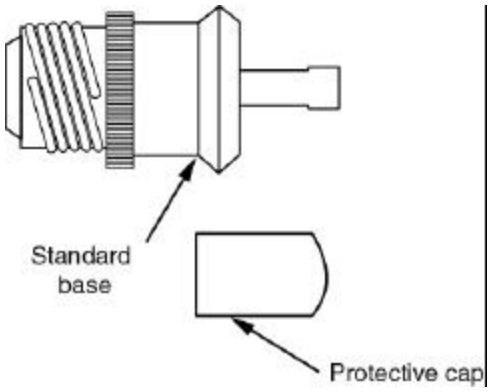
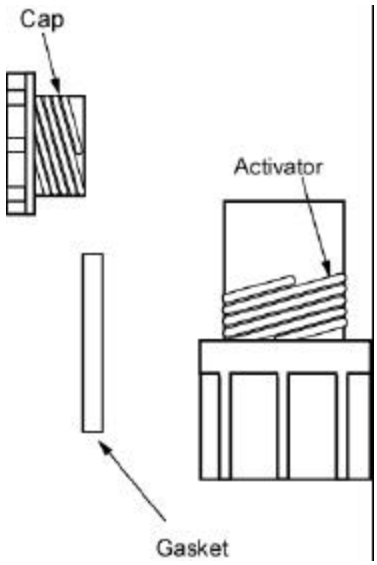
FD Accessories

Introduction

The standard base and the M1 or M2 activator are accessories used in conjunction with the FD. They are essentially detonators or boosters designed to magnify the explosive force generated by the FD and transferred to the main charge.

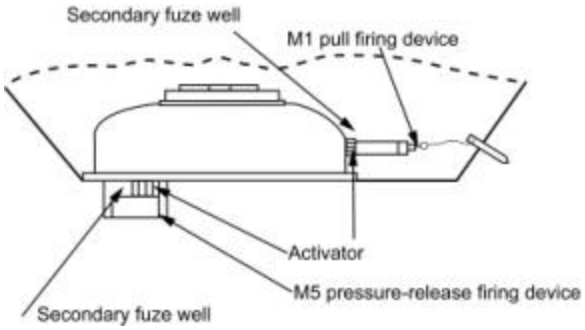
Diagram

These accessories are identified in the diagram below:

Standard Base	M1 or M2 Activator
	

Employment Method

The FD employment method on an AT mine is identified in the diagram below:



M5 Pressure Release FD Characteristics

Introduction

The M5 Pressure Release FD, also known as the mousetrap, is activated by the release of pressure. Lifting or removing a restraining weight releases the striker to fire the percussion cap.

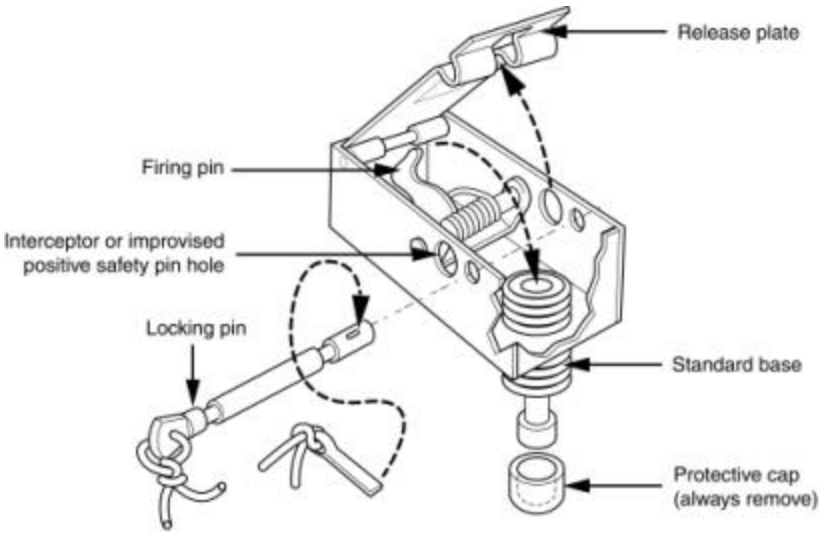
Characteristics

The components and characteristics of the M5 Pressure Release FD are listed in the table below:

Component	Characteristic
Case	Metal
Internal action	Mechanical with hinged striker release
Initiating action	Removal of restraining weight, 5 pounds or more
Safety	• Locking safety pin • Positive safety pin • Interceptor or improvised positive safety pin hole
Packaging	Four complete FDs with four plywood pressure boards in a paper carton

Internal View

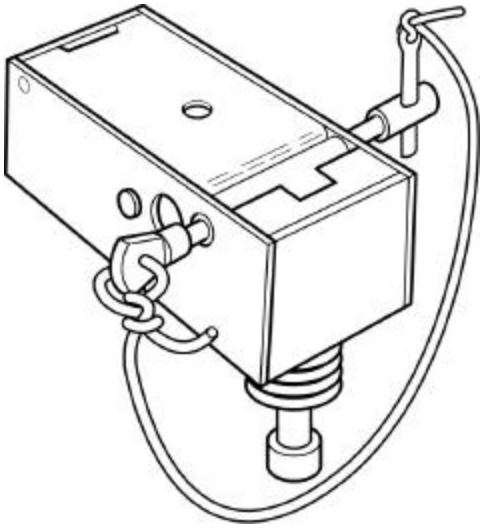
The internal components of the M5 Pressure Release FD are identified in the diagram below:



Continued on next page

M5 Pressure Release FD Characteristics, Continued

External View The diagram below is an external view of the M5 Pressure Release FD.



Installing the M5 Pressure Release FD

Tasks

There are eight tasks you must perform to install the M5 Pressure Release FD:

Task	Description
1	Inspect FD
2	Prepare Hole
3	Attach Accessories
4	Place Mine
5	Arm Mine
6	Camouflage Mine
7	Arm FD
8	Complete Camouflage

Task 1: Inspect FD

To inspect the FD, complete the steps listed in the table below:

Step	Action
1	Check the FD for dents, cracks, and damage. **WARNING:** Do not use if any defects are found.
2	Make sure the positive and locking safety pins are in place.
3	Make sure the safeties move freely.

Task 2: Prepare Hole

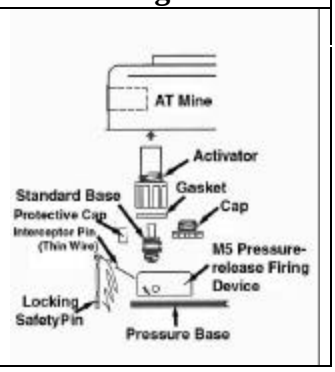
Prepare a hole large enough for the mine with a small trench connected to the side for the FD.

Continued on next page

Installing the M5 Pressure Release FD, Continued

Task 3: Attach Accessories

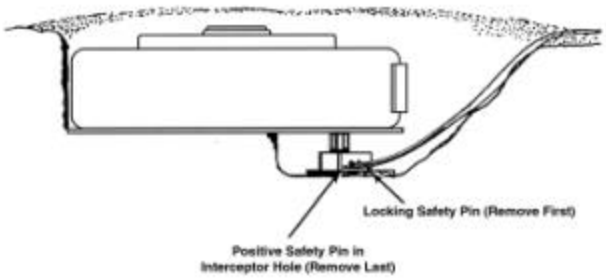
To attach the accessories, complete the steps listed in the table below:

Step	Action	Diagram
1	Remove the cap from the activator.	
2	Remove the protective cap from the standard base.	
3	Screw the standard base to the FD.	
4	Screw the activator to the standard base.	
5	Install the assembled FD to the mine's secondary fuze well.	

Task 4: Place Mine

To place the mine with the FD, complete the steps listed in the table below, using the diagram for visual reference:

Step	Action
1	Make sure the hole is deep enough to bury the mine with the FD on a firm foundation.
2	Use plywood pressure board if the ground is not firm enough.
3	Make sure pressure plate is slightly above ground.
4	Use wire of at least 10 gauge thickness (approximately the size of coat hanger) as a positive safety pin.
5	Make sure safety pins remain in place.
6	Place the mine with FD in the hole and leave enough room to remove safety pins.



Continued on next page

Installing the M5 Pressure Release FD, Continued

Task 5: Arm Mine

Refer to the type of mine you are using and follow the steps accordingly.

Task 6: Camouflage Mine

Cover the mine with soil to proper height, leaving the FD exposed.

Task 7: Arm FD

To arm the FD, complete the steps listed in the table below:

Step	Action
1	Remove the locking safety pin.
2	Remove the positive safety pin. **WARNING:** If the positive safety pin resists movement, **DO NOT** withdraw the pin. Recheck settings.

Task 8: Complete Camouflage

To complete the camouflage process, complete the steps listed in the table below:

Step	Action
1	Complete covering the mine and FD with soil.
2	Place the excess soil in sandbags and remove the sandbags from the area.
3	Give all safeties to your NCOIC upon completion of camouflaging the mine.

Removing the M5 Pressure Release FD

Tasks

There are two tasks you must perform to remove the M5 Pressure Release FD:

Task	Description
1	Disarm FD
2	Remove FD

Task 1: Disarm FD

To disarm the mine, complete the steps listed in the table below:

Step	Action
1	Uncover the mine and carefully check surrounding area for boobytraps, trip wires, and signs of tampering.
2	Replace the positive safety pin.
3	Replace the locking safety pin.
4	Place the mine on SAFE (S).

Task 2: Remove FD

To remove the FD, complete the steps listed in the table below:

Step	Action
1	Remove the mine from its location.
2	Remove the FD from the mine.

M142 Multipurpose FD Characteristics

Introduction

Although primarily intended for boobytrap applications, the M142 Multipurpose FD is readily adapted as an AHD for mines. The device comes with a coupling/primer that will accept a standard nonelectric blasting cap.

Characteristics

The components and characteristics of the M142 Multipurpose FD are listed in the table below:

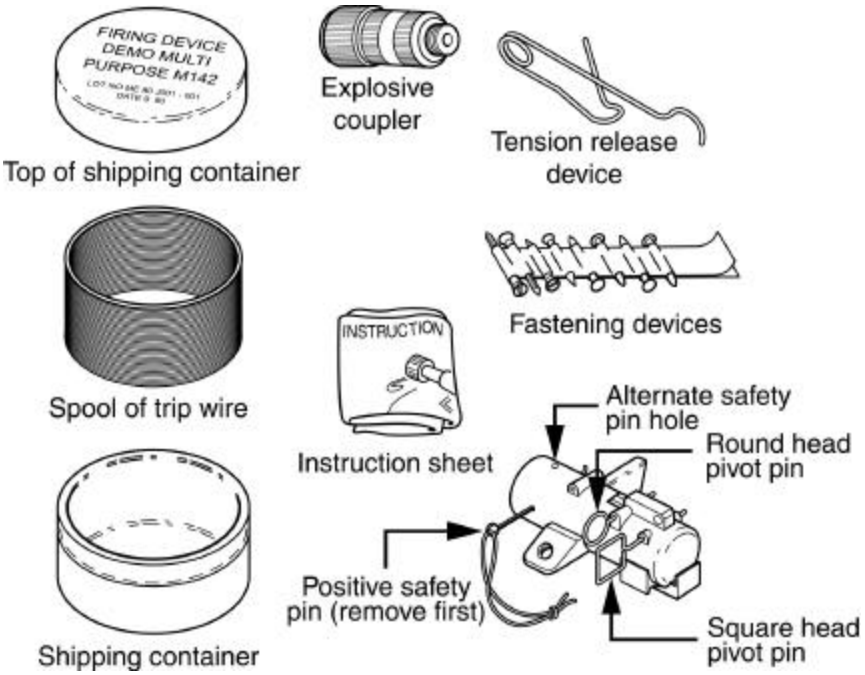
Component	Characteristic
Case	Plastic, olive drab, .75 inch diameter
Internal action	Spring driven striker
Initiating action	• Pressure: 25 pounds or more • Pressure release: 2 to 150 pounds • Pull: 7 pounds or more • Tension release: 2 pounds or more
Safety	• Square head pivot pin • Round head pivot pin • Positive safety pin • Alternate safety pin hole
Packaging	Round metal can containing the FD and accessories

Continued on next page

M142 Multipurpose FD Characteristics, Continued

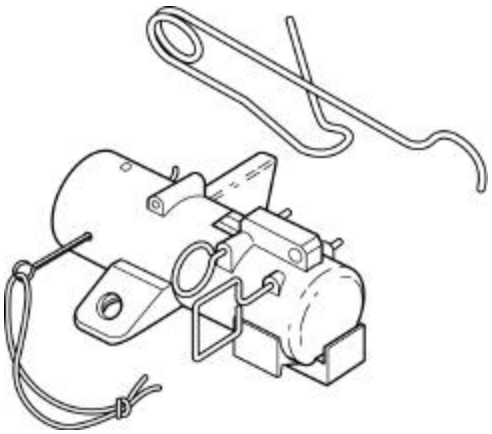
FD With Accessory Items

The M142 Multipurpose FD accessory items are identified in the diagram below:



External View

The diagram below shows the external view of the M142 Multipurpose FD.



Continued on next page

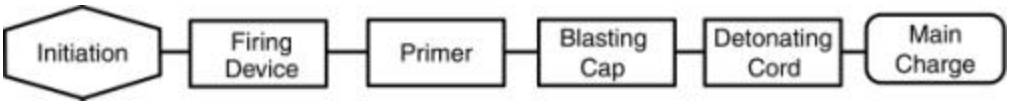
M142 Multipurpose FD Characteristics, Continued

Uses

The M142 Multipurpose FD is primarily intended for use as a boobytrap, but can also serve as an FD or an AHD.

Boobytrap

To use as a boobytrap, a nonelectric blasting cap is attached to the coupler/primer. When initiated, this action sets off the explosive chain that passes through the FD to the coupler/primer, blasting cap, and detonating cord. This action completes the firing chain that detonates the mine or explosive.



Note: The coupler and primer alone are not able to initiate the detonating cord unless a blasting cap is attached.

FD

To use as an FD, replace the coupling device with a standard base. When initiated, this action sets off the explosive chain that passes through the FD via the standard base to the main charge. This action completes the firing chain that detonates the mine or explosive.

Installing the M142 Multipurpose FD

Tasks

There are eight tasks you must perform to install the M142 Multipurpose FD:

Task	Description
1	Inspect FD
2	Prepare Hole
3	Attach Accessories
4	Place Mine
5	Arm Mine
6	Camouflage Mine
7	Arm FD
8	Complete Camouflage

Task 1: Inspect FD

To inspect the FD, complete the steps listed in the table below:

Step	Action
1	Check the FD for dents, cracks, or other damage. **WARNING**: If any damage is found, **DO NOT** use the FD.
2	Make sure all safeties are in place.
3	Make sure all safeties move freely. **WARNING**: If they do not, **DO NOT** use the FD.

Task 2: Prepare Hole

Prepare a hole large enough for the mine with a small trench connected to the side for the FD.

Task 3: Attach Accessories

To attach the accessories, complete the steps listed in the table below:

Step	Action
1	Remove the protection cap from the standard base.
2	Screw the standard base to the FD.
3	Screw the activator to the standard base.
4	Install the FD to the secondary fuze well.

Continued on next page

Task 4: Place Mine

To place the mine with the FD, complete the steps listed in the table below:

Step	Action
1	Make sure the safety pins remain in place.
2	Place the mine with the FD in the hole. **WARNING:** Use the M142 Multipurpose FD only in pull or tension release modes when attaching to a mine.

Task 5: Arm Mine

Refer to the type of mine you are using and follow the steps accordingly.

Task 6: Camouflage Mine

Cover the mine with soil to the proper height, leaving the FD exposed.

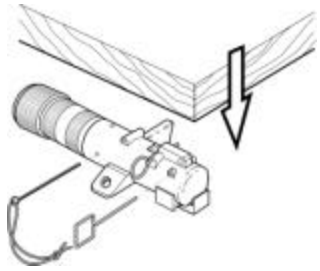
Continued on next page

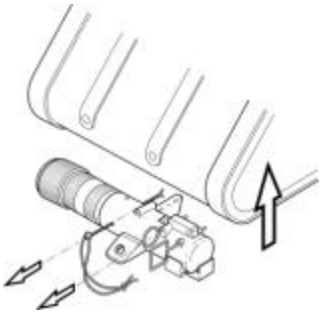
Task 7: Arm FD

The M142 Multipurpose FD can be armed in one of four modes:

- Pressure
- Pressure Release
- Pull
- Tension Release

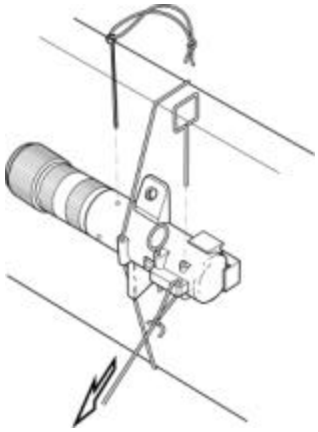
To arm the FD, complete the steps for the appropriate mode listed in the tables below:

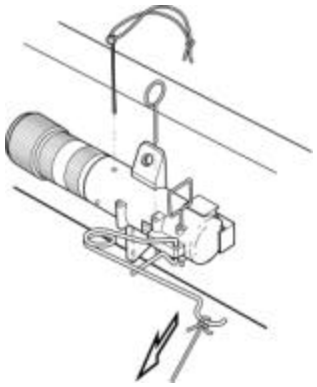
Arm FD, Pressure Mode		
Step	**Action**	**Diagram**
1	Secure the FD with nails, screws, or wire.	
2	Place **less than** 25 pounds of pressure on the FD.	
3	Remove the **square head** pivot pin.	
4	Remove the positive safety pin. **WARNING:** If the positive safety pin resists movement, **DO NOT** withdraw the pin. Recheck settings.	

Arm FD, Pressure Release Mode		
Step	**Action**	**Diagram**
1	Place and secure the FD with nails, screws, or wire.	
2	Place pressure or an object weighing **at least** 2 pounds on top of the FD.	
3	Remove the **round head** pivot pin.	
4	Remove the positive safety pin. **WARNING:** If the positive safety pin resists movement, **DO NOT** withdraw the pin. Recheck settings.	

Continued on next page

Task 7: Arm FD, continued

Arm FD, Pull Mode		
Step	**Action**	**Diagram**
1	Attach the trip wire to the anchor stake.	
2	Attach the trip wire to the FD. Leave slack in the trip wire.	
3	Remove the **square head** pivot pin.	
4	Remove the positive safety pin. **WARNING:** If the positive safety pin resists movement, **DO NOT** withdraw the pin. Recheck settings.	

Arm FD, Tension Release Mode		
Step	**Action**	**Diagram**
1	Attach the trip wire to the anchor stake.	
2	Attach the tension release accessory to the FD.	
3	Attach the trip wire to the FD.	
4	Make sure tension is placed on the trip wire.	
5	Remove the **round head** pivot pin.	
6	Remove the positive safety pin. **WARNING:** If the positive safety pin resists movement, **DO NOT** withdraw the pin. Recheck settings.	

Continued on next page

Task 8: Complete Camouflage

To finish the camouflage process, complete the steps listed in the table below:

Step	Action
1	Cover the FD and trip wire with soil. Do not put any pressure on the trip wire or FD.
2	Place the excess soil in sandbags and remove the sandbags from the area.
3	Give all safeties to your NCOIC upon completion of camouflaging the mine.

Removing the M142 Multipurpose FD

Tasks

There are two tasks you must perform to remove the M142 Multipurpose FD:

Task	Description
1	Disarm FD
2	Remove FD

Task 1: Disarm FD

To disarm the M142 Multipurpose FD, complete the steps listed in the table below:

Step	Action
1	Uncover the mine and carefully check the surrounding area for boobytraps, trip wires, and signs of tampering.
2	Replace the positive safety pin.
3	Replace the square or round head pivot pin.
4	Check **both** ends of the trip wire before cutting.
5	Place mine on SAFE (S).

Task 2: Remove FD

To remove the M142 Multipurpose FD, complete the steps listed in the table below:

Step	Action
1	Remove the mine from its location.
2	Remove the FD from mine.

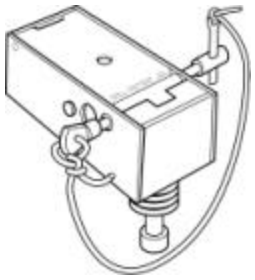
Lesson 4 Exercise

Directions

Complete exercise items 1 through 26 by performing the action required. Check your answers against those listed at the end of this lesson.

Item 1

What type of FD is illustrated below?

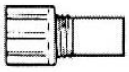


a. M1
b. M3
c. M5
d. M142

Item 2 Through Item 4

Identify the parts of the M1 or M2 activator by writing your answer in the spaces provided.

2.  _____

3.  _____

4. _____

Continued on next page

Item 5 Through Item 11

Matching: For items 5 through 11, match the M5 Pressure Release FD characteristic in column 1 to the item in column 2. Place your responses in the spaces provided. Items in column 2 may be used more than once.

Column 1	**Column 2**
Characteristic	**Item**
___ 5. Four complete FDs with four plywood pressure boards in a paper carton	a. Case
___ 6. Interceptor or improvised positive safety pin hole	b. Initiating action
___ 7. Locking safety pin	c. Internal action
___ 8. Metal	d. Packaging
___ 9. Positive safety pin	e. Safety
___ 10. Removal of restraining weight, 5 pounds or more	
___ 11. Mechanical with hinged striker release	

Item 12

After completing the task, *place mine*, what is the next sequence for installing the M5 Pressure Release FD?

a. Prepare hole, inspect FD, arm mine, complete camouflage
b. Arm FD, camouflage mine, complete camouflage
c. Arm mine, camouflage mine, complete camouflage
d. Arm mine, camouflage mine, arm FD, complete camouflage

Item 13

When removing the M5 Pressure Release FD, what is the first step in task 1 to *disarm FD*?

a. Remove the FD from its location.
b. Replace the positive safety pin.
c. Uncover the mine and carefully check the surrounding area for boobytraps, trip wires, and signs of tampering.
d. Unscrew the three pronged pressure head from the top of the trigger head.

Continued on next page

Item 14 Through Item 24

Matching: For items 14 through 24, match the M142 Multipurpose FD characteristic in column 1 to the item in column 2. Place your responses in the spaces provided. Items in column 2 may be used more than once.

Column 1	**Column 2**
Characteristic	**Item**
___ 14. Alternate safety pin hole	a. Case
___ 15. Plastic, olive drab, .75 inch diameter	b. Initiating action
___ 16. Positive safety pin	c. Internal action
___ 17. Pressure: 25 pounds or more	d. Safety
___ 18. Pressure release: 2 to 150 pounds	e. Packaging
___ 19. Pull: 7 or more pounds	
___ 20. Round head pivot pin	
___ 21. Round metal can containing the FD and accessories	
___ 22. Spring driven striker	
___ 23. Square head pivot pin	
___ 24. Tension release: 2 or more pounds	

Item 25

What are the modes to arm the M142 Multipurpose FD?

a. Pressure release, tension release, vibration, timer rundown
b. Pressure release, vibration, magnetic-influence, frequency induction
c. Pressure, pressure release, pull, tension release
d. Pressure, electrical, vibration, pressure release

Continued on next page

Item 26

When removing the M142 Multipurpose FD, what is the second step in task 1?

a. Make sure the safety pins remain in place.
b. Place the mine on safe.
c. Remove the mine from its location.
d. Replace the positive safety pin.

Continued on next page

Solutions

The table below lists the answers to the exercise items. If you have questions about these items, refer to the reference page.

Item Number	Answer	Reference
1	c	1-77
2	Cap	1-78
3	Activator	1-78
4	Gasket	1-78
5	d	1-79
6	e	1-79
7	e	1-79
8	a	1-79
9	e	1-79
10	b	1-79
11	c	1-79
12	d	1-81
13	c	1-84
14	d	1-85
15	a	1-85
16	d	1-85
17	b	1-85
18	a	1-85
19	b	1-85
20	d	1-85
21	d	1-85
22	c	1-85
23	d	1-85
24	b	1-85
25	c	1-90
26	d	1-93

Lesson Summary

In this lesson, you learned about the identification, construction, formulas, and activation method for expedient mines.

In the next study unit, you will learn about U.S. minefields.

STUDY UNIT 2

U.S. MINEFIELDS

Overview

Introduction

A minefield is an area of ground that may contain one mine or several hundred mines placed with or without patterns. It has the ability to disrupt, turn, fix, and block enemy forces.

Scope

The purpose of this study unit is to provide you with the skills and knowledge necessary to identify the types of minefields and employment procedures.

In This Study Unit

This study unit contains the following lessons:

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LESSON 1

CHARACTERISTICS AND PRINCIPLES

Overview

Introduction

Minefields are designed, sited, placed, and integrated with direct and indirect fires to provide the commander with a tactical advantage. The function and types of mines installed classify minefields.

Content

In this lesson, you learn about the principles, types, effects, and designs of U.S. minefields.

Learning Objectives

Upon completion of this lesson, you should be able to

- Identify the three types of minefields.
- Identify the purpose of the three types of minefields.
- Identify the characteristics of each minefield.
- Identify the intent of each minefield obstacle group.
- Identify the variables of each minefield.
- Identify tactical minefield designs.

In This Lesson

This lesson contains the following topics:

Types of Minefields and Purposes

Introduction

Each minefield has a distinct purpose on the battlefield. Selecting the type of minefield depends on the mission. As a result, they are employed differently and target the enemy in a unique way that supports the overall concept of the operation.

Types

There are three general types of minefields:

- Protective
- Tactical
- Phony

Purpose

The purpose of the minefields are listed in the table below:

Type	Purpose
Protective	Protects the defending force from the enemy's final assault
Tactical	Attacks enemy maneuvers and gives the defender an advantage position over the attacker
Phony	Gives the same signature as a real minefield, thereby deceiving the enemy

Protective Minefield Characteristics

Introduction

Protective minefields are used to add temporary strength to crew served weapons, position security, and clear existing obstacles. The same protective minefield may later be included in larger and long-term obstacle systems.

Characteristics

The characteristics of protective minefields are listed in the table below:

Factor	Characteristic
Type	• Hasty • Deliberate
Authority	• Hasty: Regimental commander may be delegated to battalion or company levels on a mission basis. • Deliberate: Division or base commander
Employment	• Hasty: Temporary position protection forward and rear areas such as outposts, work sites, and roadblocks • Deliberate: Static installations protection such as depots, airfields, and static missile sites
Type of Mines Used	• Metallic AT mines • Do not use mines that are difficult to detect chemical mines or AHDs.
Marking	Required to protect friendly troops
Mine Placement	Required to make it easy for the laying unit to detect and recover
Removal	Required by the laying unit unless relieving unit commander requests mines to be left in place. The report of transfer is sent to the lowest commander having command of both relieved and relieving units.
Reports	• Report of Intention • Report of Initiation • Report of Completion • Report of Change • Report of Transfer

Continued on next page

Protective Minefield Characteristics, Continued

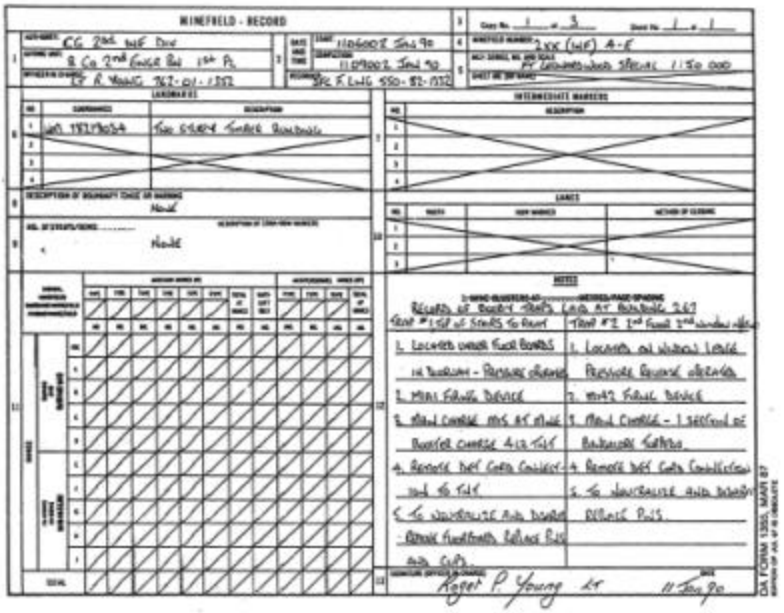
Characteristics, continued

Factor	Characteristic
Records	• Hasty: DA Form 1355-1-R, Hasty Protective Minefield Record is required • Deliberate: Standard DA Form 1355, Minefield Record is required

Remarks	• Hasty
	  • Located within small arms range, but beyond hand grenade range of defenders position
	  • Laid on short notice
	  • Must be covered by fire
	  • Exact location of mine should be known by several Marines
	• Deliberate
	  • Located within small arms range, but beyond hand grenade range

DA Form 1355, Minefield Record

DA Form 1355, Minefield Record is identified in the diagram below:



Tactical Minefield Characteristics

Introduction

Tactical minefields may be employed by themselves or in conjunction with other types of tactical obstacles. They affect the enemy's maneuver by disrupting combat formations, interfering with command and control, reducing the enemy's ability to mass fires against the defender, and reduces their ability to reinforce.

Characteristics

The characteristics of tactical minefields are listed in the table below:

Factor	Characteristic
Tactical Intent	• Disrupt • Turn • Fix • Block
Authority	Division commander may be delegated to regimental or comparable commander.
Employment	• Stops, delays, and, or disrupts an enemy attack • Enhances friendly weapon fires • Assists in blocking penetrations • Strengthens manned positions • Denies enemy withdrawal or prevents enemy reinforcements
Minimum Belts	Minimum of three belts is employed with a distance of 50 to 100 meters between each
Type of Mines Used	AT and AHDs
Marking	Required to protect friendly troops—the standard marking fence is used
Removal	Not required. If responsibility is transferred, report will be completed as for a protective minefield.
Reports	• Report of Intention • Report of Initiation • Report of Progress (if required) • Report of Completion • Report of Transfer
Records	Standard DA Form 1355, Minefield Record is required Note: A record of change is required if the minefield is altered.
Remarks	Density and depth depend upon tactical situation

Phony Minefield Characteristics

Introduction

A phony minefield is an area of ground used to simulate a live minefield and deceive the enemy. Phony minefields can supplement or extend live minefields and are used when time, effort, and, or material for live minefields is limited.

Characteristics

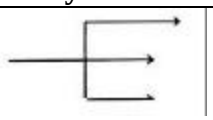
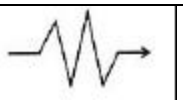
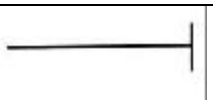
The characteristics of phony minefields are listed in the table below:

Factor	Characteristic
Authority	Required as for the type of minefield simulated
Employment	• Used when lack of time, personnel, or material prevents laying a live minefield • Used to deceive the enemy into thinking the area is mined • Used to camouflage gaps in minefields
Type of Mines Used	• Phony mines • Ground disturbed to simulate live mines • Metal cans and scrap metal are used to give false signals on detector sets
Marking	Required as for the type of minefield simulated
Removal	Not required
Reports	Required as for the type of minefield simulated
Records	Required as for the type of minefield simulated
Remarks	• Planning and coordinating for laying and fire coverage must be done with same care as type simulated. • Integration of small, live minefields is encouraged. • Never use live mines in phony minefield. • Occasionally leave empty mine crates, discarded fuzes, or other mine laying supplies to add to the deception.

Intent and Variables of Tactical Minefields

Minefield Obstacle Group

The symbols of minefield obstacle groups and their intent are listed in the table below:

Symbol	Intent
 Disrupt	Breaks up the enemy's formations; causes premature commitment of breach assets; interrupts command and control; alters timing; and causes a piecemeal commitment of attacking forces
 Turn	Manipulates the enemy's maneuver in a desired direction
 Fix	Slows the enemy within a specified area
 Block	Stops an enemy's advance along a specific avenue of approach (AA) or allows him to advance at an extremely high cost

Variables

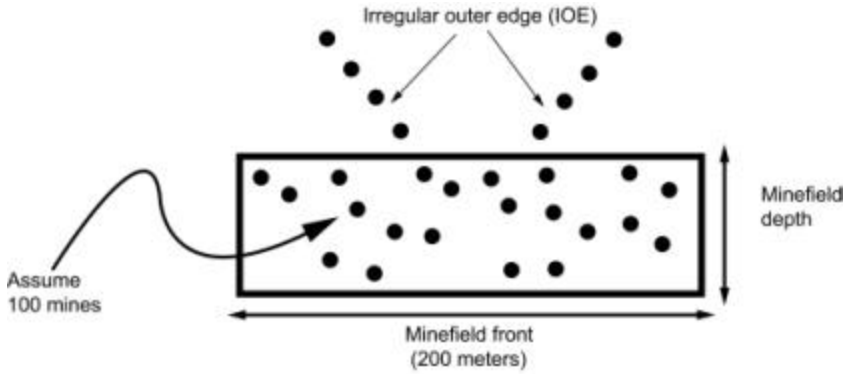
A list of variables to use when designing minefields is provided in the table below:

Variable	Definition
Resource Factor	A numeric value that determines the amount of linear minefield frontage necessary to cause the intended effect.
Frontage	The dimension of the minefield that defines how much of the attacking enemy formation is affected by the minefield. The front of an individual minefield is based on the desired minefield effect (disrupt, turn, fix, or block) and the attack frontage of the enemy.
Depth	Minefield depth is based on the amount of breaching assets we want the enemy to exhaust to create a lane. The standard should start with 100 meters and increase in depth as necessary.

Continued on next page

Variables, continued

Variable	Definition
Density	Minefield density is an expression of how many mines are contained in the minefield. It is expressed in either linear or area density. • Linear density: the average number of mines within a 1-meter path through the minefields depth anywhere along the front. • Area density: the average number of mines in a 1-square meter anywhere in the minefield.
Mine Composition	Mine composition includes effective use of different types of mines. By using full-width kill mines, the probability of kill increases for the minefield. M18A1 AP mines are used where the enemy is expected to conduct a dismounted breach.
Probability of Kill	A measure expressed as a percentage that a vehicle blindly moving through a minefield would detonate a mine.
Irregular Outer Edge (IOE)	A strip or multiple strips extending from the first row of the minefield (enemy side) used to break up the regular pattern of the minefield.



Linear Density: 100 mines ÷ 200 meters = 0.5 mines per meter front
Area Density: 100 mines ÷ (100 x 200) =.005 mines per square meter

Tactical Minefield Design

Introduction

There are guidelines for varying minefield depth, frontage, density, and composition to achieve the best results. These guidelines are not fixed rules and may be tailored to fit the needs of the mission. They may apply to conventional mine laying techniques, as well as the employment of scatterable mine systems.

Minefield Computation

To calculate the number of minefields necessary to achieve the desired results, complete the steps listed in the table below:

Step	Action
1	Multiply the resource factor by the width of the unit's AA to obtain the total amount of tactical minefield linear frontage. Constant AA for a company and a battalion are • Company width: 500 meters • Battalion width: 1,500 meters
2	Divide the linear frontage by the constant minefield frontage.
3	Round up to the next whole number to obtain the total number of individual minefields.

Example

Scenario: Reconnaissance reports indicate that a battalion size enemy unit has been sighted. The enemy is expected to move through your area of operation. The division has tasked your unit to emplace a disrupt minefield on your AA.

Task: Determine the number of minefields necessary to achieve the desired effect.

Consideration	Constant
Resource Factor	0.5
Battalion AA	1,500m
Frontage	250m

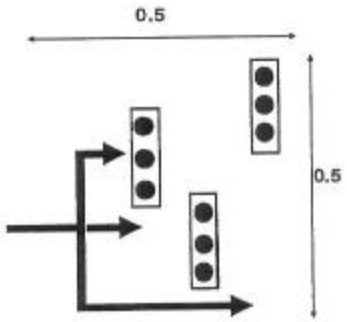
Example: $.5 \times 1{,}500 = 750 \div 250 = 3$ minefields

Disrupt Tactical Minefield Design

Variables

The constant factors for the disrupt tactical minefield design are listed in the table below:

Variable	Constant
Resource factor	0.50
Group dimensions	0.5 W x 0.5 D
Probability of kill	50%
Frontage	250m
Depth	100m
AT mines	Yes (Pressure/tilt)
AP mines	No
AHD	Yes
IOE	No



Considerations

Factors to consider when designing the disrupt tactical minefield are listed in the table below:

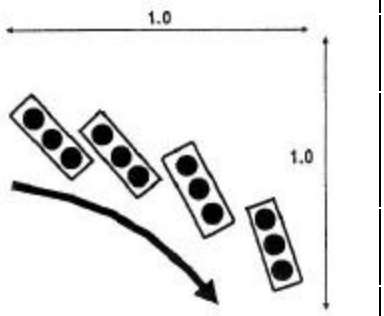
Factor	Consideration
Employment	Used forward of or within the engagement areas (EAs)
Effect	Designed to attack half of the enemy's AA
Mines	Predominantly contain track-width AT mines. Full-width mines are used at the leading edge of the minefield to increase the probability of mine encounter, causing the enemy to commit his breaching assets.
AHDs	• May be used to frustrate the enemy's breaching operations • May be used with scatterable mine systems • Will **not** be used with conventional mines
IOE	Not required to deceive the enemy on orientation or increase the probability of kill

Turn Tactical Minefield Design

Variables

The constant factors for the turn tactical minefield design are listed in the table below:

Variable	Constant
Resource factor	1.20
Group dimensions	1.0 W x 1.0 D
Probability of kill	75%
Frontage	500m
Depth	300m
AT mines	Yes (Pressure/tilt)
AP mines	No
AHD	No
IOE	No



Considerations

Factors to consider when designing the turn tactical minefield are listed in the table below:

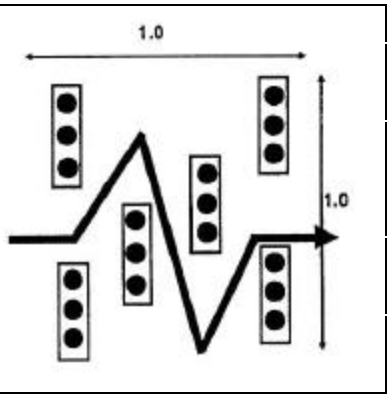
Factor	Consideration
Employment	• Must entice the enemy to maneuver in the desired direction rather than breach the obstacle. • The bypass must be easily detected to entice the enemy to it. • The point where the turn is to be initiated is anchored by no go terrain or heavily fortified by friendly forces.
Effect	Directs the enemy's maneuvers in a desired direction
Mines	The majority of mines should be full-width AT mines. Full-width AT mines are in the first rows the enemy encounters and the depth of the minefield either exhausts the enemy's breaching assets or convinces him to bypass early.
AHDs	Not required since the enemy force will seldom commit to dismounted breach when faced with intense fires
IOE	Should not be used because the enemy will determine the orientation of the minefield and the bypass

Fix Tactical Minefield Design

Variables

The constant factors for the fix tactical minefield design are listed in the table below:

Variable	Constant
Resource factor	1.00
Group dimensions	1.0 W x 1.0 D
Probability of kill	50%
Frontage	250m
Depth	120m
AT mines	Yes (Pressure/tilt)
AP mines	No
AHD	No
IOE	Yes



Considerations

Factors to consider when designing the fix tactical minefield are listed in the table below:

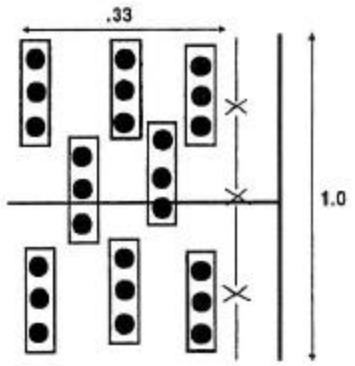
Factor	Consideration
Employment	Used to give the defender time to acquire, target, and destroy the attacking enemy throughout the depth of an EA or AA
Effect	Must span the entire width of the AA, causing the enemy to slow down in a specified area
Mines	The majority of mines are track-width AT. Full-width AT mines are used in the IOE and leading edge of the minefield.
AHDs	Not required because the application of massed direct and indirect fires complicate the enemy's breaching efforts
IOE	Added to delay the enemy and confuse the attacker on the exact orientation of individual minefields

Block Tactical Minefield Design

Variables

The constant factors for the block tactical minefield design are listed in the table below:

Variable	Constant
Resource factor	2.40
Group dimensions	1.0 W x .33 D
Probability of kill	100%
Frontage	500m
Depth	300m+
AT mines	Yes (Pressure/tilt)
AP mines	No
AHD	Yes
IOE	Yes



Considerations

Factors to consider when designing the block tactical minefield are listed in the table below:

Factor	Consideration
Employment	Individual minefields are employed successively in a shallow area. As soon as the enemy breaches one minefield, it is critical to encounter another, thereby denying the enemy to project combat power and maintain momentum.
Effect	Must span the entire width of the AA and not allow a bypass
Mines	• Track-width mines are used in the first row of each minefield. • Full-width AT mines are located in the rear of each minefield. This allows the enemy to penetrate and meet the most lethal part of the minefield and prevents any maneuvering within the minefield.
AHDs	Used against dismounted troops
IOE	AHDs are used to confuse the attacker as to the minefield's limits and to complicate enemy employment of mechanical breaching assets.

Lesson 1 Exercise

Directions Complete exercise items 1 through 12 by performing the action required. Check your answers against those listed at the end of this lesson.

Item 1 What are the three types of minefields?

a. Protective, tactical, and phony
b. Protective, phony, and deliberate
c. Deliberate, hasty, and protective
d. Tactical, turn, and fixed

Item 2 What type of minefield directly attacks enemy maneuvers and gives the defender an advantage position over the attacker?

a. Disrupt
b. Deliberate
c. Tactical
d. Protective

Item 3 The characteristics, hasty and deliberate, describe which type of minefield?

a. Tactical
b. Protective
c. Phony
d. Block

Continued on next page

Item 4 What DA form is required with the hasty minefield?

a. DA Form 1355
b. DA Form 1355-2-R
c. DA Form 1355-1-R
d. DA Form 1355-1-H

Item 5 Disrupt, turn, fix, and block are characteristics of which type of minefield?

a. Deliberate
b. Phony
c. Protective
d. Tactical

Item 6 What type of minefield uses metal cans and scrap metal to give false signals on detector sets?

a. Protective
b. Disrupt
c. Tactical
d. Phony

Item 7 A tactical minefield designed to slow the enemy within a specified area is known as the _____ minefield.

a. fix
b. turn
c. block
d. disrupt

Continued on next page

Item 8 The standard minefield depth should start with _____ meters and increase in depth as necessary.

a. 100
b. 150
c. 250
d. 300

Item 9 How many minefields are necessary to manipulate a battalion size enemy unit tasked to design a turn tactical minefield?

a. Two
b. Three
c. Four
d. Five

Item 10 The average number of mines within a 1-meter path through the minefield depth anywhere along the front is known as

a. IOE.
b. density.
c. linear density.
d. area density.

Item 11 Which two tactical minefields use AHDs?

a. Disrupt and turn
b. Fix and turn
c. Block and fix
d. Block and disrupt

Continued on next page

Item 12 In the block tactical minefield, where are the full-width AT mines located?

a. Front of each minefield
b. Leading edge of minefield
c. Rear of each minefield
d. In the IOE

Continued on next page

Solutions

The table below lists the answers to the exercise items. If you have questions about these items, refer to the reference page.

Item Number	Answer	Reference
1	a	2-4
2	c	2-4
3	b	2-5
4	c	2-6
5	d	2-7
6	d	2-8
7	a	2-9
8	a	2-9
9	c Solution: Turn RF = 1.20 Battalion AA = 1,500 Frontage = 500 1.20 x 1,500 = 1,800 ÷ 500 = 3.6; rounded off to 4	2-10
10	c	2-11
11	d	2-12 and 2-15
12	c	2-15

Lesson Summary

In this lesson, you learned about the types, characteristics, intent, variables, and design of tactical minefields.

In the next lesson, you will learn about the hasty protective minefield.

LESSON 2

HASTY PROTECTIVE MINEFIELDS

Overview

Introduction

Hasty protective minefields are used as part of a unit's defensive perimeter. They are usually laid by units using mines from their basic load. If time permits, the mines should be buried to increase their effectiveness, but they may be laid on top of the ground in a random pattern.

Content

In this lesson, you learn about employment of the hasty protective minefield.

Learning Objectives

Upon completion of this lesson, you should be able to

- Identify the tasks to install the hasty protective minefield.
- Identify the tasks to record the hasty protective minefield.
- Identify the tasks to activate the hasty protective minefield.
- Identify the tasks to remove the hasty protective minefield.

In This Lesson

This lesson contains the following topics:

Installing the Hasty Protective Minefield

Tasks

There are seven tasks you must perform to install the hasty protective minefield listed in the table below:

Task	Description
1	Perform Area Reconnaissance
2	Submit Intention Report
3	Organize Personnel
4	Submit Initiation Report
5	Post Security
6	Establish Reference Point
7	Place Minefield

Task 1: Perform Area Reconnaissance

Conduct an area reconnaissance to determine the following:

- Mine location to cover perimeter, enhance weapon systems, and dead space
- Number and type of mines necessary
- Equipment necessary
- Time required to install minefield
- Listening posts (LP) and observation posts (OP)
- Landmark that can be identified on a map using an eight-digit grid coordinate
- Reference point (RP) that is easy to identify

Continued on next page

Task 2: Submit Intention Report

The table below is an example of the *intention report* submitted via your chain of command. Reports are submitted by the fastest and most secure means available.

Report Line	Reported Information	Example
Alpha	Tactical objectives (temporary road block or other)	Bridge work site security
Bravo	Type of minefield	Hasty protective
Charlie	Estimated number and types of mines and whether surface-laid mines or mines with AHDs	(5) M16 AP mines (7) M18 AP mines No AHDs
Delta	Location of minefield by grid	Grid 89654539
Echo	Location and width of minefield lanes and gaps	Rt. 67 No. ____ south approach to bridge
Foxtrot	Estimated starting and completion date-time group is written as Day/Time/Time Zone/Month/Year	Start: 120700ZApr95 Completion: 120800ZApr95

Task 3: Organize Personnel

Organize working parties and make sure each Marine knows and understands their assigned task in the following areas:

- Security party
- Site party
- Laying party
- Marking party
- Arming party
- Recording party (squad leader's task)

Continued on next page

Installing the Hasty Protective Minefield, Continued

Task 4: Submit Initiation Report

The table below is an example of the *initiation report* submitted via your chain of command. Reports are submitted by the fastest and most secure means available.

Report Line	Reported Information	Example
Delta	Location of minefield by grid	Grid: 89654539
Foxtrot	Estimated starting and completion date-time group	Start: 120700ZApr95 Completion: 120800ZApr95

Task 5: Post Security

Establish LPs, OPs, and security teams on the flanks and forward of the area to be mined.

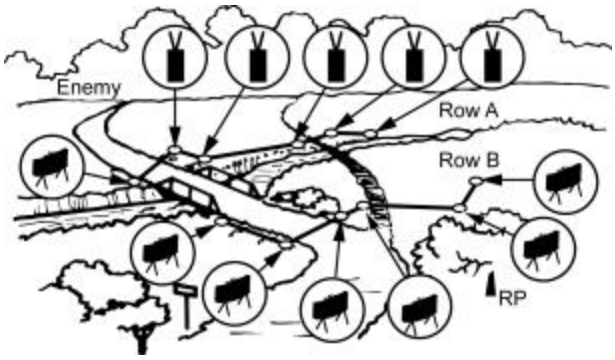
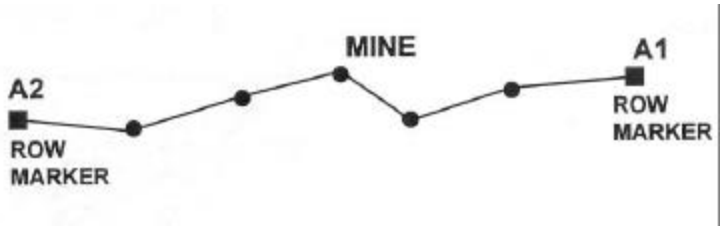
Task 6: Establish Reference Point

Select an easily identifiable RP. It may be a lone tree, large rock, or tree stump.

Continued on next page

Task 7: Place Minefield

To install the hasty protective minefield, complete the steps listed in the table below:

Step	Action
1	Provide each Marine with one type of mine to carry.
2	Direct each Marine to stand in the position that you have selected for the first row of mines. Note: Position mines from right to left as you are facing the enemy. The row closest to the enemy is always known as row A and succeeding rows are designated B, C, D, etc. 
3	Make adjustments once the first row of mines is initially positioned. Note: Make sure the mines are spaced far enough apart to prevent sympathetic detonation.
4	Place a row marker (stake) at an arbitrary point 15 to 25 paces to the right and left (facing the enemy) of the first and last mine in row A.  Note: The stake on the right is known as A1 and the left as A2.
5	Repeat steps 1 through 3 if additional rows are needed.

Recording the Hasty Protective Minefield

Tasks

There are six tasks you must perform to record the hasty protective minefield listed in the table below:

Task	Description
1	Record Azimuth Block
2	Calculate Scale
3	Record RP and Row Markers
4	Record Mines
5	Record Landmark
6	Complete Tabular and Identification Blocks

Task 1: Record Azimuth Block

To record the azimuth block, complete the steps listed in the table below:

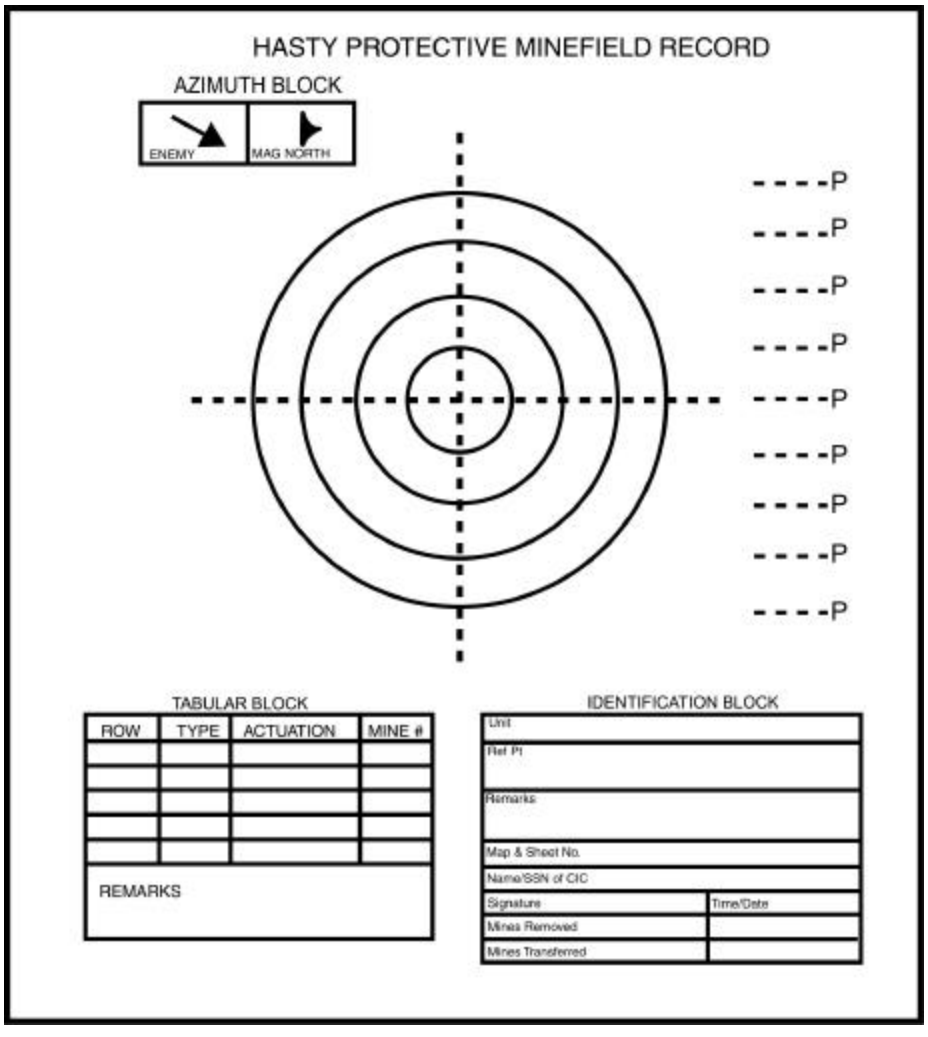
Step	Action
1	Using a blank DA Form 1355-1-R, Hasty Protective Minefield Record, locate the azimuth block in the upper left-hand portion of the form.
2	In the left-hand portion of the azimuth block, draw an arrow indicating the enemy's direction of travel.

Continued on next page

Recording the Hasty Protective Minefield, Continued

Task 1: Record Azimuth Block, continued

Step	Action
3	In the right-hand portion of the azimuth block, draw an arrow indicating the direction of magnetic north.



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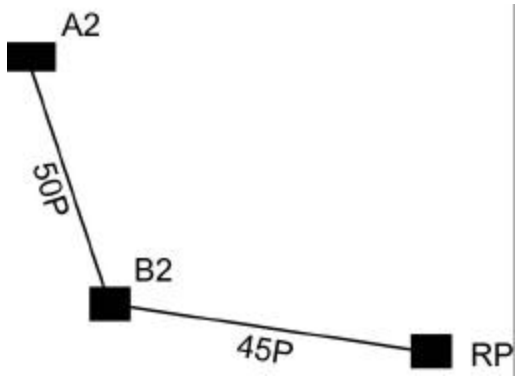
Task 2: Calculate Scale

To determine which scale to use, complete the steps listed in the table below:

Step	Action
1	Determine the scale for the DA Form 1355-1-R, Hasty Protective Minefield Record. Formula: Distances from RP to farthest point in minefield + 10 paces ÷ 4 = scale.

Constant	Factor
4	Represents the four concentric rings on the form.
10	Added to the pace count as a safety margin to make sure the minefield sketch is entirely contained within the largest ring in the form.

Example: The distance from the RP to A2 is 95 paces. RP to B2 equals 45 paces plus B2 to A2 is 50 paces, making a total of 95 paces.



95 + 10 = 105 ÷ 4 = 26.2 paces—rounded off to the nearest whole number.

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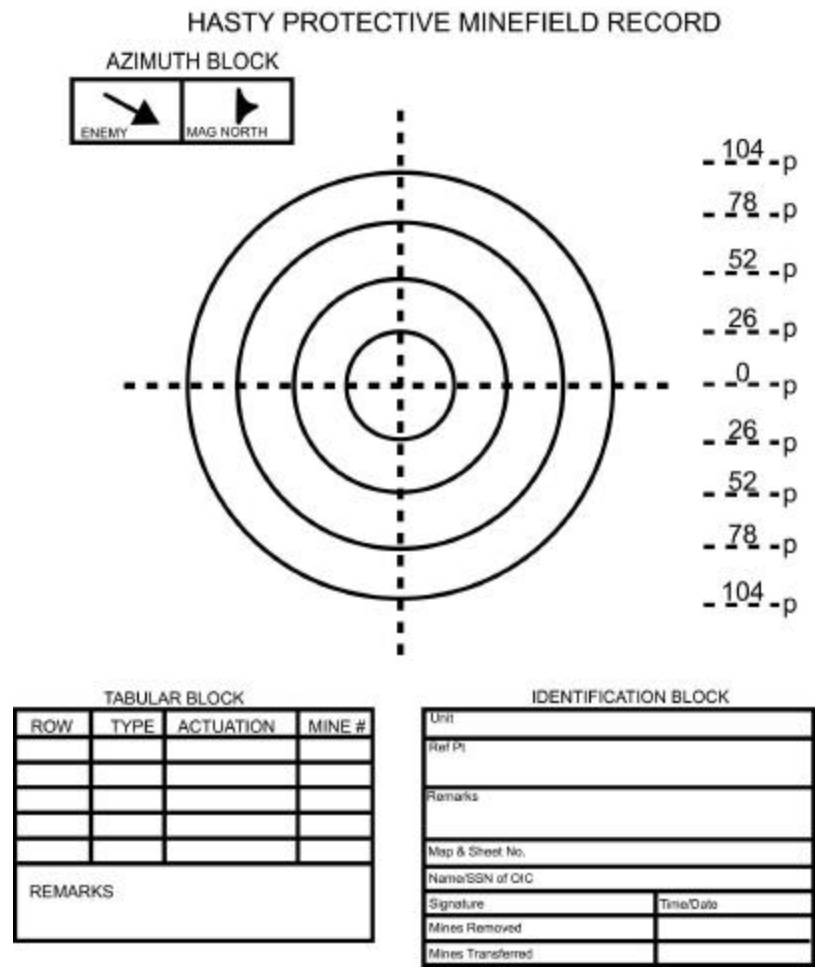
Task 2.
Calculate Scale, continued

Step	Action
2	Record the scale as 2 centimeters, which equal 26 paces, in the blank spaces on the right-hand side of the form. Using a 26-pace increment and going in both directions on the scale, start with zero in the center and insert the additional pace counts of 26, 52, 78, and 104 on the scale as shown in the diagram below: 

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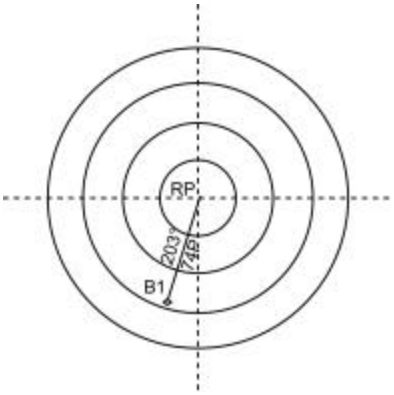
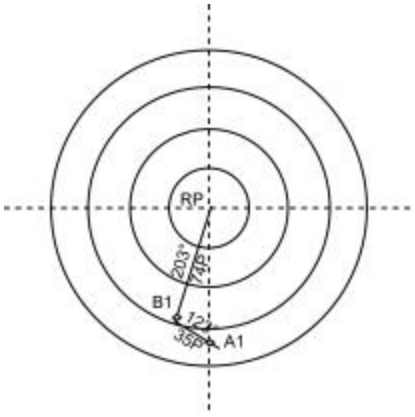
Recording the Hasty Protective Minefield, Continued

Task 3: Record RP and Row Markers

To record the RP and row markers, complete the steps listed in the table below:

Step	Action
1	Shoot a magnetic azimuth from RP to B1 row marker and pace the distance. Note: Azimuths are shot from right to left facing the enemy.
2	Draw a line from the RP to B1 marker. Record the azimuth and pace count on the recording form as shown in the diagram. 
3	Shoot a magnetic azimuth from B1 to A1 row marker and pace the distance.
4	Draw a line from the B1 marker to A1 marker. Record the azimuth and pace count on the recording form as shown in the diagram. 

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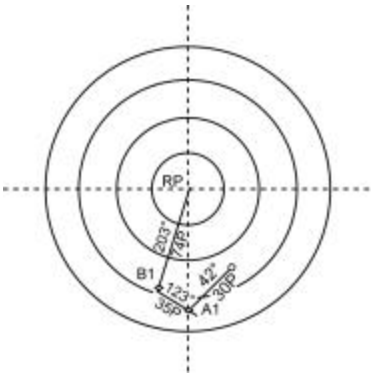
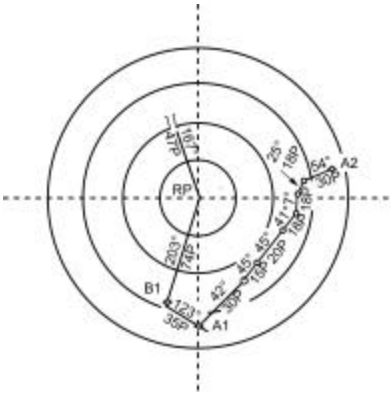
Recording the Hasty Protective Minefield, Continued

Task 4: Record Mines

To record the mines, complete the steps listed in the table below:

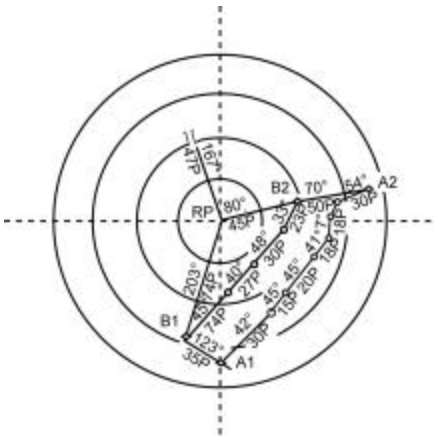
Step	Action
1	Shoot a magnetic azimuth from A1 marker to the first mine in row A and pace the distance. Note: Azimuths are shot from right to left facing the enemy.
2	Draw a line from the A1 marker to the first mine. Record the azimuth and pace count on the recording form as shown in the diagram. 
3	Shoot a magnetic azimuth from the first mine to the second mine in row A and pace the distance.
4	Draw a line from the first mine to the second mine. Record the azimuth and pace count on the recording form as shown in the diagram. Repeat steps 1 through 4 to record remaining mines in row. 
5	To record subsequent rows, return to the right side of the minefield and begin with the row marker; repeat steps 1 through 3 with B1, C1, D1, etc.

Continued on next page

Recording the Hasty Protective Minefield, Continued

Task 5: Record Landmark

To record the landmark, complete the steps listed in the table below:

Step	Action
1	Shoot a magnetic azimuth from the landmark to the RP and pace the distance.
2	Draw a line from the landmark to the RP. Record the azimuth and pace count to the recording form as shown in the diagram. Note: The landmark is used to assist others in locating the minefield should it be abandoned. 

Task 6: Complete Tabular and Identification Blocks

Fill in the tabular and identification blocks with the necessary information as shown below:

TABULAR BLOCK

ROW	TYPE	ACTUATION	MINE #
A	M16A1	TRIPWIRE	1,2,6
	M18A1	PRESSURE	3,4,5
B	M16A1	TRIPWIRE	1,3
	M21	PRESSURE	2
REMARKS	Lankmark is located at S.E. Corner Concrete Bridge 18s122343409		

IDENTIFICATION BLOCK

Unit	2nd PLT. A Co., 2nd CEB, 2nd MARDIV	
Ref Pt	Long Oak Tree 1851184314	
Remarks	Points A1 & A2, B1 & B2 are marked with U-shaped steel picket	
Map & Sheet No.	TALBOT 5568	
Name/SSN of OIC	Lt Lee Marks 260 07 4299	
Signature	ICE MARKS	Time/Date 0800/12 Apr 95
Mines Removed		
Mines Transferred		

Activating the Hasty Protective Minefield

Tasks

There are two tasks you must perform to activate the hasty protective minefield listed in the table below:

Task	Description
1	Arm Minefield
2	Submit Completion Report

Task 1: Arm Minefield

To arm the minefield, complete the steps listed in the table below:

Step	Action
1	Recall LPs, OPs, and security personnel as the arming of the mines is being performed. Note: First recall the Marines forward of the minefield, then move the flanking security back toward friendly forces as the rows of mines are being armed.
2	Camouflage and arm the mines, starting with the mines nearest the enemy (row A) back to friendly position.
3	Verify the mine count by collecting and counting each mine's safety pins and clips. Note: These pins will be used in the future for disarming.

Continued on next page

Task 2: Submit Completion Report

The table below is an example of the *completion report* submitted via your chain of command. Reports are submitted by the fastest and most secure means available.

Report Line	Reported Information	Example
Alpha	Changes in information submitted to lay report	None
Bravo	Total number and types of mines used	(5) M16 AP Mines (7) M18 AP Mines
Charlie	Date and time of completion	0800/000412
Delta	Method of placing mines (surface-laid or buried)	M16's Buried M18's Surface
Foxtrot	Laying unit authorized lay minefield	2nd PLT, A Co., 2nd CEB, 2nd MARDIV

CAUTION: After the DA Form 1355-1-R, Hasty Protective Minefield Record has been completed, it becomes a SECRET document. It must be guarded as such, and not be allowed to fall into the possession of the enemy or unauthorized personnel.

Removing the Hasty Protective Minefield

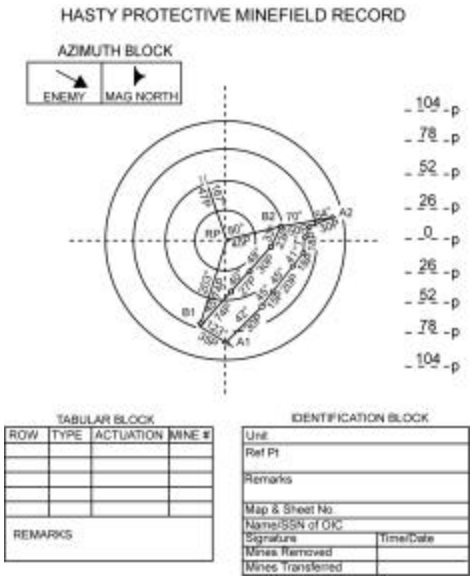
Tasks

There are seven tasks you must perform to remove the hasty protective minefield listed in the table below:

Task	Description
1	Locate Minefield
2	Enter Minefield
3	Establish Security
4	Locate RP
5	Locate Row Marker
6	Locate Mines
7	Recall Security
8	Return DA Form 1355-1-R, Hasty Protective Minefield Record

Task 1: Locate Minefield

To locate the minefield, complete the steps listed in the table below:

Step	Action
1	Obtain a map of the area and the completed DA Form 1355-1-R, Hasty Protective Minefield Record.
2	Study the map and DA Form 1355-1-R.
3	Locate landmark using DA Form 1355-1-R and map. 
4	Move to landmark.

Continued on next page

Removing the Hasty Protective Minefield, Continued

Task 2: Enter Minefield

Request permission via chain of command to enter minefield.

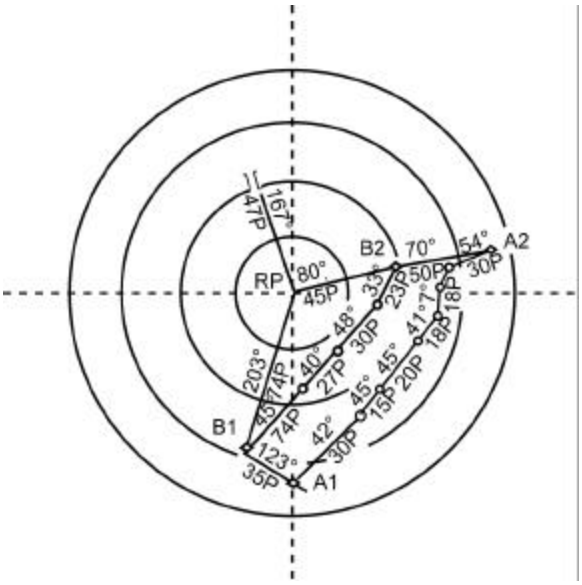
Task 3: Establish Security

Establish LPs and OPs. The enemy situation and terrain visibility, etc will determine security teams.

CAUTION: Do not allow your securities to become trapped between the minefield and the enemy.

Task 4: Locate RP

To locate the RP, shoot an azimuth from the landmark to the RP using the information on the DA Form 1355-1-R, Hasty Protective Minefield Record.



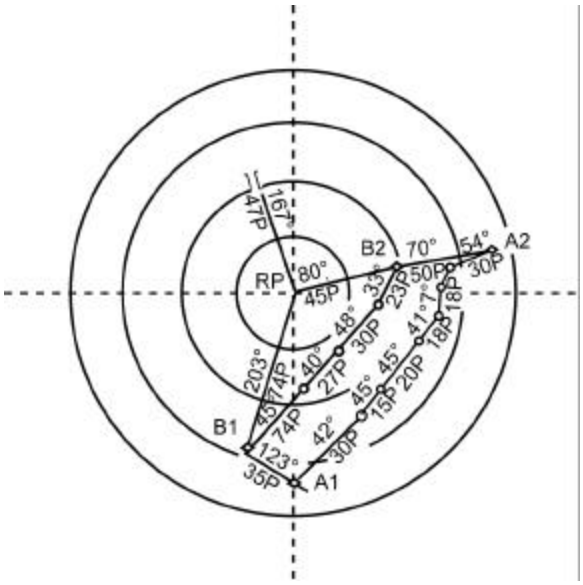
Note: Have two Marines execute the shooting of azimuths and pacing off distances. This will help prevent mistakes. Each will verify the other before advancing.

Continued on next page

Removing the Hasty Protective Minefield, Continued

Task 5: Locate Row Marker

To locate the first row marker, complete the steps listed in the table below:

Step	Action
1	Shoot an azimuth from the RP to the first row marker B1. Use the information on the DA Form 1355-1-R, Hasty Protective Minefield Record. 
2	Pace off the distance to the B1 marker.

Continued on next page

Task 6: Locate Mines

To locate the mines, complete the steps listed in the table below:

Step	Action
1	Shoot an azimuth from the B1 marker to the first mine in row B. 
2	Pace off the distance to the first mine by advancing slowly toward the mine and carefully observing the area. CAUTION: When you are within five paces of where the mine should be, STOP! Look for the mine, it should be visible. If you are unable to see the mine, seek assistance by either probing or obtaining a mine detector to locate the mine.
3	Disarm and remove the mine.
4	Shoot an azimuth from the first mine to the second mine in row B. Note: Follow the procedures in steps 2 and 3 to pace the distance, locate, and disarm the mine.
5	Shoot an azimuth from the second mine to the third mine and continue this procedure until the entire row (B1 to B2) of mines have been disarmed and removed.
6	Remove the B1 and B2 markers and proceed to A1 marker.
7	Repeat steps 1 through 6 to locate, disarm, and remove the remaining mines.

Continued on next page

Removing the Hasty Protective Minefield, Continued

Task 7: Recall Security	Recall LPs, OPs, and flank securities.
Task 8: Return DA Form	Return the completed DA Form 1355-1-R, Hasty Protective Minefield Record to your unit commander for proper destruction.

Lesson 2 Exercise

Directions Complete exercise items 1 through 11 by performing the action required to each exercise item. Check your answers against those listed at the end of this lesson.

Item 1 During installation, determining the reference point is conducted in which task?

a. Intention report
b. Place minefield
c. Area reconnaissance
d. Post security

Item 2 What information found on the intention report is also found on the initiation report?

a. Grid location of the minefield and type of minefield
b. Estimate starting/completion date-time group and grid location of the minefield
c. Tactical objective and estimated start/completion date-time group
d. Estimate number/type of mines and location of width, lane, and gaps

Item 3 The row closest to the enemy is known as row

a. A.
b. B.
c. C.
d. D.

Continued on next page

Item 4 Row markers are placed at what distance from the first and last mines in a row?

a. 8 to 10 paces
b. 10 to 20 paces
c. 10 to 25 paces
d. 15 to 25 paces

Item 5 Using the distance of the row markers from the RP provided below, select the scale to be used on the recording form.

RP to C1 = 50P	RP to C2 = 45P
C1 to B1 = 38P	C2 to B2 = 35P
B1 to A1 = 47P	B2 to A2 = 48P

a. 26 paces
b. 35 paces
c. 36 paces
d. 37 paces

Item 6 How are azimuths shot when recording the minefield?

a. Left to right facing the enemy
b. Starting from the landmark
c. From row closest to the enemy
d. Right to left facing the enemy

Item 7 The landmark is used to assist others

a. maintaining the minefield.
b. providing direct fire support.
c. locating the minefield should it be abandoned.
d. locating the row markers.

Continued on next page

Item 8

When recording, what information is found in the tabular block?

a. Location of the minefield
b. Information on the mines
c. Information on the laying unit
d. Information on the enemy

Item 9

How is the mine count verified after arming the hasty protective minefield?

a. Reference the logistics calculation worksheet.
b. Count the number of safety pins and clips saved from the mines.
c. Visually inspect the placing of each mine.
d. Debrief the laying party after they have completed their task.

Item 10

Why would you have two Marines shooting the azimuths and pacing the distances?

a. Help prevent mistakes
b. Debrief the junior personnel on job performance
c. Help speed up the process
d. Make sure that all the mines are removed

Item 11

When removing mines, how many paces away do you stop from where the mine should be?

a. Three
b. Four
c. Five
d. Six

Continued on next page

Solutions

The table below lists the answers to the exercise items. If you have questions about these items, refer to the reference page.

Item Number	Answer	Reference
1	c	2-22
2	b	2-23 and 2-24
3	a	2-25
4	d	2-25
5	c RP to C1 = 50P AP to C2 = 45 C1 to B1 = 38P C2 to B2 = 35 B1 to A1 = $\frac{47P}{135}$ B2 to A1 = $\frac{48}{128}$ (135 + 10) ÷ 4 = 36.2	2-28
6	d	2-30 and 2-31
7	c	2-32
8	b	2-32
9	b	2-33
10	a	2-36
11	c	2-38

Lesson Summary

In this lesson, you learned how to install, record, activate, and remove the hasty protective minefield.

In the next lesson, you will learn about row minefields.

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LESSON 3

ROW MINEFIELDS

Overview

Introduction

Row mining is the process of laying mines in rows instead of in another standard or random pattern. A typical row minefield contains several rows of regularly spaced mines.

Row mining is not a new idea. It has been used since the beginning of modern mine warfare and is very effective. It is especially effective in support of maneuver oriented doctrine. Row mining improves the maneuver commander's flexibility by providing an obstacle that requires less manpower effort. Row mining is faster to lay than standard pattern mining because the mines are often laid directly from slow-moving vehicles, reducing the time and personnel required to lay them.

Content

In this lesson, you learn the general rules for installing row mines, including formulas for logistical calculations, working party responsibilities, and procedures. You will also learn configurations for four standard types of row minefields.

Learning Objectives

Upon completion of this lesson, you should be able to

- Identify row minefield rules.
- Identify logistical calculations for laying row minefields.
- Identify working parties responsibilities for laying row minefields.
- Identify procedures for laying row minefields.
- Identify variable characteristics of the four standard types of row minefields: disrupt, fix, turn, and block.

Continued on next page

Overview, Continued

In This Lesson This lesson contains the following topics:

Row Minefield Rules

Introduction

The most important factor in row mining is the requirement for strict command and control; row mining can be the most hazardous type of mine laying there is for two main reasons:

- Vehicles and personnel have to move in and around mines without the safety of a centerline strip.
- The laying procedure is very rapid.

However, the laying unit has flexibility to develop techniques and standard operating procedures (SOPs) to meet specific battlefield requirements as long as it follows the same rules that govern the authority, reporting, recording, and marking of all other conventional minefields.

Mine Rows

The rules of mine rows are listed below:

- There are two types of mine rows--regular and short, which are described under the IOE rules below.
- Regular rows are marked and recorded and designated by letters A, B, and so forth, with row A being closest to the enemy.
- The minimum distance between rows of AT mines is 8 meters.
- The distance between the start row marker and the first mine in a row is the mine spacing for that row.
- Start and end row markers are permanent markers that are made of detectable material.

IOE

The rules of the IOE are listed below:

- The IOE is located on the enemy side of the minefield.
- The IOE baseline must be at least 15 meters from row A.
- IOE mines are buried.
- IOE short rows are labeled at start (I1) and end (I1E) points.
- IOE short rows must be at least 15 meters apart.

Continued on next page

Row Minefield Rules, Continued

Clusters

The rules of cluster mines are listed below:

- Clusters are placed on the row centerline and directed toward the enemy side.
- Cluster composition must remain the same throughout the row.
- A cluster in row mining usually consists of one AT mine. (The type of AT mine may vary from one cluster to another.)
- When a cluster contains a mine equipped with an AHD, the mine is armed before the AHD is armed and the cluster is not armed until all personnel are at least 60 meters away.
- Mines or clusters will not be closer than 15 meters from the perimeter fence.
- Omitted clusters do not contain mines. They are recorded on DA Form 1355, Minefield Record.
- Clusters are omitted within lanes, within gaps, in areas less than 2 meters from boundaries and lanes, and in areas where the terrain (trees, rocks) prohibits emplacement.

Mine and Cluster Spacing

Spacing between mines or clusters can vary from 4 to 10 meters, but will remain constant within the row.

Row Marker Spacing

The distance between a *start* row marker and the first mine in a row is the mine spacing for that row.

Omitted Cluster or Mine

If the distance between a mine or cluster and any turning point is less than the mine spacing for that row, omit that mine or cluster. The mine immediately following a turning point is always located at the mine spacing for that row.

Recording Form

Record all minefields on DA Form 1355, Minefield Record.

Logistical Calculations for Laying Row Minefields

Introduction

To determine the logistical requirements for the row minefield, you need to know the mine type, desired density, minefield front, type of mine spacing, and type of vehicle. When not using one of the four standard row minefields (disrupt, fix, turn, or block), you will have to apply specific formulas for calculating the total number of AT mines and the amount of fencing and marking material you will need. Round numbers up to the nearest whole number.

To determine the number of vehicle loads needed, there is a chart following these formulas that provides the mine-haul capacity for various types of vehicles.

Method for Calculations

The steps for calculating row minefields are listed in the table below:

Step	Calculation
1	To determine the number of mines required, multiply the desired density by the minefield frontage *Density X Frontage = Total number of Mines Required*
2	To determine the number of mines per row, divide the minefield frontage by the desired spacing interval between mines. *Frontage / Mine Spacing = Number of Mines per Row*
3	To determine the number of rows, divide the number of mines by the number of mines per row. *Number of Mines / Number of Mines per Row = Number of Rows*
4	To determine the actual number of mines, multiply the number of mines per row by the number of rows. *Number of Mines per Row X Number of Rows = Actual Number of Mines*
5	To determine the number of mines to request, multiply the actual number of mines by 1.1 (includes 10 percent resource factor). *Actual Number of Mines X 1.1 = Number of Mines to Request*

Continued on next page

Methods for Calculations, continued

<table>
<tr><th>Step</th><th>Calculation</th></tr>
<tr><td>6</td><td>Apply formulas to determine how much you will need of the following materials:

• Concertina wire and engineer stakes to support the concertina wire

• Barbwire and engineer stakes to support the barbwire

• Minefield marking signs

<table>
<tr><th>Material Required</th><th>Formula</th></tr>
<tr><td>Concertina wire:
Multiply the front by 2 = A. Multiply the depth by 2 = B. Add A + B = C. Add C + 160. Multiply C by 1.4</td><td>[(Front X 2) + (Depth X 2) + 160] X 1.4 = Meters of concertina required.</td></tr>
<tr><td>Number of engineer stakes for use with concertina wire:
Amount of concertina wire divided by 15 (round up)</td><td>Amount of concertina wire / 15 = Number of engineer stakes.</td></tr>
<tr><td>Barbwire:
Multiply the front by 2 = A. Multiply the depth by 2 = B. Add A + B = C. Add C + 320. Multiply C by 1.4</td><td>[(Front X 2) + (Depth X 2) + 320] X 1.4 = Meters of barbwire required.</td></tr>
<tr><td>Number of engineer stakes for use with barbwire:
Amount of barbwire divided by 30 (round up)</td><td>Amount of barbwire / 30 = Number of engineer stakes.</td></tr>
<tr><td>Marking signs:
Number of marking signs = the number of engineer stakes</td><td>Number of marking signs = Number of engineer stakes.</td></tr>
</table>
</td></tr>
</table>

Continued on next page

Logistical Calculations for Laying Row Minefields, Continued

Mine Laying Vehicles

Marines normally lay row minefields from vehicles to speed up installation--any type of tactical or wheeled vehicle may be used. The preferred technique is to use three vehicles (spaced approximately 60 meters apart) so three rows can be laid simultaneously.

Capacity for Various Vehicles

The mine haul capacity for various types of vehicles are listed in the table below:

Vehicle		Concertina Wire		M15 AT Mine		M19 AT Mine		M21 AT Mine		M16 AT Mine		MICLIC Reload	
HMMWV, M998 2,500-lb; 215 cu ft		2		51		34		27		55		1 (over-loads)	
2 ½-ton Truck, 5,000-lb; 443 cu ft		4		102		69		55		111		1	
5-ton Truck, 10,000-lb, 488cu ft		7		204		138		109		222		3	
5-ton Dump Truck, 10,000-lb; 135/291 cu ft		2/4		112/204		79/138		32/69		168/222		2/3	
40-ton Lowboy 80,000-lb; 1,760 cu ft		27		1,466		1,035		419		1,777		27	
# Mines Wt/lb	Cube cu ft	40/1180	64	1/49	1.2	2/72	1.7	4/91	4.2	4/45	.8	2656	64.8

Use Random Vehicle Patterns to Deceive

Before installation or even preparing vehicles for mine laying, make sure you drive them in random patterns across the minefield. Such random patterns deceive the enemy by masking the actual planned mine laying pattern.

Platoon Organization

Introduction

Task-organizing when executing a row minefield is intricate and places great demands on the leader. Leave nothing to chance; make allowances for transporting, handling, and controlling the mines.

Platoon Organization Table

To maximize the efficiency of the row mining process, the supervisory personnel must task-organize the platoon into the following parties: siting and recording, marking, mine dump, and laying.

PLATOON ORGANIZATION TABLE

Parties	Personnel	Equipment Needed
Supervisory personnel	1 Officer 1 SNCO	Map, lensatic compass, notebook, and minefield forms
Siting and recording party	1 NCO 2 Troops	Vehicle, engineer stakes, sledgehammer, sketching equipment, lensatic compass, minefield recording forms, and map
Marking party	1 NCO 2 Troops	Wire, engineer stakes, marking signs, wire cutters, gloves, and sledgehammer
Mine dump party	1 NCO 6-8 Troops	Notebook, wire cutters, and pry bar

Laying party

When laying three rows at once, each laying party consists of an armored personnel carrier (APC) labeled 1, 2, and 3 with the following teams:

Team	Personnel	Equipment Needed
Carrier Team	1 Driver 1 Track Cdr	APC
Sapper Team	1 NCO 4 Troops	Rope, sandbag, mines, fuzes, and wrenches
Digging Team (If mines are surface-laid, there is no digging team.)	1 NCO 4 Troops	E-Tool, stakes, sandbag, and sledgehammer

Note: Using tilt rod fuzes requires more troops to stake mines, insert fuzes, and arm mines.

Working Parties Responsibilities

Supervisory Personnel

The supervisory personnel supervise minefield laying and are responsible for

- Designating the starting point and azimuth of row A which is the closest row to the enemy
- Designating the landmark to the rear of the minefield
- Reviewing entries on DA Form 1355, Minefield Record for accuracy and making sure the form is classified SECRET
- Signing the DA Form 1355, Minefield Record
- Submitting one copy to higher headquarters and retaining one copy

Siting and Recording Party

The siting and recording party is responsible for

- Siting row markers for IOE and IOE short strips
- Siting row and intermediate markers for regular strips
- Providing marking and engineering tape to identify lanes and gaps
- Augmenting other parties once tasks are completed
- Recording landmark azimuths and distances
- Completing DA Form 1355, Minefield Record

Marking Party

The marking party is responsible for

- Installing the marking fence as required
- Augmenting other parties once tasks are completed

Mine Dump Party

The mine dump party is responsible for

- Accounting for all strip packages that arrive from other sources
- Setting up vehicle mine sets at the mine dump
- Hauling supplies
- Creating vehicle sets by setting aside the required number of mines and fuzes for each laying vehicle
- Loosening and hand tightening arming and shipping plugs
- Helping to load the mines onto the laying vehicles
- Disposing of residue

Continued on next page

Working Parties Responsibilities, Continued

Laying Party

The laying party is responsible for

- Establishing mine dumps
- Uncrating and stacking AT mines
- Leaving all other mines in their crates with the lids removed
- Placing fuzes and detonators in separate boxes (Do not mix fuzes and detonators in the same box.)
- Installing, arming, and camouflaging mines

Row Minefield Layout Considerations

Introduction

Once the platoon leader coordinates the location of the minefield(s) with the maneuver commander, siting (or positioning) the mines can begin. Siting is the first step in the actual laying process; it is done for safety and control. Although the minefield may need to be installed at night or during limited visibility, the siting party should site it under the most favorable conditions possible at the time.

Natural Obstacles

Certain features, like thick woods and wide streams, are natural obstacles. Mine rows should be laid in such a way as to both reinforce natural terrain advantages and also to increase effectiveness of the minefield.

Control Measures

Control measures are markers used to guide vehicles through the minefield. They key the laying party when to start and stop laying mines and when to turn. Control measures must be easily discernible to the laying party, but they should not give the minefield orientation away to the enemy.

Different materials should be used to construct each type of marker. For example, a single engineer stake could be used to indicate the starting point of a row. Three engineer stakes could indicate a turning point. Any combination of stakes can be used as long as the parties are informed as to what each marker or combination of markers represents.

Control Measures Construction Material

The material used to construct control measures are listed in the table below:

During daylight operations	During night operations
Engineer stakes	Chem-lights are placed on engineer stakes or hand held
Hand emplaced minefield marking system (HEMMS) poles	Directional flashlights taped on the engineer stakes or hand held
Wooden posts	HEMMS lights used with engineer stakes of poles
Steel rods	Lights from minefield marking set
Engineer tape	Infrared reflectors

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Row Minefield Layout Considerations, Continued

Mine Rows

Mine rows are labeled with a letter; row A would be nearest to the enemy, followed by rows B, C, D, E, and so forth.

When laying tactical minefields, each row has a start and end row marker. Intermediate markers may also be needed, depending on row length and terrain.

Distance Between Rows

The distance between rows is determined by the following factors:

- Depth and density of the minefield
- Terrain
- Suitability

Note: Standard row minefields use a distance of 50 meters between rows.

Mine Spacing

The minefield OIC decides mine spacing. The desired density, availability of laying vehicles, number of vehicles, number of rows, and possibility of sympathetic detonation affect the distance between mines.

Preparation for Submitting an Intention Report

Tasks

If you are planning to install a row minefield, you need to plan how you are going to accomplish the following general tasks in preparation. The results of your reconnaissance and calculations will be included in your *intention report*, describing how you intend to install the mines.

Task	Description
1	Perform Area Reconnaissance
2	Calculate Requirements
3	Submit Intention Report

Task 1: Perform Area Reconnaissance

Perform an area reconnaissance of the minefield location and coordinate with the maneuver force on the exact location. To perform an area reconnaissance, complete the steps listed in the table below:

Step	Action
1	Make sure the maneuver force covers the minefield by direct or indirect fire.
2	Make sure the final location is tied to existing or reinforcing obstacles.
3	Determine locations for rows, landmarks, fences, dumps, and approaches.
4	Select movement routes.
5	Establish local security and job site security.

Task 2: Calculate Requirements

To calculate logistical requirements, complete the steps listed in the table below:

Step	Action
1	Determine number of mines.
2	Determine number of platoon hours to install the minefield.
3	Determine amount of fencing and marking material necessary.
4	Determine number of vehicles necessary to transport materials.

Continued on next page

Preparation for Submitting an Intention Report, Continued

Task 3: Submit Intention Report

The table below is an example of the *intention report* submitted via your chain of command. Reports are submitted by the fastest and most secure means available. To complete the report, provide details about your plan for each report line.

Report Line	Reported Information	Example
Alpha	Tactical objectives	Break enemy formation and cause commitment of enemy breaching assets
Bravo	Type of minefield	Disrupt row minefield
Charlie	Estimated number and types of mines and whether they will be surface-laid mines or mines with AHDs.	(222) M15 AT mines surface-laid
Delta	Location of minefield by grid	Grid: 89654539
Echo	Location and width of minefield lanes and gaps	None
Fox-trot	Estimated starting and completion date-time group	Start: 120700ZApr95 Completion: 120800ZApr95

Row Minefield Layout Procedures

Tasks

There are 10 tasks you must perform when you are planning to lay row minefields.

Task	Description
1	Organize Platoon
2	Submit Intention Report
3	Establish Mine Dump
4	Site Minefield
5	Mark Minefield
6	Submit Progress Report
7	Lay Mines
8	Complete Marking Minefield
9	Submit Completion Report
10	Complete DA Form 1355, Minefield Report

Task 1: Organize Platoon

The supervisory personnel must organize the platoon into working parties and issue equipment.

Task 2: Submit Intention Report

Complete the *intention report* and submit it via your chain of command. Reports are submitted by the fastest and most secure means available.

Task 3: Establish Mine Dump

The supervisory personnel will

- Select a reasonably level site with adequate access for vehicles.
- Keep mines, if necessary, on trailers for mobile dumps.

Continued on next page

Row Minefield Layout Procedures, Continued

Task 4: Site Minefield

To site the minefield, complete the steps listed in the table below:

Step	Action
1	Establish landmark 1 and site the left or right boundary fence.
2	Record distances and azimuths to be used on DA Form 1355, Minefield Record.
3	Install row markers for IOE, starting with IOE 1 (row closest to enemy). **If….** — **Then….** IOE is not used — Proceed to the next step
4	Install A1 row marker and proceed to A2, place intermediate markers as required. Install A2 row marker.
5	Install B2 row marker and proceed to B1, place intermediate markers as required. Install B1 row marker. Follow this procedure until all control measures are installed.
6	Establish landmark 2 and the left or right boundary fence.

Continued on next page

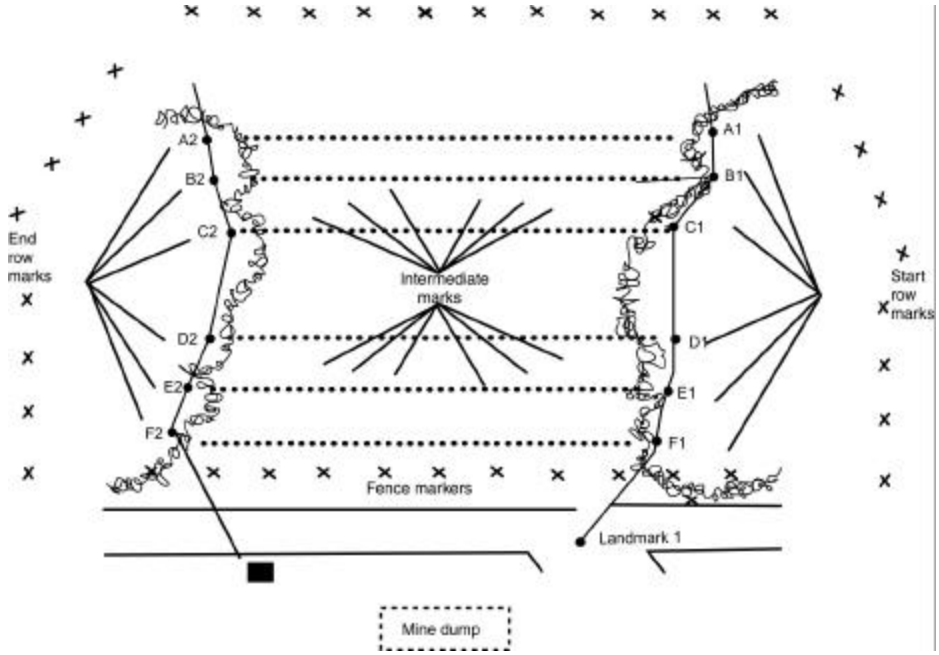
Row Minefield Layout Procedures, Continued

Task 5: Mark Minefield

Install the minefield marking fence while the siting and recording party is performing their tasks.

Diagram

The row minefield site layout is identified in the diagram below:



Task 6: Submit Progress Report

The table below is an example of the *progress report* submitted via your chain of command. Reports are submitted by the fastest and most secure means available.

REPORT LINE	REPORT INFORMATION	EXAMPLE
Delta	• Location of minefield by grid • 25, 50, 75, or 100 percent completed	• Disrupt row minefield, Grid: 89654539 • 25 percent completed

Continued on next page

Row Minefield Layout Procedures, Continued

Task 7: Lay Mines

Platoons usually install row minefields using three vehicles. The following two methods explain how to lay the minefield using each of the methods.

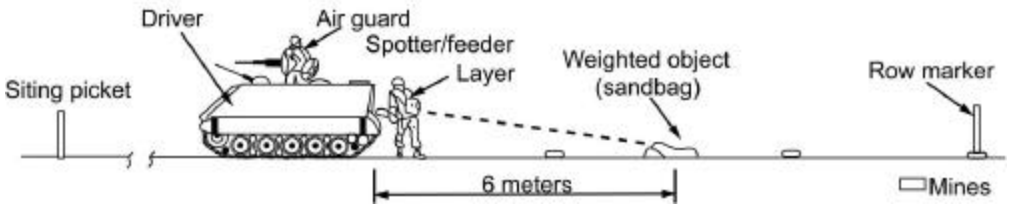
Lay Mines Method 1

To lay mines using method 1, complete the steps listed in the table below:

Step	Action
1	Drive vehicles on site and proceed down the right or left boundary of the minefield to their assigned row. Note: A separate party must be detailed to install the IOE.
2	Task • Vehicle 1 to lay mines at required spacing along the line of control markers. • Vehicle 2 to lay mines as soon as vehicle 1 moves to a safe distance of approximately 60 meters. • Vehicle 3 to lay mines as soon as vehicle 2 moves to a safe distance of approximately 60 meters.
3	Task arming party (members of the laying party) to follow behind the vehicle that is arming mines and remove the temporary control measures.

Diagram

The mine spacing techniques for row minefields are identified in the diagram below:



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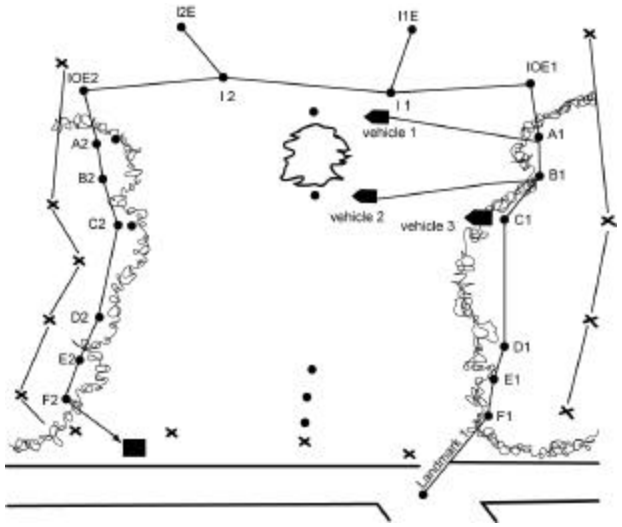
Row Minefield Layout Procedures, Continued

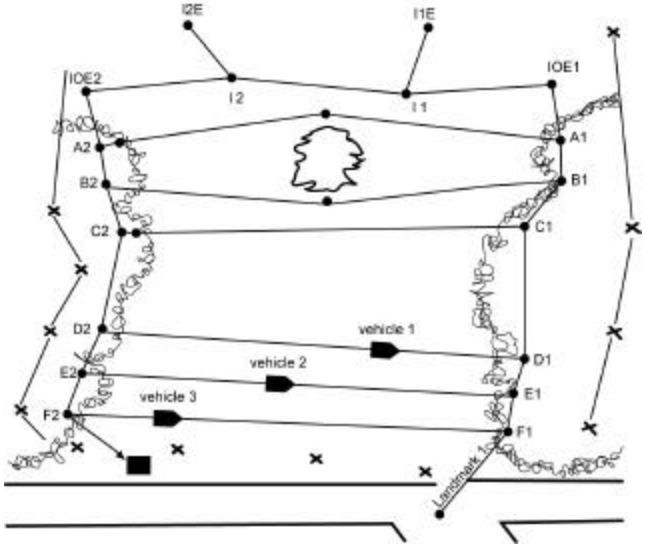
Initial Lay

As vehicles 1 and 2 finish their assigned rows, they pass 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 their next assigned row.



Return Lay

The process of laying and arming mines is repeated, this time in the opposite direction.



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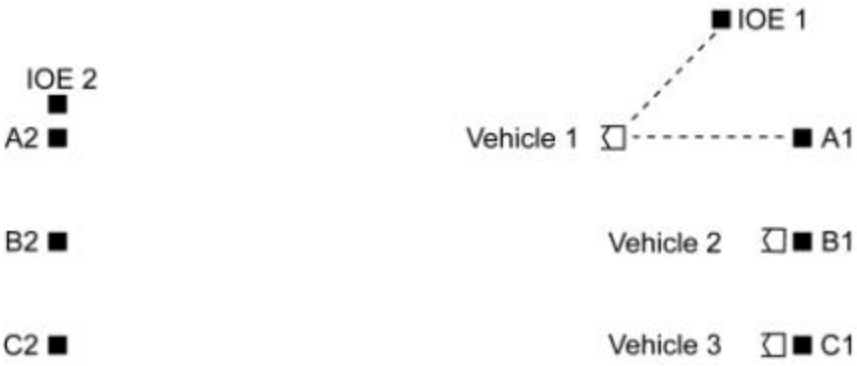
Lay Mines Method 2

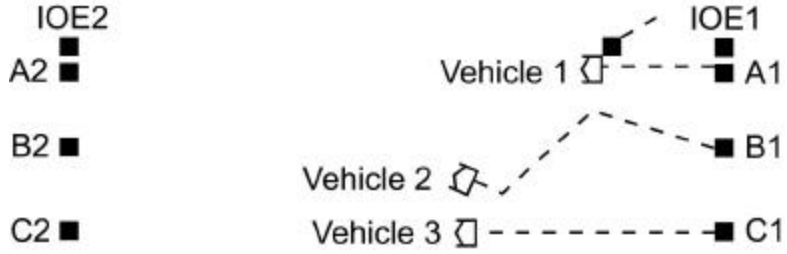
To lay mines using method 2, complete the steps listed in the table below:

In method 2, row B has turning points. If the minefield has six rows, row E will also have turning points. The squad leader in row B is in charge of the overall laying.

Step	Action
1	Drive vehicles on site then proceed down the right or left boundary of the minefield to the assigned rows.
2	Task vehicle 1 to lay mines in row A.  **If….** / **Then….** If an IOE is required and speed is essential — Row A team places the IOE concurrently and at the same mine spacing. Each IOE strip is laid after a predetermined number of mines is placed in row A. Example: Assume an IOE strip is placed every eighth mine. Row A team would omit the eighth mine and place an IOE end marker instead. At the IOE end marker, install the IOE along a designated azimuth. Omit the first two mines in the strip and begin laying at the position of the third mine and continue until the IOE strip is laid.
3	Task vehicle 1 to return to the IOE end marker on row A and stop.

Continued on next page

Lay Mines Method 2, continued

Step	Action
4	Task vehicle 3 to lay mines on row C until told to stop approximately 60 meters past vehicle 1. 
5	Task vehicle 2 to lay mines on row B by heading toward vehicle 1. When vehicle 2 is within 15 meters of vehicle 1, turn it towards vehicle 3 as the last mine is being placed. Task vehicle 2 to lay mines on row B by heading toward vehicle 3. 
6	Vehicle 1 repeats step 1, to include emplacing the IOE strips.

Task 8: Complete Marking Minefield

The minefield marking party completes marking the minefield by installing the rear minefield fence.

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Task 9: Submit Completion Report

The table below is an example of the *completion report* that needs to be submitted via your chain of command. Reports are submitted by the fastest and most secure means available. To complete the report, provide details about your plan for each report line.

Report Line	Reported Information	Example
Alpha	Changes in information submitted in the intention report	None
Bravo	Type of mines used and total number	M15 222
Charlie	Time of completion and date	121000ZApr95
Delta	Method of laying mines (buried or surface-laid)	Surface-laid
Echo	Details of lanes and gaps including marking	No lanes used Single engineer stakes starting point Double engineer stakes turning points
Fox-trot	Details of perimeter marking	Standard fence
Golf	Laying unit and signature of individual authorizing laying of the minefield	2nd Plt. Co A, 8th EngrSptBn FSSG

Enemy Attack

If the enemy attacks during minefield installation, all parties enter vehicles.

- Vehicle 1 exits the minefield first by making a wide turn around the front of the other two vehicles.
- Vehicle 2 follows by making a wide turn around the front of vehicle 3.
- Vehicle 3 exits the minefield last.

Task 10: Complete DA Form 1355

Recording procedures are the same as other minefields. Complete and submit DA Form 1355, Minefield Record.

Types of Row Minefields

Introduction

The specific composition of row minefields depends on mission, enemy, terrain, troops – time, space, logistics (METT-TSL) and available resources. To aid in standardization and platoon techniques, four row minefield compositions have been developed to match obstacle intent and effect:

- Disrupt
- Fix
- Turn
- Block

These standard row minefields are used as building blocks to create the appropriate obstacle based on intent.

Standard Disrupt Row Minefield

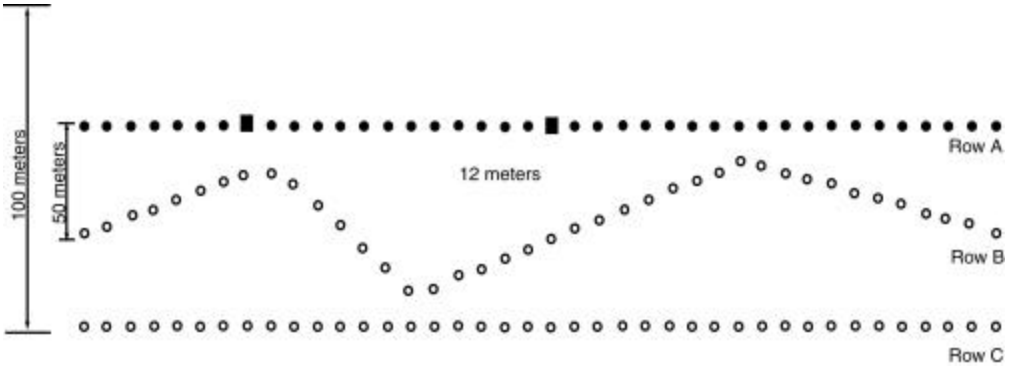
Variables

The constant factors for each standard variable characteristic of the *disrupt* minefield are listed in the table below:

Variable Characteristic	Constant Factor
Frontage (m)	250
Depth (m)	100
AT full-width (# rows)	1
AT track-width (# rows)	2
IOE	No
AHD	No
Platoon hours required	1.5
AT full-width mines	42
AT track-width mines	84
Density	0.5
Mine placement	Surface-laid or buried

Diagram

The layout of a standard *disrupt* row minefield is identified in the diagram below:



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Standard Disrupt Row Minefield, Continued

Factors

The constant factors for each standard *disrupt* mine row are listed in the table below:

Mine Row	Constant Factor
A	• Uses 42 AT full-width (tilt rod) mines placed 6 meters apart • No turning points • May be surface-laid or buried
B	• Place the start and end row markers 50 meters behind row A • Uses 42 track-width AT mines placed 6 meters apart • Preferably no more than three turning points • May be surface-laid or buried
C	• Emplace 100 meters behind row A • Uses 42 track-width AT mines placed 6 meters apart • No turning points • May be surface-laid or buried

Standard Fix Row Minefield

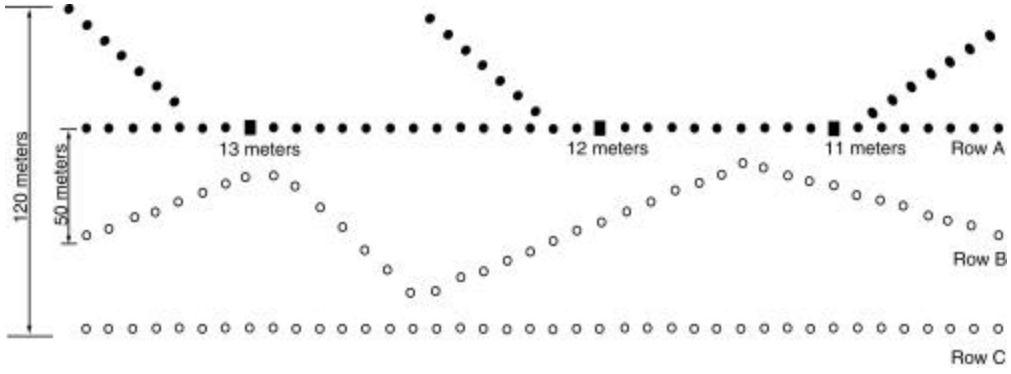
Variables

The constant factors for each standard variable characteristic of the *fix* row minefield are listed in the table below:

Variable Characteristic	Constant Factor
Frontage (m)	250
Depth (m)	120
AT full-width (# rows)	1
AT track-width (# rows)	2
IOE	Yes
AHD	No
Platoon hours required	1.5
AT full-width mines	63
AT track-width mines	84
Density	0.6
Mine placement	Surface-laid or buried

Diagram

The layout of a standard *fix* row minefield is identified in the diagram below:



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Standard Fix Row Minefield, Continued

Factors

The constant factors for each standard *fix* mine row are listed in the table below:

Mine Row	Factor
A	• Uses 42 AT full-width (tilt rod) mines placed 6 meters apart • No turning points • May be surface-laid or buried
B	• Place the start and end row markers 50 meters behind row A • Uses 42 track-width AT mines placed 6 meters apart • No more than three turning points • May be surface-laid or buried
C	• Emplace 100 meters behind row A • Uses 42 track-width AT mines placed 6 meters apart • No turning points • May be surface-laid or buried
IOE	• Has a separate IOE baseline with three IOE short rows • IOE baseline is on the enemy side, 15 meters from row A • Seven full-width AT mines are placed 6 meters apart on each IOE short row • Mines are buried • The first IOE short row is placed 48 meters from the IOE end marker. The second short row is 84 meters from the first short row, and the third short row is 84 meters from the second short row.

Standard Turn Row Minefield

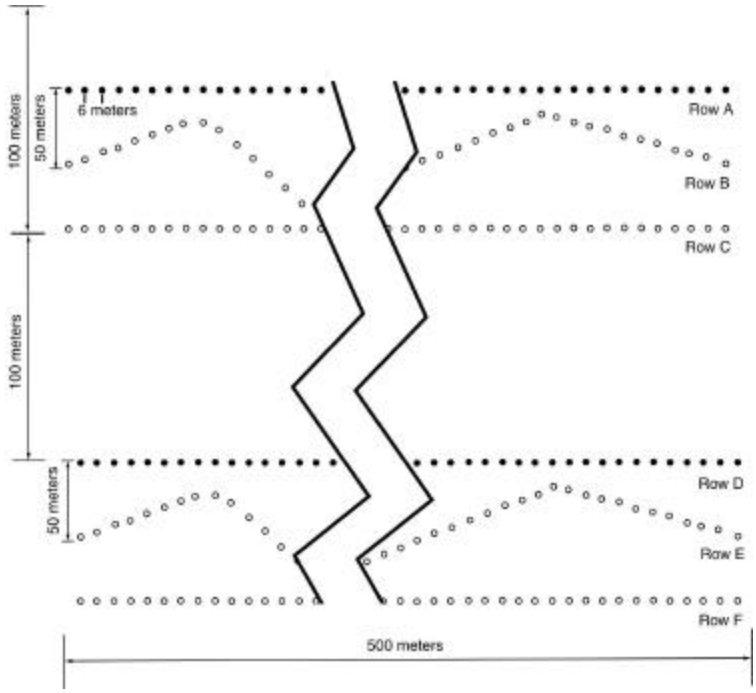
Variables

The constant factor for each standard variable characteristic of the *turn* row minefield are listed in the table below:

Variable Characteristic	Constant Factor
Frontage (m)	500
Depth (m)	300
AT full-width (# rows)	4
AT track-width (# rows)	2
IOE	No
AHD	No
Platoon hours required	3.5
AT full-width mines	336
AT track-width mines	168
Density	1
Mine placement	Surface-laid or buried

Diagram

The layout of a standard *turn* row minefield is identified in the diagram below:



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Standard Turn Row Minefield, Continued

Factors

The constant factors for each standard *turn* mine row are listed in the table below:

Mine Row	Constant Factor
A	• Uses 84 full-width (tilt rod) AT mines placed 6 meters apart • No turning points • May be surface-laid or buried
B	• Place the start and end row markers 50 meters behind row A • Uses 84 full-width (tilt rod) AT mines placed 6 meters apart • Preferably no more than five turning points • May be surface-laid or buried
C	• Emplace 100 meters behind row A • Uses 84 full-width (tilt rod) AT mines placed 6 meters apart • No turning points • May be surface-laid or buried
D	• Emplace 100 meters behind row C • Uses 84 full-width (tilt rod) AT mines placed 6 meters apart • No turning points • May be surface-laid or buried
E	• Place the start and end row markers 50 meters behind row D • Uses 84 track-width AT mines placed 6 meters apart • Preferably no more than five turning points • May be surface-laid or buried
F	• Emplace 100 meters behind row D • Uses 84 track-width AT mines placed 6 meters apart • No turning points • May be surface-laid or buried

Standard Block Row Minefield

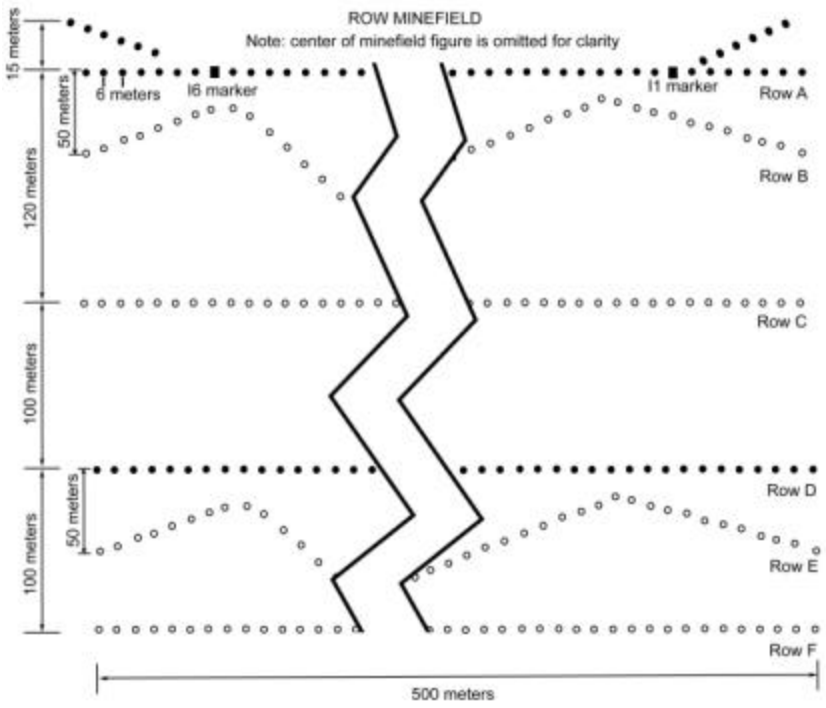
Variables

The constant factor for each standard variable characteristic of the *block* row minefield are listed in the table below:

Variable Characteristic	Constant Factor
Frontage (m)	500
Depth (m)	320
AT full-width (# rows)	4
AT track-width (# rows)	2
IOE	Yes
AHD	Yes
Platoon hours required	5
AT full-width mines	378
AT track-width mines	168
Density	1.1
Mine placement	Surface-laid or buried

Diagram

The layout of a standard *block* row minefield is identified in the diagram below:



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Standard Block Row Minefield, Continued

Factors

The constant factors for each standard *block* mine row are listed in the table below:

Mine Row	Constant Factor
A	• Uses 84 full-width (tilt rod) AT mines placed 6 meters apart • No turning points • May be surface-laid or buried
B	• Place the start and end row markers 50 meters behind row A • Uses 84 full-width (tilt rod) AT mines placed 6 meters apart • Preferably no more than five turning points • May be surface-laid or buried
C	• Emplace 100 meters behind row A • Uses 84 full-width (tilt rod) AT mines placed 6 meters apart • No turning points • May be surface-laid or buried
D	• Emplace 100 meters behind row C • Uses 84 full-width (tilt rod) AT mines placed 6 meters apart • No turning points • May be surface-laid or buried
E	• Place the start and end row markers 50 meters behind row D • Uses 84 track-width AT mines placed 6 meters apart • Preferably no more than five turning points • May be surface-laid or buried
F	• Emplace 100 meters behind row D • Uses 84 track-width AT mines placed 6 meters apart • No turning points • May be surface-laid or buried
IOE	• Has six IOE short rows • Has a separate IOE baseline • Seven full-width AT mines are placed 6 meters apart on each IOE short row • Mines are buried • The first IOE short row is placed 72 meters from the IOE end marker, and the five subsequent IOE short rows are placed at 72-meter intervals on the IOE baseline.

Lesson 3 Exercise

Directions Complete exercise items 1 through 17 by performing the action required. Check your answers against those listed at the end of this lesson.

Item 1 The distance between the *start* row marker and the first mine in a row is

a. half the mine spacing for that row.
b. two times the mine spacing for that row.
c. six meters from the first mine.
d. the mine spacing for that row.

Item 2 What would you do if the distance between a mine or cluster and any turning point were less than the mine spacing for that row?

a. Nothing.
b. Omit the mine or cluster.
c. Notify your NCOIC.
d. Place the mine at the proper spacing.

Item 3 What information is necessary to determine the logistical requirements for the row minefield?

a. Type of minefield, desired density, mine types, and mine spacing
b. Desired density, mine type, number of rows, and mine spacing
c. Desired density, minefield front, mine type, mine spacing type, and type vehicle
d. Mines per row, density, front, mine spacing, and type vehicle

Continued on next page

Directions for Items 4 and 5

Answer questions 4 and 5 by completing the row minefield logistical calculation worksheet using the table below:

Vehicle		Concertina Wire		M15 AT Mine		M19 AT Mine		M21 AT Mine		M16 AT Mine		MICLIC Reload	
HMMWV, M998 2,500-lb, 215 cu ft		2		51		34		27		55		1 (over-loads)	
2.5-ton truck 5,000-lb, 443 cu ft		4		102		69		55		111		1	
5-ton truck 10,000-lb, 488 cu ft		7		204		138		109		222		3	
5-ton dump truck 10,000-lb 135/291 cu ft		2/4		112/204		79/138		32/69		168/222		2/3	
40-ton lowboy 80,000-lb, 1,760 cu ft		27		1,466		1,035		419		1,777		27	
# Mines Wt/lb	Cube cu ft	40/1180	64	1/49	1.2	2/72	1.7	4/91	4.2	4/45	.8	2656	64.8

Scenario

Your platoon commander tasked you to calculate requirements for a row minefield that the platoon is going to install. The minefield will have a 600-meter front; desired density of 0.5-0-0; M15 mines spaced 8 meters apart; and a 5-ton dump with a capacity of 291 cubic feet.

ROW MINEFIELD LOGISTICAL CALCULATION WORKSHEET					
Given Information	**Desired Density**	**Minefield Front**	**Mine Type**	**Mine Spacing**	**Type Vehicle**

To determine number of …	Then …	Results are…
AT mines required	Multiply desired density by the minefield frontage.	
Mines per row	Divide minefield frontage by desired spacing per mine.	
Rows	Divide the number of mines by the number of mines per row.	
Mines to request	Multiply number of actual mines by 1.1.	
Vehicle loads Note: Use the same table for the standard pattern minefield.	Divide number mines requested by mines per vehicle.	
Fencing and marking material required	Follow procedures as in the standard pattern minefield.	
Note: Resulting numbers are rounded up to the nearest whole number.		

Continued on next page

Item 4 How many mines will you request?

a. 75
b. 300
c. 330
d. 331

Item 5 How many vehicle loads are required to transport the mines?

a. 1
b. 1.61
c. 2
d. 2.5

Item 6 How many vehicles does a platoon usually use to install row minefields?

a. One
b. Two
c. Three
d. Four

Item 7 What party is responsible for submitting a copy of DA Form 1355, Minefield Record to headquarters?

a. Supervisory personnel
b. Siting and recording party
c. Marking party
d. Mine dump party

Item 8 What party is responsible for establishing mine dumps?

a. Laying party
b. Marking party
c. Siting party
d. Recording party

Continued on next page

Item 9 What is the approximate safe distance between vehicles while laying mines in a row minefield?

a. 30 meters
b. 40 meters
c. 50 meters
d. 60 meters

Item 10 When vehicles enter and exit the minefield, they proceed down the

a. right or left lanes.
b. right or left boundaries.
c. left or right mine rows.
d. left or right mine lanes.

Item 11 When is the IOE placed concurrently with row A?

a. During the installation of the minefield
b. In laying mines method 2, an IOE is required and speed is essential
c. In laying mines method 1, an IOE is required and speed is essential
d. In laying mines methods 1 and 2, as required by the OIC

Item 12 If the enemy attacks during minefield installation, what should vehicle 2 do?

a. Follow vehicle 1 making a wide turn around the front of vehicle 3.
b. Exit minefield first by making a wide turn around the front of vehicle 1.
c. Exit the minefield as soon as possible.
d. Request for supporting fire and seek cover.

Continued on next page

Item 13 What are the four types of row minefield compositions?

a. Disrupt, fixed, turn, block
b. Disruption, fixed, turn, block
c. Disrupt, fix, turn, block
d. Disrupt, fix, turn, blockout

Item 14 How many turning points are in a standard *disrupt* row minefield?

a. No more than three
b. No more than four
c. No more than five
d. No more than six

Item 15 The standard *block* row minefield has _____ rows.

a. Three
b. Four
c. Five
d. Six

Item 16 Which of the standard *block* row minefields have IOE strips?

a. Fix and disrupt
b. Disrupt and turn
c. Block and turn
d. Fix and block

Continued on next page

Solutions

The following table below lists the answers to the exercise items. If you have questions about these items, refer to the reference page.

Item Number	Answer	Reference
1	d	2-48
2	b	2-48
3	c	2-49
4	c	2-51
5	c	2-51
6	c	2-51
7	a	2-53
8	a	2-54
9	d	2-62
10	b	2-63
11	b	2-64
12	a	2-66
13	c	2-67
14	a	2-69
15	d	2-74
16	d	2-71 and 2-75

Lesson Summary

In this lesson, you learned the general rules for installing row mines (including formulas for logistical calculations, working party responsibilities and procedures) and the configurations for four standard types of row minefields.

In the next study unit, you will learn about minefield breaching.

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STUDY UNIT 3

MINEFIELD BREACHING

Overview

Introduction

Minefield breaching is defined as those activities that enable a force to move personnel and equipment across the minefield without delays due to terrain or obstacles.

Scope

This study unit will help to provide you with the skills and knowledge necessary in detecting, breaching, and clearing minefields.

In This Study Unit

This study unit contains the following lessons:

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LESSON 1

COUNTERMINE OPERATIONS

Overview

Introduction

Countermine operations are used to breach or clear a minefield. These tasks include detecting, reporting, reducing, proofing, and marking. Minefield breaching and clearing techniques and procedures are contained in this lesson. FM 90-13-1, *Combined Arms Breaching Operations*, provides combined arms commanders and staffs with doctrine, tactics, and techniques needed to successfully overcome obstacles.

Content

In this lesson, you learn about the skills and knowledge necessary to be an effective member of any breaching force.

Learning Objectives

Upon completion of this lesson, you should be able to

- Define common terms for countermine operations.
- Identify the five tenets necessary to perform a successful breach.
- Identify the four types of lanes by purpose in breach operations.
- Identify the three types of breach forces.
- Identify the four types of breaching operations.
- Identify the five types of explosive minefield breaching systems.
- Identify the two types of mechanical minefield breaching systems.
- Identify the methods of manual reduction.
- Identify the two methods for proofing.
- Identify lane marking requirements.

Continued on next page

Overview, Continued

In This Lesson This lesson contains the following topics:

Definitions

Obstacle	The term *obstacle* refers to anything that effects or impedes the flow of movement towards an objective.
Reduction	Reduction means action taken against an obstacle that diminishes or eliminates its original intended effect. One example is a lane created in a minefield.
Mine Neutralization	When the mine has been made incapable of detonation upon passage of a target, it is neutralized. Neutralization does not necessarily mean the mine is completely safe to handle.
Breaching	Breaching is the use of a combination of tactics, techniques, and procedures to project combat power to the far side of an obstacle.
Breaching Operations	Breaching operations is a synchronized combined arms operation under the control of the maneuver commander.

Minefield Clearance	Clearing is the total elimination or neutralization of an obstacle. Clearing operations are
	• Not conducted under fire
	• Usually performed
	  • After the breaching operation by follow-on engineer units
	  • When in a friendly area of operations where an obstacle is a hazard or hinders movement

Route Clearance	Route clearance is the removal of mines along pre-existing roads and trails.

Obstacle Breach Theory

Introduction

The first step in understanding breaching operations is to know the obstacle breach theory. This theory equips the engineer and maneuver commander with fundamentals needed to integrate a breach into the tactical planning, preparation, and execution of an operation.

Breaching Tenets

Successful breaching operations are characterized by the application of these five breaching tenets:

- Intelligence
- Fundamentals
- Organization
- Mass
- Synchronization

Intelligence

In any operation where enemy obstacles can interfere with friendly maneuver, obstacle intelligence (OBSTINTEL) becomes a priority intelligence requirement. Finding enemy obstacles or seeing enemy obstacle activity validates and refines the intelligence officer's picture of the battlefield.

Purpose

The engineer unit depends on OBSTINTEL to determine which reduction techniques offer the best chance for success and minimize the risk to the breaching force. OBSTINTEL helps to

- Determine the enemy's intentions, plans, and strength
- Discover the types of mines and mine fuzes the enemy has used

Collection

Reconnaissance is a combined arms activity that includes engineers. A combination of light and heavy engineers is the ideal obstacle reconnaissance force.

Gathering OBSTINTEL

- Requires a reconnaissance patrol to examine the minefield
- Is a combined arms reconnaissance activity that must include engineers

Continued on next page

Obstacle Breach Theory, Continued

Fundamentals

The breaching fundamentals apply regardless of METT-TSL or specific breach assets. Tactics, techniques, and procedures may vary within the suppress, obscure, secure, reduce, and resupply (SOSRR) breach fundamentals.

Suppress

Suppression is the focus of all available fires on enemy personnel, weapons, and equipment to prevent fires on breaching operations. Suppressive fires include

- Direct fire
- Indirect fire
- Electronic countermeasures
- Directed energy

Obscure

Obscuration interferes with enemy observation and target acquisition and conceals breaching activities. Terrain can be used to obscure operations. Obscuration smoke deployed on or near enemy positions minimizes the enemy's vision. Screening smoke used in the breaching area and on the enemy conceals movement and reduction activities.

Secure

The force secures the breaching operation site to

- Prevent the enemy from interfering with obstacle reduction
- Ensure safe passage of the force through lanes created during obstacle reduction

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Reduce

Obstacle reduction is the creation of lanes through the minefield to allow passage of the attacking force. The number and width of the lanes varies with the situation and type of breaching operation. Lanes must be sufficient to allow the force to cross the minefield and accomplish its mission.

The types, lane width, and purposes of different lane widths are listed in the table below:

Type	Lane Width (in meters)	Purpose
Assault footpath	1	• Allows you to pass dismounted troops and continue an attack • Allows you to secure the far side of the minefield while lanes are being breached
Initial lane	4	• Allows the minimum width to pass breaching and assaulting forces • Is widened and marked as soon as the tactical situation allows
Single lane	8	Allows one-way vehicular traffic to pass with little impact on vehicle speed or safety
Double lane	16	Allows two-way traffic through the breach

Marking and Report

The unit reducing the minefield will mark and report the minefield, lane locations, and conditions to higher headquarters. Follow-on units will further reduce or clear the minefield, if required.

Resupply

Resupply is making sure all breaching materials are resupplied and units are ready for another breach, if necessary.

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Obstacle Breach Theory, Continued

Reduce

The minimum number of lanes required for obstacle reduction is outlined in the table below:

If the breach is...	And the commander is...	Number of lanes required…
Deliberate or In-stride	Task force	Two
	Any force greater than a company	One
Assault	Assaulting platoon	One

Organization

The commander organizes his or her forces with assets necessary to accomplish the breaching operation quickly and effectively. He or she must organize the following forces:

- Support force
- Breach force
- Assault force

Support Force

The primary responsibility of the support force is to eliminate the enemy's ability to interfere with the breaching operation. The support force must isolate the battlefield with fires and suppress enemy fires by using direct and indirect fires against the enemy vehicles and personnel capable of bringing fire on the breach force.

Breach Force

The primary responsibility of the breach force is to create a lane through the minefield that allows passage of the assault force. The breach force must mark the lane lengths and entry and exit points to speed passage of the assault and follow-on forces. In combat, one engineer platoon with breaching assets is required for each lane.

Once the lanes are breached, the breach force secures the far side of the minefield and provides suppressive fires as the assault force passes through the lanes.

Assault Force

The primary responsibility of the assault force is to destroy or dislodge the enemy on the far side of the minefield. The assault force secures the far side by physical occupation. The assault force may also assist the support force with suppression while the breach forces reduce the minefield.

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Obstacle Breach Theory, Continued

Mass	Breaching is conducted by rapidly applying concentrated force at a point to crack the minefield and rupture the defense. Massed combat power is directed against the enemy's weakness. The commander masses engineers and breaching equipment to reduce the obstacle.
Enemy Weakness	The breach site is selected according to enemy defense weaknesses and favorable terrain conditions. If a weakness is not apparent, create one.
Application	Fix the majority of the defending force, and then isolate a small portion of it for attack. Suppress this portion of the defense and then mass the breach force at this location. The breach force is organized and equipped (100 percent redundancy in equipment is required) to use several different reduction techniques in the event the primary technique fails.
Synchroni-zation	Breaching operations require precise synchronization of SOSRR breaching fundamentals by support, breach, and assault forces. Synchronization means the breach plan supports the maneuver plan, and there is unity of effort. It also means that obscuration and suppression fires are in sync and the breach forces' timing is such that the applied fires adequately cover the time needed to breach.
Requirements	Detailed reverse planning, effective command and control, and a well-rehearsed force are fundamental to achieving synchronization. Failure in these areas can result in rapid and massive losses of personnel and equipment in the minefield, or from the enemy's fires.

Breaching Operations

Introduction

Breaching operations make maneuver possible in the face of enemy obstacle efforts. Since obstacles may be encountered anywhere, maneuver forces integrate breach operations into all movement plans.

Bypass

When possible, enemy minefields are bypassed to maintain momentum and conserve critical countermine assets. However, when deciding to bypass rather than breach, you must consider the possibility of friendly units being channeled into kill zones. You can accomplish a bypass in two ways:

- Maneuver around the minefield
- Move over the minefield with aviation assets

When maneuvering around the obstacle, attempt to locate a portion of the force in overwatch positions to cover the bypass of the main element.

Types

Maneuver units currently employ the following types of breaching operations:

- In-stride
- Deliberate
- Assault
- Covert

In-Stride Breaching Operations

Definition

In-stride breaching is a very rapid technique using standard actions on contact and normal movement techniques. It consists of preplanned, well-trained, and well-rehearsed breaching action and reduction procedures by predesigned combined arms elements.

Characteristics

Normally, a task force conducts an in-stride breach during movement to contact or during a hasty attack. The in-stride breach

- Uses the element of surprise and the initiative to get through the obstacle with minimal loss of momentum
- Is used against weak defenders or very simple obstacles
- Is executed from the march
- Maintains the momentum of the attack by denying the enemy the opportunity to mass forces to cover the obstacles

Operations

Task force commanders plan and prepare for an in-stride breach by task-organizing the subordinate units with forces necessary to conduct independent breaching operations. Proper integration of engineers and breaching assets into task force and company team formations is critical to the success of an in-stride breach.

Deliberate Breaching Operations

Definition

Deliberate breaching is a scheme of maneuver specifically designed to cross an obstacle to continue the mission. The deliberate breach is characterized by

- Thorough reconnaissance
- Detailed planning
- Extensive preparation
- Explicit rehearsal

Characteristics

Units conduct a deliberate breach when

- It is impossible to take the obstacle in stride
- An in-stride breach has failed
- The forces required for support, breach, and assault are beyond the capability of a task-organized subordinate unit

Operations

Normally, a company-sized unit executes a deliberate breach because the commander must halt the unit's momentum to maneuver his or her platoons as support, breach, and assault forces.

Assault Breaching Operations

Definition

Assault breaching allows a force to penetrate the enemy's protective obstacles and destroy the defender in detail. Company-size units and platoons assigned to assault an objective, as part of a larger force, conduct the assault breach.

Characteristics

Engineers are integrated into assault forces to provide decentralized, responsive support to the lowest possible level. This is a sharp contrast to the in-stride breach, where engineer platoons operate as a unit under the control of the platoon commander.

Operations

Engineers contribute to the assault in four major areas. Their task includes

- Conducting decentralized obstacle reduction to maintain the mobility of the assault force and momentum of the attack
- Reducing fortifications with demolition
- Widening initial assault breaches to permit follow-on forces to move on or through the objective
- Handing over assault lanes to follow-on forces for widening and improving marking

Covert Breaching Operations

Definition

Dismounted forces conduct covert breaching, a special operation, during limited visibility. The covert breach is silently executed to achieve surprise and minimize casualties.

Characteristics

The covert breach relies on

- Stealth
- Quiet manual lane reduction techniques
- Dismounted maneuver

Operations

The task force commander plans to conduct a covert breach when the

- Mission specifies infiltration through enemy forward, lightly defended obstacles to attack an objective deeper in the enemy's sector
- Need for surprise outweighs the need for overwhelming suppressions

The main difference between a covert breach and other breaching operations is the execution of the SOSRR breaching fundamentals. In the covert breach, suppression from the support force is an

- On-call task upon detection of the breach force
- On-order task once the breach is complete and the assault is initiated

Minefield Breaching Systems (Explosive)

Types

The types of explosive minefield breaching systems are listed below:

- MK2 MOD 0 system (discussed in lesson 3)
  - M353 trailer chassis
  - MK155 launcher
  - M58 linear demolition charge, also known as a mine clearing line charge (MICLIC)
  - MK22 rocket
  - Storage box
- MK1 MOD 0 system
  - MK154 launcher
  - M59 linear demolition charge (3)
  - MK22 rocket (3)
- M1A1/M1A2 bangalore torpedo
- AP obstacle breaching system (APOBS)

Minefield Breaching Systems (Explosive): MK2 MOD 0 System

M58 Linear Demolition Charge or MICLIC

The MICLIC is used to breach both AT and AP minefields. It must be ready before reaching a minefield. Preparation time required for pre-load and inspection is approximately 30 minutes and requires a 7.5-ton crane or a 6,000-pound forklift. Proper continuity and pre-firing inspections of the launcher and charge assembly will greatly increase the reliability of the commander's most valuable asset.

Special Considerations

Since the MICLIC is critical to a successful breach, it is

- Protected by the force
- Moved to the breach site along easily traveled, covered, and concealed routes
- Not used for any other task, such as firing and maneuvering

You must consider these factors when selecting a vehicle to tow the MICLIC.

WARNING: When exposed to fire or extreme heat, volatility of the boosters and pentaerthritoltetranitrate (PETN) increases dramatically and could cause uncontrolled detonation of the line charge. Never fire a line charge into an area where brush or debris is aflame.

Vehicular Transport

The trailer mounted MICLIC can be towed by many combat vehicles:

- Tanks
- Amphibious assault vehicles (AAVs)
- Light armored vehicles (LAVs)
- Military 5-ton trucks
- Other selected items of engineer equipment

The M1 series tanks are not suitable for towing the MICLIC because of its high exhaust temperature.

Continued on next page

Minefield Breaching Systems (Explosive): MK2 MOD 0 System, Continued

Vulnerabilities

The MICLIC's trailer

- Limits mobility over rough terrain
- Hinders the towing vehicle's maneuverability
- Increases the MICLIC's vulnerability to enemy fire

Firing

The MICLIC can be fired from within an armored towing vehicle without exposing Marines to enemy fires. The lanyard and initiating cable are brought into the vehicle through a hatch that may have to be left ajar. Therefore, in a nuclear, biological and chemical (NBC) attack, the crew will not be protected from the NBC agent.

If the MICLIC is fired from a wheeled vehicle, the crew must move to a covered position to the rear and side of the launcher. The special-purpose cable of the firing control switch is long enough to allow the required standoff distance.

Effectiveness

The MICLIC will create a lane approximately 90 to 100 meters long and approximately 8 meters wide depending on soil conditions and types of mines. The table below describes the MICLIC effectiveness on different obstacles:

High Effect Against	Limited Effect Against
Single-impulse, pressure activated AT mines and mechanically activated AP mines	Blast hardened outer casings unless the charge is contacting the mine
	Anti-vehicular ditches and walls
Surface-laid mines (95 percent)	Magnetically activated fuzes
Buried mines	Log and concrete barriers

Continued on next page

Minefield Breaching Systems (Explosive): MK2 MOD 0 System, Continued

Advantage

The significant shock effect and psychological impact of the detonation of the MICLIC makes it a useful weapon in close combat or military operations in urban terrain (MOUT).

Determining Number of MICLICs Required

The number of MICLICs required to clear a single lane depends on the depth of the minefield. Minefields greater than 100 meters deep require more than one MICLIC.

Minefield Depth

The exact limits and depth of an enemy minefield are seldom known before the breaching operation, especially when the

- Situation is unclear
- Enemy minefield is encountered simultaneously with enemy contact

A primary indication that the unit is in a minefield is when a vehicle detonates a mine. At this point, the leading edge of the minefield may be behind you, placing you in an unfavorable position. If the mines are surface-laid, then you could be led to believe that this is the actual location of the minefield.

Clearing a Lane 80 Meters or Less Long

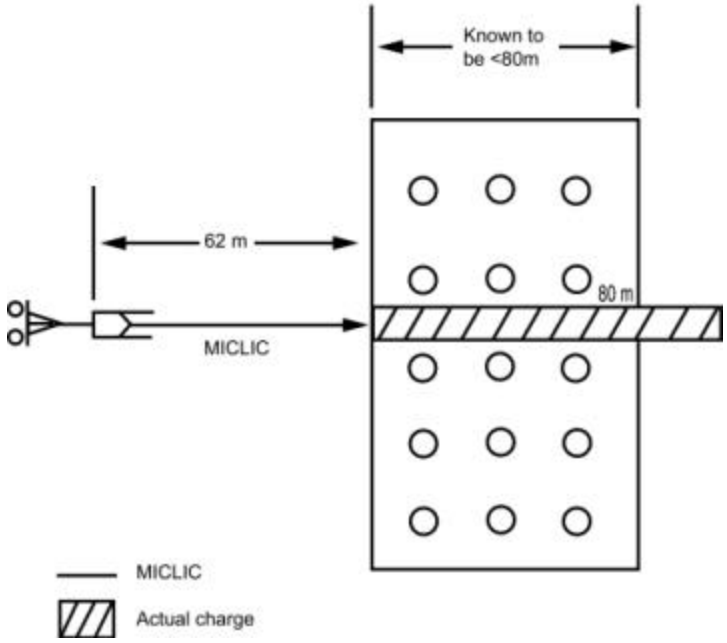
Clearing a lane through a minefield less than 80 meters long requires one MICLIC.

If time permits, you should conduct reconnaissance to identify and confirm the leading edge of the minefield. The MICLIC is employed from a minimum distance of 60 meters from the leading edge of the minefield.

Continued on next page

Diagram

The MICLIC employment in a minefield less than 100 meters deep is illustrated in the diagram below:



Clearing a Lane Greater Than 100 Meters Long

The matrix of required MICLICs when clearing a lane greater than 100 meters long is listed in the table below:

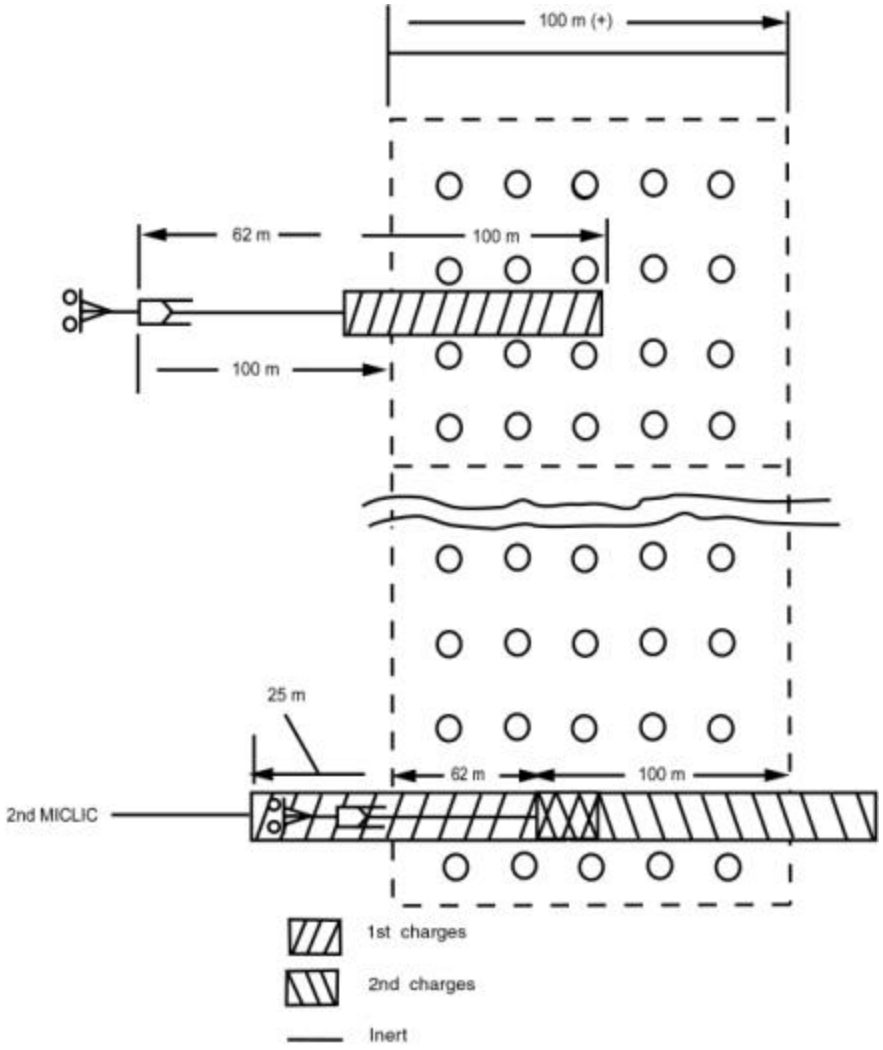
MICLIC	Action	
First	**If the leading edge of the minefield…**	**Then deploy 100 meters from the…**
	Can be identified	Leading edge of minefield
	Cannot be identified	Stricken vehicle
Second	When the first MICLIC is detonated, • Position 25 meters into the first MICLIC's path. • Fire its charge to extend the lane and additional 87 meters.	
Additional	Employed in the same manner for minefields of extreme depth.	

Continued on next page

Minefield Breaching Systems (Explosive): MK2 MOD 0 System, Continued

Diagram of Multiple MICLICs

The use of multiple MICLICs is identified in the diagram below:



Minefield Breaching Systems (Explosive): MK1 MOD 0 System

Description	The MK154 system contains three M59 linear demolition charges and three MK22 5-inch rocket motors inside a dedicated AAV. Although the M59 linear demolition charge is packed vertically vice horizontally, the explosive charge composition is identical to the M58 and utilizes the MK22 5-inch rocket motor to propel the charge into firing position.
Purpose	The MK154 is principally designed for deployment during amphibious assaults through mined surf and beach areas.
Use	When firing on land, fire the rear charge first for rapid reloads. When firing from the water, fire the forward charge first due to buoyancy factors.
Effectiveness	The M59's effectiveness is identical to the M58 and the same cautionary considerations apply.

Minefield Breaching Systems (Explosive): M1A1/M1A2 Bangalore Torpedo

Description

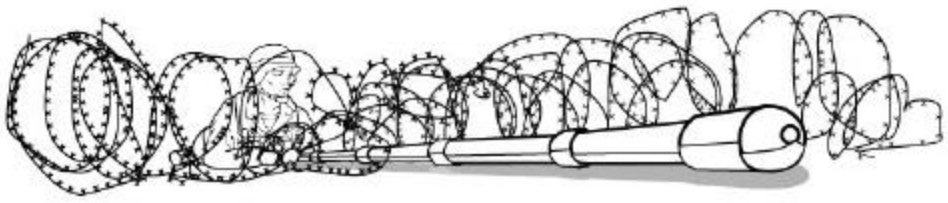
The bangalore torpedo is a manually emplaced explosive-filled pipe that was designed as a wire-breaching device. It is also effective against simple pressure-activated AP mines. The bangalore torpedo is issued as a demolition kit consisting of ten 1.5-meter tubes. Each tube contains 10.5 pounds of composition B4 and a booster charge (.5 pound on each end) of composition A3. Each tube weighs 15 pounds. The kit clears a one 1 meter by 15-meter footpath.

Operation

Dismounted units use the bangalore torpedo. One or more Marines connect the number of sections needed and push the torpedo through the minefield before it is primed. A detailed reconnaissance is conducted before employing the torpedo to make sure none of the trip wires have been used.

Diagram

The operation of the bangalore torpedo is illustrated in the diagram below:



Effectiveness

The bangalore torpedo is not effective against AT mines or double-impulse fuzes.

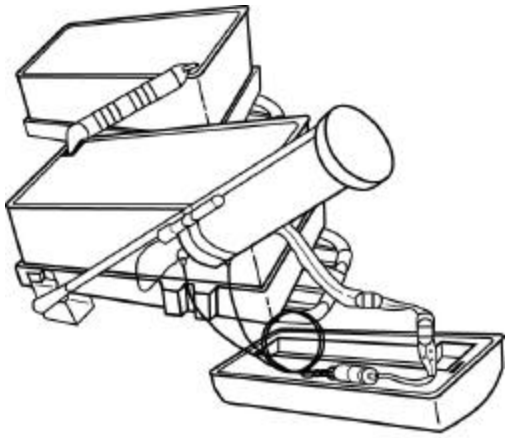
Minefield Breaching Systems (Explosive): AP Obstacle Breaching System (APOBS)

Description

The APOBS is a small linear type charge. The APOBS is a two-man portable system weighing approximately 120 pounds that can quickly create a footpath through AP minefields and wire obstacles.

Diagram

The APOBS is identified in the diagram below:



Purpose

The APOBS is designed to breach a footpath in

- AP minefields
- Wire obstacles

The APOBS will create a path

- 45 meters long by .6 meters wide through AP minefields
- 45 meters long by 3 to 4 meters wide through wire obstacles

Operation

Dismounted units use the APOBS. The APOBS contains a lightweight, self-contained, two-man, portable line charge that is rocket-propelled over AP minefields or wire obstacles from a standoff position away from the edge of the obstacle. It has a 25-meter standoff distance requirement and can be time-delayed or command-detonated.

Continued on next page

Minefield Breaching Systems (Explosive): AP Obstacle Breaching System (APOBS), Continued

Effectiveness

The APOBS is more effective in breaching AP minefields and wire obstacles than the bangalore torpedo because of its effective

- Length
- Weight
- Standoff capability
- Employment time

Minefield Breaching Systems (Mechanical)

Types

The types of mechanical minefield breaching systems are listed below:

- Tank-mounted, track-width mine plow (TWMP)
- Tank-mounted, track-width mine roller (TWMR)

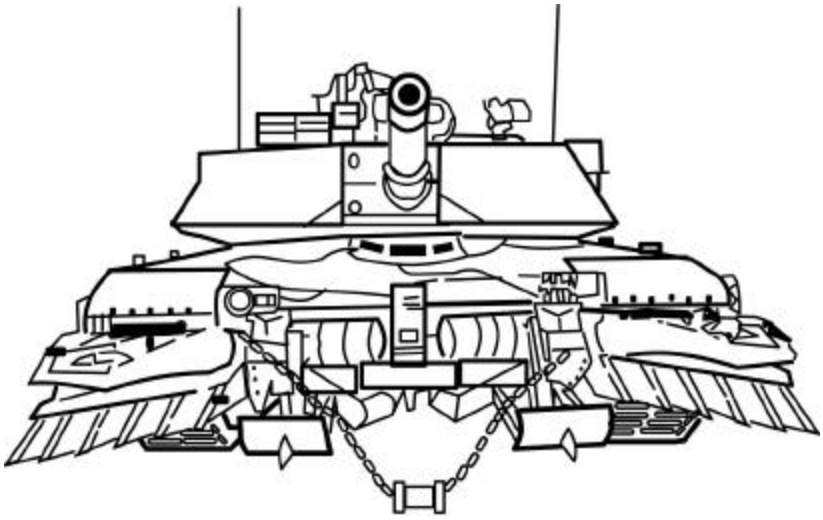
Minefield Breaching Systems (Mechanical): Tank-Mounted, Track-Width Mine Plow (TWMP)

Description

The TWMP, also known as a mine clearing blade, consists of a plow arrangement with six scarifying teeth to extract mines, a mold board to cast them aside, and a leveling skid to control the depth of the plow. The TWMP can be mounted to both the M-60 and M1 series tanks.

Diagram

The TWMP is identified in the diagram below:



Operation

The TWMP is used to extract and remove land mines from the minefield. This type of plow is used to proof lanes that have been explosively breached by a linear demolition charge. TWMPs can also be used as a primary breaching device when a

- Linear demolition charge
  - Has not performed optimally
  - Has failed
  - Is not available
- Hasty breach is being conducted

Continued on next page

Minefield Breaching Systems (Mechanical): Tank-Mounted, Track-Width Mine Plow (TWMP), Continued

Characteristics The characteristics of the TWMP plow are listed below:

- Lifts and pushes mines that are surface-laid or buried up to 6 inches deep to the side of the track-width lanes
- Creates a 68-inch cleared path in front of each track
- Adjusts to depths of 8, 10, or 12 inches depending on soil and depth of mines
- Requires
  - Lift capability
  - Approximately 1 hour to mount
- Mount well in advance of the mission
- Once mounted, the TWMP plow
  - Is raised and lowered by an electric motor
  - Cannot be easily transferred to another tank
  - Is equipped with an emergency quick-disconnect

Continued on next page

Minefield Breaching Systems (Mechanical): Tank-Mounted, Track-Width Mine Plow (TWMP), Continued

TWMP Restrictions

Limitations for the TWMP tank are listed below:

- The tank is limited to **no more than** 5 mph, depending on soil conditions.
- The tank cannot maneuver; must travel in a straight path, otherwise it will damage the plow.
- The main gun must be traversed to the side during plowing operations to prevent damage if a mine is detonated.
- The area selected for the lane must be relatively flat and free of large rocks and other obstacles.
- Mines lifted by the plow remain a hazard until removed.
- A width of approximately 64 inches remains uncleared in the center of the lane. (Following vehicles may eventually *belly out*, detonating the uncleared mines.)
- Mines armed with antihandling/disturbance devices could be activated when lifted by the plow, possibly disabling the plow.
- The plow can sustain one to two heavy mine hits.
- Long rectangular mines, such as the British Bar Mine, may not completely clear out of the lane.

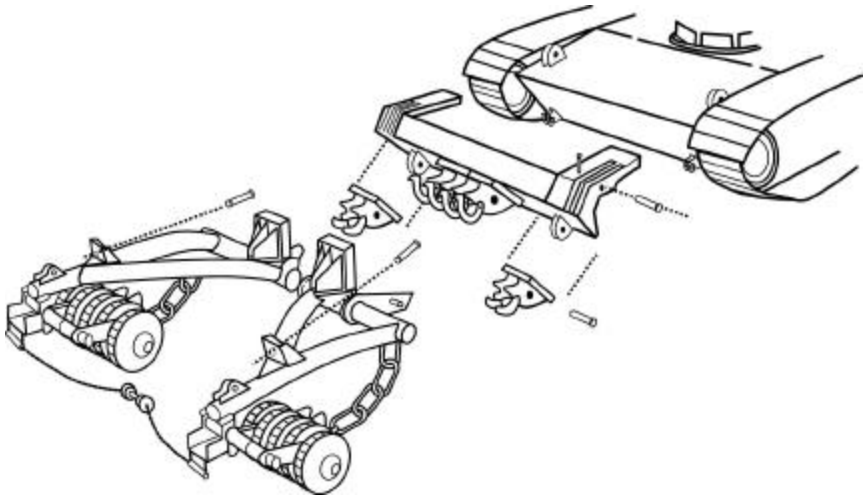
Minefield Breaching Systems (Mechanical): Tank-Mounted, Track-Width Mine Roller (TWMR)

Description

The TWMR consists of a roller assembly, mounting kit, and a hand winch kit. The roller will create a 44-inch path in front of each track with a 72-inch uncleared area between tracks. An antimagnetic mine actuating device assembly, like the one used with the mine plow, is centered between the rollers to defeat magnetic influenced mines and tilt rod mines.

Diagram

The TWMR is identified in the diagram below:



Operation

The TWMR's primary purpose is to detect mines. The mine rollers are used

- To proof lanes that have been explosively breached if no TWMPs are available
- As a secondary proofing device in place of a mine plow or rake

The rollers are designed to defeat most AT and AP mines, which are single-impulse, pressure activated.

Continued on next page

Minefield Breaching Systems (Mechanical): Tank-Mounted, Track-Width Mine Roller (TWMR), Continued

TWMR Restrictions

Limitations for the TWMR tank are listed below:

- Its weight of 10 tons greatly impacts the tank's maneuverability.
- The dog bone and chain assembly must be lifted by the operator and curbing removed when a tank intends to cross an Armored Vehicle Launched Bridge (AVLB), otherwise the bridge's hydraulic line will be damaged.
- The main gun must be traversed to the side during proofing operations to prevent damage if a mine is detonated.
- The tank travels in a straight path as turns may cause the roller to deviate from the path of the track, leaving the tank vulnerable to undetected mines.
- Ground fluctuations due to terrain or debris may cause the roller to lose contact with the intended path and miss mines.

Minefield Breaching Systems (Manual)

Introduction

Manual reduction is the only method that works in all situations and under all conditions. Certain types of terrain and weather and sophisticated fuzes can severely degrade the effectiveness of rollers, plows, and line charges. When advanced mechanical equipment is unavailable, manual breaching procedures provide a backup.

Types

The types of manual breaching systems used are listed below:

- Hand-placed explosives
- Grapnel hooks attached to ropes
- Probes
- Mine detectors
- Hand-placed marking equipment

Purpose

Manual reduction is used against

- Buried minefields
- Surface-laid minefields

Always assume the presence of AHDs and trip wires during all manual reduction procedures unless proven otherwise.

Minefield Breaching Systems (Manual): Buried Minefields

Description

Buried mines are usually found in a prepared defense, requiring a deliberate breach operation. When manually reducing a buried minefield, keep in mind, it is

- Extremely difficult to perform as part of an in-stride breach operation
- Usually part of a deliberate breach

Operation

If mine burrows are not easily seen (as they are after rainfall), mine detectors and probes must be used to locate mines. Mines are then destroyed by hand-placed charges.

As an alternative, mines can be removed by grappling hooks and, if necessary, a rope-supporting tripod. The engineer unit can expect to be exposed for long periods of time.

Minefield Breaching Systems (Manual): Surface-Laid Minefields

Description

A surface-laid minefield was the preferred obstacle for the former Soviet Union. The Soviets possessed a significant mechanical mine burying capability and had the capacity and propensity for the labor-intensive effort required to bury mines by hand. In the current world environment, we can expect this method to be undertaken by many Third World countries.

Grapnel Hook Breach

Each grapnel hook has a 60-meter length of cord attached to it. The limited range of the tossed hook (usually about 25 meters) requires the procedure to be repeated through the estimated width and depth of the obstacle. The excess length of the cord is used as a standoff distance when the thrower begins grappling. Extra hooks are carried, as mine hits will destroy the hook with one hit.

Grapnel Hook Line Main Method

From covered positions, engineers first use grapnel hooks to check for trip wires in the desired lane. A demolition team then moves through the desired lane. The team places a line main (trunk line) down the center of the lane, ties the line from the explosives into the line main, and places the blocks of explosives next to the surface-laid mines.

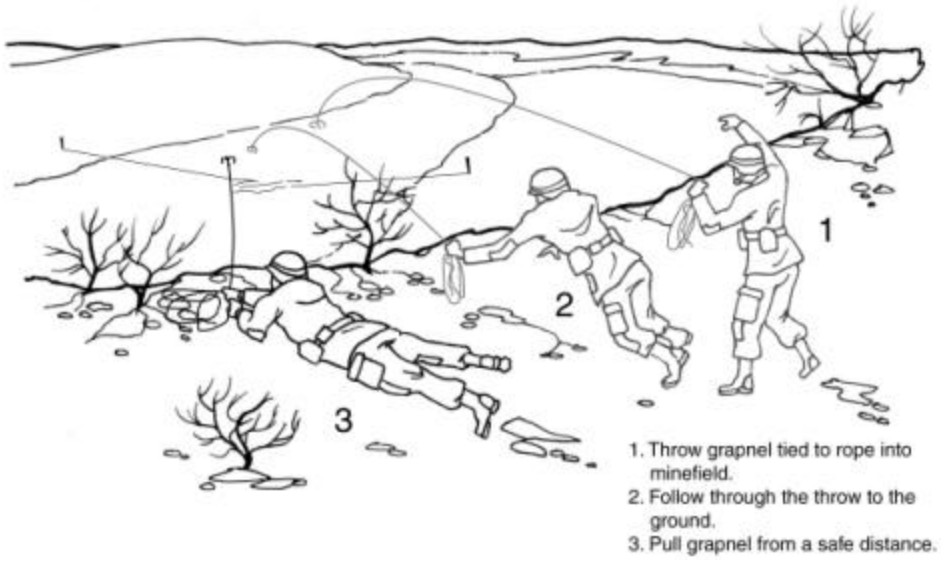
After the mines are detonated, the team makes a visual check to ensure all mines were cleared before directing a proofing roller or other traffic through the lane.

Continued on next page

Minefield Breaching Systems (Manual): Surface-Laid Minefields, Continued

Diagram

The grapnel hook removal process is identified in the diagram below:



Explosive Breach Method

As a variation of the grapnel hook procedure, blocks of explosives are preprimed with a fixed length of time fuze set for command SOP time of approximately 5 minutes. The team moves through the surface-laid obstacle to

- Light the time fuze on the blocks of demolitions
- Set demolitions next to surface-laid mines

Effectiveness

The explosive breach method is much faster than the line main (trunk line) method; however, there are limitations. Those limitations are listed below:

- A higher chance of misfire exists with individually primed explosives.
- Possible injuries in the minefield containing initiated FDs can defeat the closely timed breach.
- Detonations occurring at different times can dislodge explosives placed next to other mines.

Continued on next page

Minefield Breaching Systems (Manual): Surface-Laid Minefields, Continued

Uses

The explosive breach method is used only when speed and mission necessitate such risks. For the best possible chance of success, you must rehearse the procedure.

During the breach, the engineer unit can expect to be exposed for 5 to 30 minutes, depending on the mission, minefield depth, and their level of training.

Proofing

Definition

Proofing is verification that a lane is free of mines. A mine roller or another mine resistant vehicle is used as the lead vehicle through the lane.

When to Proof

Proofing is only done

- When the risk of live mines remaining in the lane exceeds the risk of loss to enemy fire while waiting
- To upgrade breach lanes following a breach during a limited clearing operation
- After the routes used throughout the area are completely cleared

Two Methods

Using two TWMPs, there are two methods to proof a lane:

- Offset method
- Centerline method

Offset Method

The first TWMP sets the plow 1 meter to the right of the line charge trough. The second TWMP then lines up its plow to the right in an echelon formation to proof the uncleared centerline of the TWMP ahead.

Using two TWMPs will create a lane that is adequately wide, but a third vehicle should be used when time and the situation permits to widen the lane further.

The offset method should be conducted when enemy fire is thoroughly suppressed. This method requires more time than the centerline method.

Centerline Method

The plow lines up with the centerline of the vehicle directly over the trough created by the line charge. The second proofing vehicle then lines up, one-half track width to the right, creating a path 1½ lanes wide.

The centerline method should only be used if the trough is shallow and straight. This method is faster than the offset method.

Lane Marking

Introduction

After tactical lanes or bypasses are established in an obstacle, they must be marked and identified for follow-on forces. Mark and report reduced lanes immediately.

Requirements

The tactical breach lane marking system must meet the requirements listed below:

- Standard throughout the division area
  - Standard varies per SOP
  - NATO standard may apply
- Easily seen and recognized by a buttoned-up vehicle crew
- Easily seen under battlefield conditions
  - Through smoke and dust
  - At night, if needed
- Constructed from materials readily available from the unit supply system

Note: Modern tanks and infantry fighting vehicles have infrared sights that can see heat sources through smoke; however, you must consider that the active battlefield will have many active heat sources.

Markers and Guides

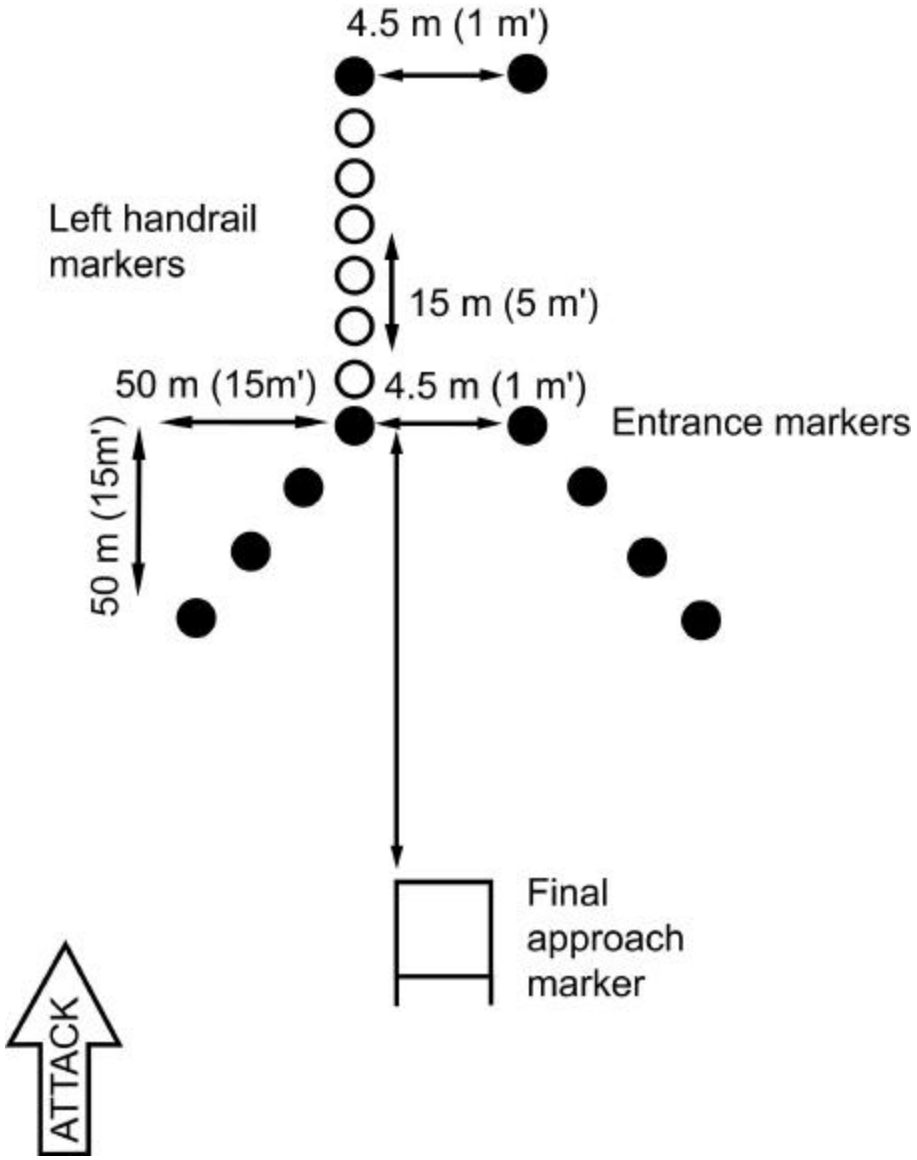
Markers and guides must be visible from a distance so the follow-on forces can line themselves up for proper approach. A V-shaped entrance (like a funnel) guides the unit. The exit is marked so the unit does not deploy back into the combat formation while still in the obstacle system. Proper markers and guides are critical when the obstacle is complex and has depths greater than 100 meters.

Continued on next page

Lane Marking, Continued

Diagram

The tactical lane marking system is identified in the diagram below:



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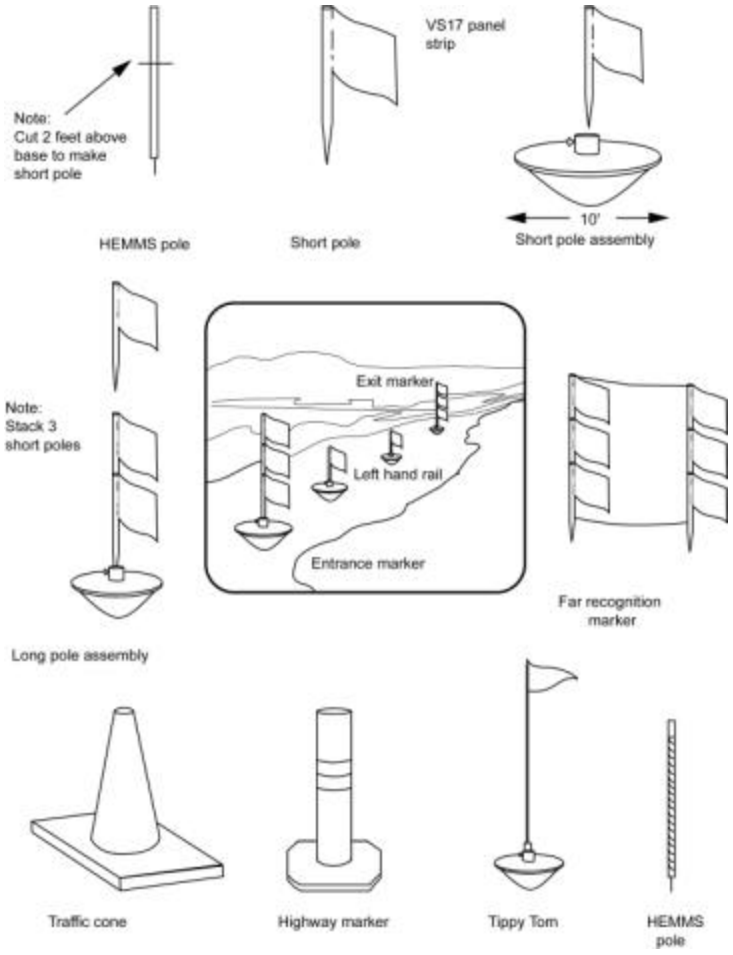
Marking Systems

The marking system currently available is the Hand Emplaced Minefield Marking Set (HEMMS). HEMMS marks a lane 400 meters long with

- Standard traffic cones
- Highway markers
- Locally fabricated "Tippy Toms," which are a copy of an Israeli system that uses a fabricated base
- HEMMS poles

Diagram

The HEMMS and Tippy Tom marking combination is identified in the diagram below:



Lesson 1 Exercise

Directions

Complete exercise items 1 through 23 by performing the action required. Check your answers against those listed at the end of the lesson.

Item 1 Through Item 3

Matching: For items 1 through 3, match the definition in column 1 with its term in column 2. Place your response in the space provided.

Column 1		**Column 2**
Definition		**Term**
___ 1.	Synchronized combined arms operation under the control of the maneuver commander.	a. Breaching b. Reduction c. Mine neutralization d. Breaching operations
___ 2.	Actions taken against an obstacle that diminish or eliminate its original intended effect.	
___ 3.	When a mine has been made incapable of detonation upon passage of a target.	

Item 4

What are the five tenets that characterize a successful breach?

a. Intelligence, organization, mass, suppress, and fundamentals
b. Intelligence, fundamentals, organization, mass, and secure
c. Intelligence, obscure, mass, synchronization, and organization
d. Intelligence, fundamentals, organization, mass, and synchronization

Item 5

What does SOSRR breaching fundamentals stand for?

a. Suppress, organize, synchronize, realize, and reduce
b. Suppress, obscure, secure, reduce, and resupply
c. Synchronize, obscure, support, report, and resupply
d. Support, organize, secure, report, and reduce

Continued on next page

Item 6 Through Item 8

Matching: For items 6 through 8, match the description in column 1 with the type of lane in column 2. Place your response in the space provided.

Column 1 **Description**	**Column 2** **Type of Lane**
___ 6. Allows one-way vehicular traffic to pass with little impact on vehicle speed or safety	a. Assault footpath b. Initial lane c. Single lane d. Double lane
___ 7. Allows you to pass dismounted troops and continue an attack	
___ 8. Allows the minimum width to pass breaching and assaulting forces	

Item 9

What must the commander do to accomplish the breaching operation quickly and effectively?

a. Organize
b. Suppress
c. Assault
d. Mass

Item 10

Eliminating the enemy's ability to interfere with the breach operation is the responsibility of the _____ force.

a. breach
b. support
c. assault
d. reconnaissance

Continued on next page

Item 11 Through Item 14

Matching: For items 11 through 14, match the description in column 1 with the type of breaching operation in column 2. Place your response in the space provided.

Column 1 **Description**	**Column 2** **Breaching Operation**
___ 11. Executed silently to achieve surprise and minimize casualties	a. Bypass
___ 12. Uses element of surprise and initiative to get through the obstacle with minimal loss of momentum	b. In-stride
___ 13. Allows a force to penetrate the enemy's protective obstacles and destroy defender in detail	c. Deliberate
___ 14. Used when the forces required for support, breach, and assault are beyond the capability of a task-organized subordinate unit	d. Assault
	e. Covert

Continued on next page

Item 15 Through Item 17

Matching: For items 15 through 17, match the description in column 1 with the type of explosive breaching system in column 2. Place your response in the space provided.

Column 1 **Description**	**Column 2** **Explosive Breaching System**
___ 15. Manually emplaced explosive-filled pipe that was designed as a wire-breaching device	a. M58 MICLIC b. MK154 c. M1A1/M1A2 Bangalore torpedo d. APOBS
___ 16. Small linear type charge used by dismounted units	
___ 17. Contains three M59 linear demolition charges and three MK22 5-inch rocket motors inside a dedicated AAV	

Item 18

Which mechanical mine clearing system consists of a plow arrangement to extract mines, a mold board to cast mines aside, and a leveling skid to control the depth of the plow?

a. Tank-mounted, track-width mine roller (TWMR)
b. Tank-mounted, track-width mine plow (TWMP)
c. M1A1/M1A2 AP obstacle breaching system (APOBS)
d. Mine clearing line charge MICLIC system

Item 19

The primary purpose of the track-width mine roller is to

a. compact the earth.
b. extract mines.
c. breach lanes.
d. detect mines.

Continued on next page

Item 20 Manual reduction of a buried minefield is usually part of a _____ breach.

a. in-stride
b. deliberate
c. assault
d. covert

Item 21 When conducting manual reduction using a grapnel hook, engineers first

a. Use the hooks to check for trip wires in the desired lane.
b. Use mine detectors and probes to locate the mines.
c. Locate themselves in uncovered positions.
d. Makes a visual check to estimate the width and depth of the obstacle.

Item 22 The verification that a lane is free of mines by the use of a mine roller is called

a. clearing.
b. breaching.
c. detection.
d. proofing.

Item 23 Which proofing method should only be conducted if the trough is shallow and straight?

a. Centerline
b. Mechanical
c. Offset
d. Explosive

Continued on next page

Item 24

Which proofing method should be conducted when enemy fire is thoroughly suppressed?

a. Centerline
b. Offset
c. Midline
d. Offside

Item 25

Select the requirement for the tactical breach lane marking system.

a. Standard throughout the division area, easily seen and recognized by buttoned-up vehicle crews and under battlefield conditions, and constructed from materials readily available from the unit supply system.
b. Standard throughout the division area, easily seen and recognized by buttoned-up vehicle crews and under battlefield conditions, and constructed from materials readily available from logistics.
c. Standard throughout the battalion area, easily seen and recognized by buttoned-up vehicle crews and under battlefield conditions, and constructed from materials readily available from the unit supply system.
d. Standard throughout the company area, easily seen and recognized by every available person and under battlefield conditions, and constructed from materials readily available from the unit supply system.

Continued on next page

Solutions

The following table provides the answers to the exercise items. If you have questions about these items, refer to the reference page.

Item Number	Answer	Reference
1	d	3-5
2	b	3-5
3	c	3-5
4	d	3-6
5	b	3-7
6	c	3-8
7	a	3-8
8	b	3-9
9	a	3-9
10	b	3-9
11	e	3-15
12	b	3-12
13	d	3-14
14	c	3-13
15	c	3-23
16	d	3-24
17	b	3-22
18	b	3-27
19	d	3-30
20	b	3-33
21	a	3-34
22	d	3-37
23	a	3-37
24	b	3-37
25	a	3-38

Lesson Summary

In this lesson, you learned about countermine operations that include reducing, proofing, marking, and reporting.

In the next lesson, you will learn about the AN/PSS-12 mine detector.

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LESSON 2

AN/PSS-12 MINE DETECTOR

Overview

Introduction

The AN/PSS-12 mine detecting set has been developed to meet today's requirements for mine clearance on the battlefield. It is in service in several countries worldwide, including NATO countries. The AN/PSS-12 can only detect metal. However, most mines have metal components in their design. The detectors can locate and identify plastic or wooden mines by this slight metallic signature.

Content

In this lesson, you learn about the skills and knowledge necessary to employ the AN/PSS-12 mine detector.

Learning Objectives

Upon completion of this lesson, you should be able to

- Identify the main components of the AN/PSS-12 mine detector.
- Identify the component on the control panel.
- Identify the component on the AN/PSS-12 mine detector control panel that attaches the search head to the telescopic pole.
- Identify how the transmitting coil in the search head is energized.
- Identify how an operator is alerted to the presence of a metal object.
- Identify the first step in unpacking the mine detector.
- Identify what step is performed after attaching the electronic unit to the operator's load-bearing vest (LBV).
- Identify how high above ground the search head should be during the initial adjustment of the sensitivity knob.
- Identify operator maintenance for the AN/PSS-12 mine detector.
- Identify the storage for the AN/PSS-12 mine detector.

Continued on next page

Overview, Continued

In This Lesson This lesson contains the following topics:

Components of the AN/PSS-12 Mine Detector

Background

The AN/PSS-12 mine detecting set is a man-portable metallic mine-detection system that is used to detect AP and AT mines. It detects mines with a very small metal content below the surface of the ground and in fresh or salt water. The mine detector is packed in a carry bag. This bag is fitted with carry straps so it can be carried like a rucksack.

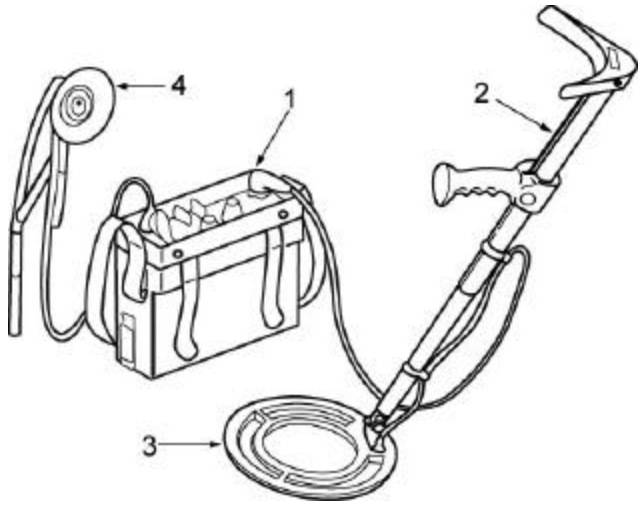
Main Components

All main components of the AN/PSS-12 mine detector set are interchangeable without recalibration. The mine detector's main components are listed in the table below:

Item	Component
1	Electronic unit with shoulder strap
2	Telescopic pole with arm support and handle
3	Search head with cable and plug
4	Headset with cable and plug

Diagram

The AN/PSS-12 components are identified in the diagram below:



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Components of the AN/PSS-12 Mine Detector, Continued

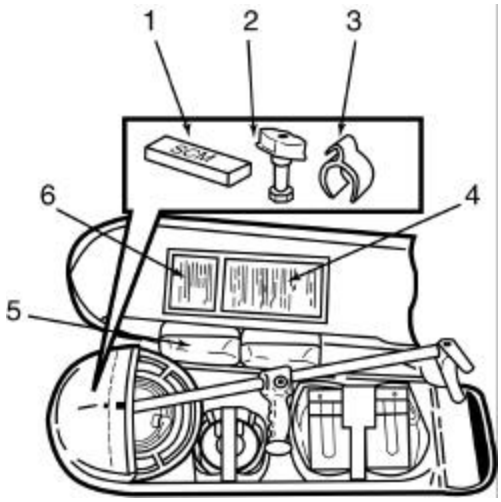
Accessories

The accessories, along with the main components of the AN/PSS-12 mine detector, are kept in the carry bag that is stored in a metal transport case equipped with a pressure relief valve. The accessories of the AN/PSS-12 are listed in the table below:

Item	Component
1	5-centimeters (2 inches) test piece
2	One spare plastic bolt
3	Cable clamps
4	Instruction card
5	Compartment for batteries
6	List of contents card

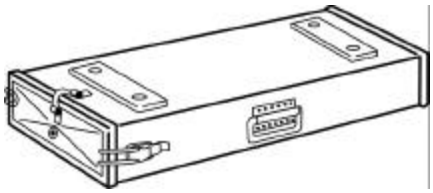
Diagram

The accessories of the AN/PSS-12 are identified in the diagram below:



Transport Case

The metal transport case for the AN/PSS-12 mine detector is identified in the diagram below:



Continued on next page

Components of the AN/PSS-12 Mine Detector, Continued

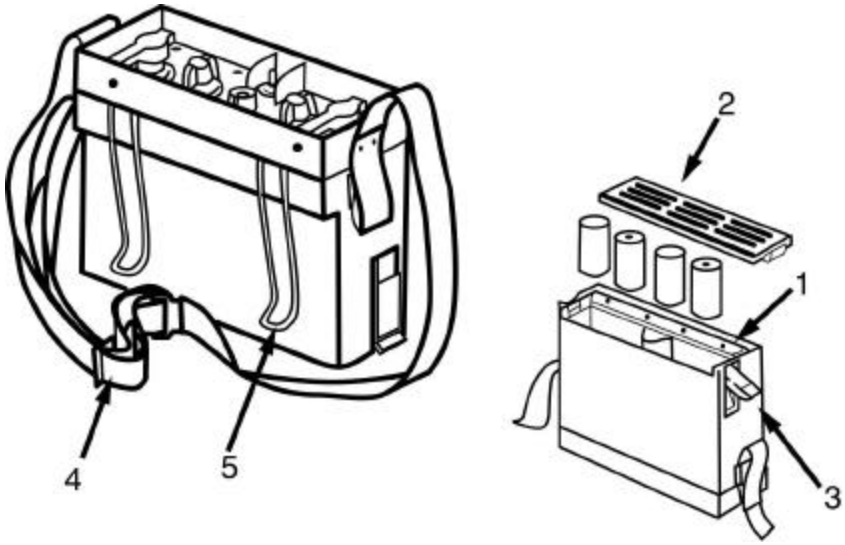
Electronic Unit

The electronic unit contains the control panel and battery compartment, as well as four standard size D batteries. The components of the electronic unit are listed in the table below:

Item	Component
1	Electronic unit case
2	Battery cover
3	Quick action catches
4	Shoulder strap
5	Belt clip (attach to belt)

Diagram

The components of the electronic unit are identified in the diagram below:



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Components of the AN/PSS-12 Mine Detector, Continued

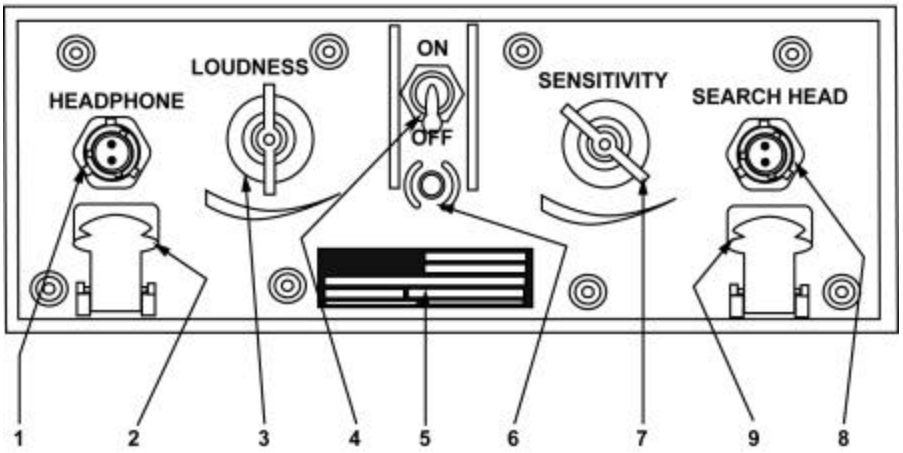
Control Panel

The control panel contains all controls for operation and sockets for search head and headset. The components of the control panel are listed in the table below:

Item	Component
1	Socket for headset
2	Rubber cap (for socket when headset is not connected)
3	LOUDNESS control knob
4	ON/OFF switch
5	Identity and modification markings' label
6	Indicator lamp for low battery voltage and malfunction
7	SENSITIVITY control knob
8	Search head socket
9	Rubber cap (for socket when search head is not connected)

Diagram

The components of the control panel are identified in the diagram below:



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Components of the AN/PSS-12 Mine Detector, Continued

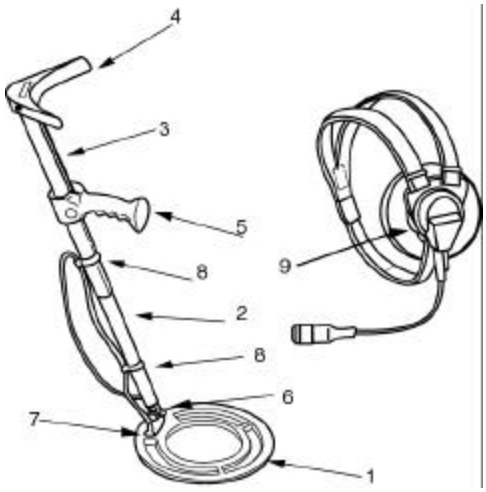
Search Head with Telescopic Pole

The nomenclature for each component of the search head and telescopic pole is listed in the table below:

Item	Component	Nomenclature
1	Search head	Concentric transmitting and receiving coils are embedded in a plastic head
2	Telescopic pole	• An inner plastic tube • An outer aluminum tube • Length is adjustable and locks into one of three adjustable length positions
3	Arm support	• Portion of the telescopic pole • Adjustable
4	Arm support	Adjustable
5	Handle	Fixed in its position by a knurlnut
6	Plastic bolt	Attaches the search head to the telescopic pole
7	Cable	Connects to the electronic unit
8	Clamps	Connects cable to telescopic pole
9	Headset	• Single side speaker • Can be worn under helmet • Connects to electronic unit.

Diagram

The components of the search head and telescopic pole are identified in the diagram below:



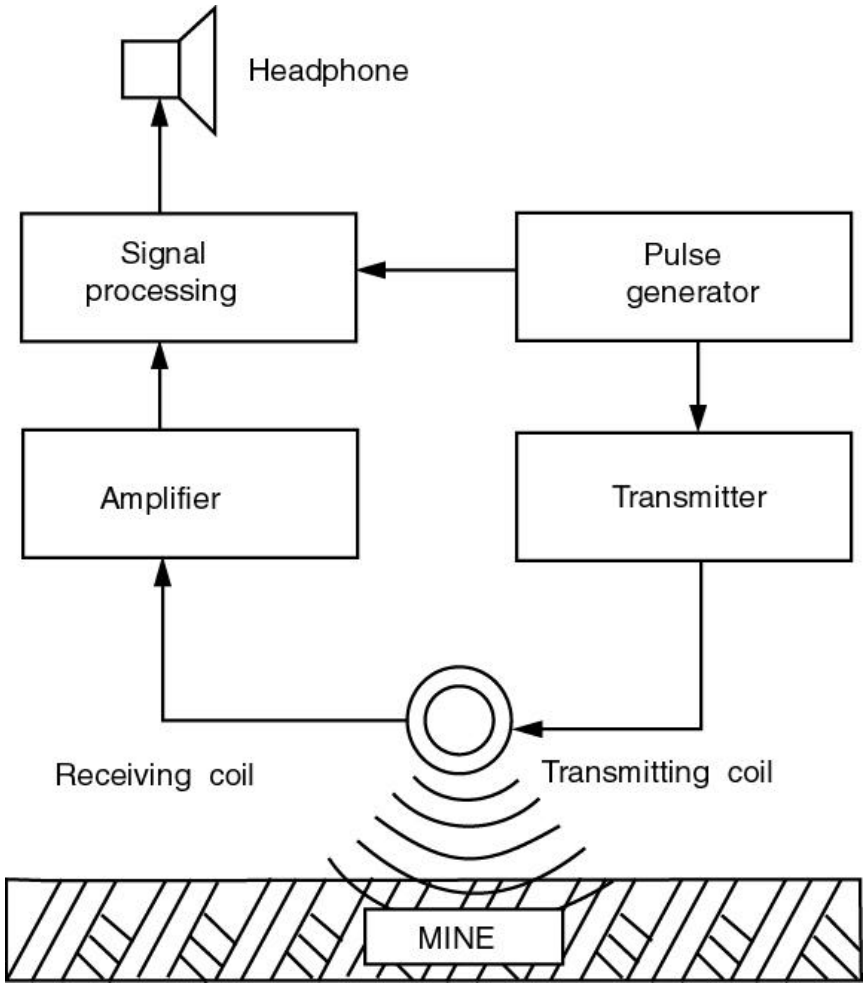
Principle of Operation

Background

The transmitting coil in the search head is energized by electric pulses to build up a magnetic field. This field induces eddy currents in metal objects in the vicinity of the search head. These eddy currents give rise to a secondary field that is picked up by the receiving coil. The signal from this coil is processed in the electronics. The operator is alerted to the presence of a metal object by a sound in the headset.

Diagram

The principle of operation is identified in the diagram below:



Operation Procedures for the AN/PSS-12

Tasks

There are five tasks you must perform to operate the AN/PSS-12 listed in the table below:

Task	Description
1	Unpack the AN/PSS-12
2	Inspect the AN/PSS-12
3	Assemble the AN/PSS-12
4	Make Initial Adjustments
5	Search with the AN/PSS-12

Note: Before adjusting or using the mine detector, remove rings, watches, jewelry, etc.

Task 1: Unpack the AN/PSS-12

The system is stored and transported in a single carrying case. To unpack the AN/PSS-12, complete the steps listed in the table below:

Step	Action
1	Open the pressure-relief valve located in the carrying case.
2	Release the latches on the carrying case to open the metal transport case.
3	Remove the bag that contains the system components.
4	Unzip the carry bag.
5	Check to make sure all the components are there by comparing the contents of the bag with the content card list.
6	Remove the following items from the bag carefully: • Electronic unit • Headset with cable and plug • Telescopic pole • Search head assembly with cable and plug

Continued on next page

Task 2: Inspect the AN/PSS-12

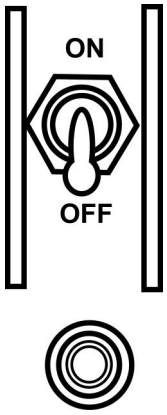
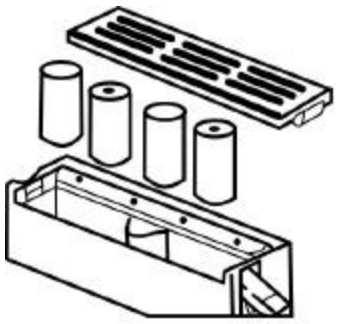
To inspect the AN/PSS-12, complete the steps listed in the table below:

Step	Action
1	Check search head for • Cracks • Damage
2	Check cable connectors for • Damage • Bent pins
3	Make sure the cables are not • Cut • Broken • Frayed
4	Inspect the electronic unit for • Cracks • Damage • Completeness • Switches (present and functional) • Knobs (present and functional)
5	Make sure the telescopic pole is not • Bent • Dented • Damaged
6	Make sure the telescopic pole can be • Extended • Retracted • Locked into place in one of three positions

Continued on next page

Task 3: Assemble the AN/PSS-12

To assemble the AN/PSS-12, complete the steps listed in the table below:

Step	Action
1	Make sure the power switch on the electronic unit is in the OFF position. 
2	Release the latches on the battery-compartment cover.
3	Remove the battery cover.
4	Insert the batteries according to the positive and negative markings.  **<u>WARNING</u>:** Make sure the battery cover is completely closed and the latches are in the proper position. This prevents the inadvertent opening of the battery compartment during operation. Failure to do this could result in injury and damage to the equipment.

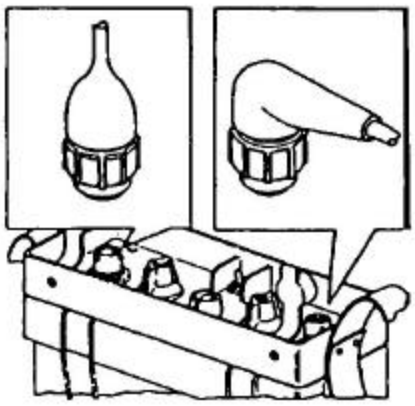
Continued on next page

Task 3: Assemble the AN/PSS-12, continued

Step	Action
5	Reinstall and latch battery cover. Make sure the latches are in the *closed* position. Note: Under severe cold weather conditions, carrying the electronic unit under outer garments to keep the batteries warm may extend battery life.
6	Attach the electronic unit to the operator's LBV using the belt clips.
7	Extend the telescopic pole from the transport position, as needed by • Pressing in on the catch, located just below the arm support • Turning the outer tube until the catch snaps into the guide groove, allowing the pole to be extended and locked into one of the three fixed positions Note: Do not adjust settings when telescopic pole is in transport position. Telescopic pole must be extended before adjusting settings.
8	Attach the magnetic search head's cable to the pole by using the snap-on plastic cable clamps and allowing for a 2-inch loop at the head end of the cable. 
9	Adjust the handle's grip position by loosening the adjustment nut, if necessary.

Continued on next page

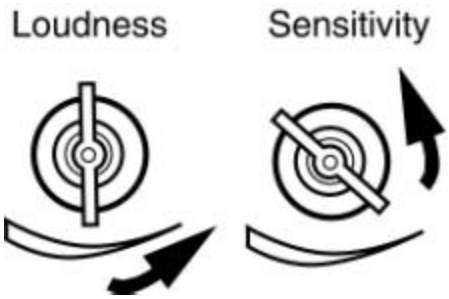
Task 3: Assemble the AN/PSS-12, continued

Step	Action
10	Adjust the search head assembly's position so that it will be parallel to the ground while being held approximately 2 inches above the surface.
11	Connect the search head cable to the electronic unit's search head connector. 
12	Plug the headphones into the electronic unit's headset.
13	Put on the headset. The hook and pile material goes behind the head at the nape of the head.
14	Put on the electronic unit • Adjust the shoulder strap length • Belt springs must face the body

Continued on next page

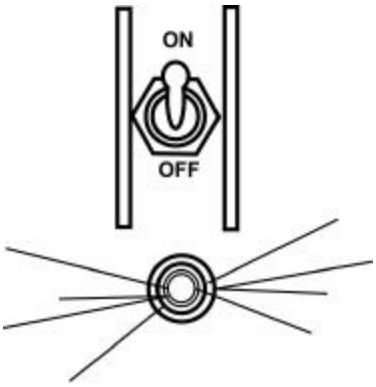
Task 4: Make Initial Adjustments

To make initial adjustments and control settings, complete the steps listed in the table below:

Step	Action
1	Turn SENSITIVITY and LOUDNESS knobs completely counterclockwise. This will reduce the noise from the device and sensitivity from electromagnetic interference (EMI). Note: EMI from 60-cycle power lines, power transformers, or radio transmitters affects the SENSITIVITY of this mine detector. If you suspect EMI, adjust the SENSITIVITY to eliminate the interference. If this cannot be done, discontinue use.  **WARNING:** Turn LOUDNESS knob all the way down or else it may cause hearing loss, then turn on unit and adjust volume to a comfortable level.

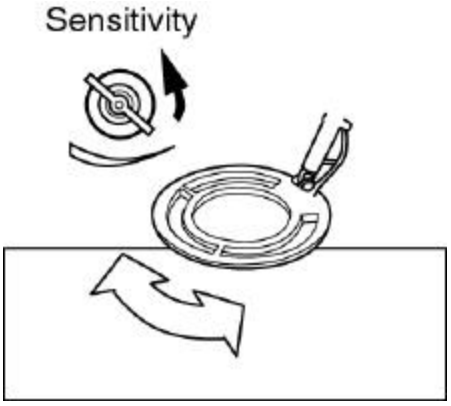
Continued on next page

Task 4: Make Initial Adjustments, continued

Step	Action
2	Observe the indicator lamp and turn the switch to the ON position. The lamp should give a short flash. **If…** / **Then…** Lamp does not give a short flash or the indicator lamp flashes continuously → Check batteries to make sure they are inserted correctly. Insert new batteries. 
3	Hold the search head approximately .5 meter (2 feet) above the ground and turn the SENSITIVITY knob clockwise until you hear a continuous tone. While this is being done, adjust the loudness control to a comfortable listening level. 

Continued on next page

Task 4: Make Initial Adjustments, continued

Step	Action
4	Turn SENSITIVITY knob slightly counterclockwise until the tone ceases. A ticking check tone should be heard every 1 to 2 seconds. Readjust the LOUDNESS control if necessary. 
5	Sweep the search head approximately 0.3 meter per second while holding it approximately 5 centimeters (2 inches) above the ground. 

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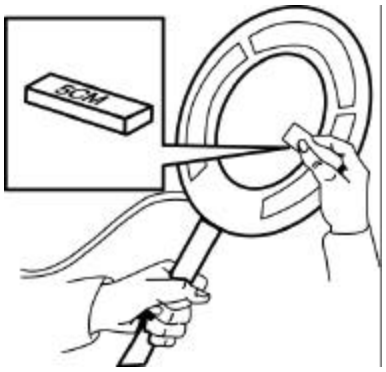
Task 4: Make Initial Adjustments, continued

Step	Action
6	Turn SENSITIVITY knob further counterclockwise if a disturbing audible tone is heard due to ground conditions until the tone ceases.
7	Check the SENSITIVITY with the 5-centimeter test piece. • Carry out the check with the search head at least 3 feet (1 meter) above the surface of the ground and away from the body. • Make sure there are no metal objects (wristwatches, rings, etc.) in the vicinity that can affect the check. • The mine detector must emit a distinct signal (tone) for a distance of at least 2 inches (5 centimeters) between the metal pin in the test piece and the bottom of the search head. 

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Task 5: Search with the AN/PSS-12

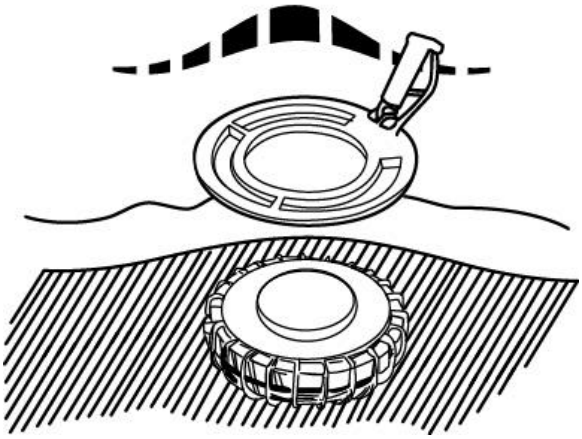
The sensitivity control may require frequent adjustments during operation. If you are searching for large metal objects, detecting and localizing is faster when the sensitivity control is turned down (counterclockwise). Keep the mine detectors at least 2 meters apart during setting and adjustment phases to prevent interference. Make sure only the inner part of the telescopic pole is used when a Marine operates the equipment in the prone position.

To search with the AN/PSS-12, complete the steps listed in the table below:

Step	Action
1	Move the search head in sweeping motions: • Maximum 5 centimeters above the ground • Approximately 0.3 meters per second 
2	Listen for an audible tone indicating the inner ring of the magnetic search head is over a metal object. Intensity of the tone depends upon the object's • Size • Shape • Content • Depth • Position

Continued on next page

Task 5: Search with the AN/PSS-12, continued

Step	Action
3	Make an X-pattern sweeping movement across the area when a tone is heard.  The tone will be loudest when the search head is immediately above the object. For small, horizontal metal pins, the tone will be louder when the inner ring is near the pin rather than when the pin is in the center of the ring. 
4	Turn the unit OFF after completing the search operation.

Continued on next page

Task 5: Search with the AN/PSS-12, continued

Troubleshooting	
If…	**Then…**
The indicator lamp flashes Note: The search sensitivity is not affected when the lamp is flashing.	• Change the batteries. • Readjust the unit.
Searching continues	• A constant audible tone will sound. • Replace batteries.
The check tone disappears or its frequency decreases	• Discontinue searching. • Readjust the unit's sensitivity.

Maintenance and Storage

Maintenance

To perform maintenance of the AN/PSS-12, complete the steps listed in the table below:

Step	Action
1	Clean the equipment with a wet rag and let it dry. If the mine detector was used in salt water, clean it with fresh water.
2	Check the equipment for damage.
3	Report any faults and deficiencies that are not remedied to your supervisor.

Storage

To store the AN/PSS-12, complete the steps listed in the table below:

Step	Action
1	Make sure the switch is in the OFF position.
2	Detach the cable connection on the electronic unit for the magnetic search head.
3	Replace the protective caps on the plug and socket.
4	Release the electronic unit's battery-cover latches.
5	Remove the battery cover.
6	Remove the batteries.
7	Make sure none of the battery cases have ruptured. If one or more battery cases have ruptured, notify your supervisor.
8	Reinstall the battery cover.
9	Latch the battery cover.
10	Remove the two cable clamps, which are holding the search head's cable, from the telescopic pole.
11	Collapse the telescopic pole to its travel length by turning its outer tube until it is locked by the catch.
12	Loosen the plastic restraining bolt.
13	Fold in the magnetic search head.
14	Pack the components in the carry bag. For long time storage, DO NOT put batteries in the carry bag.
15	Close and zip carry bag.
16	Place the carry bag in the metal transport case.
17	Close the pressure relief valve.

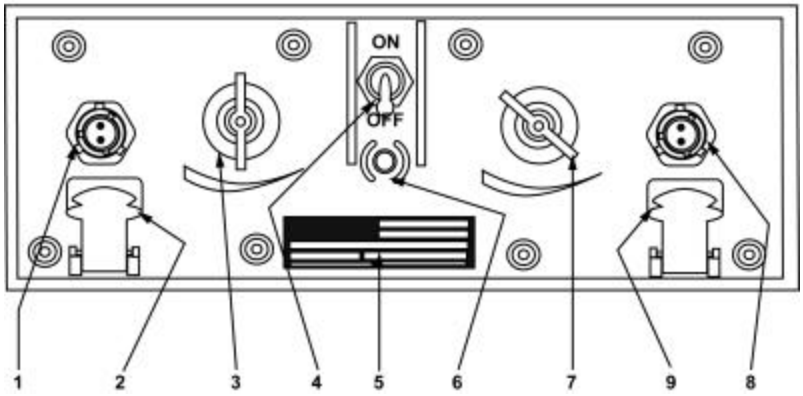
Lesson 2 Exercise

Directions Complete exercise items 1 through 12 by performing the action required. Check your answers against those listed at the end of the lesson.

Item 1 The main components of the AN/PSS-12 are the electronic unit, search head, headsets, and

a. telescopic pole.
b. test piece.
c. plastic bolt.
d. batteries.

Directions for Item 2 Through Item 4 Use the diagram below to answer questions 2 through 4**.**



Item 2 Identify the indicator lamp on the control panel.

a. 3
b. 4
c. 6
d. 7

Continued on next page

Item 3 Identify the search head socket on the control panel.

a. 1
b. 2
c. 7
d. 8

Item 4 What component attaches the search head to the telescopic pole?

a. Arm support
b. Cable
c. Plastic bolt
d. Clamp

Item 5 The transmitting coil in the search head is energized by

a. batteries.
b. sunlight.
c. electronics.
d. electrical pulses.

Item 6 The operator is alerted to the presence of a metal object by

a. a sound in the headset.
b. the blinking of indication lamp.
c. magnetic pull on the search head.
d. vibration in the headset.

Item 7 What is the first step in unpacking the mine detector?

a. Check for damage.
b. Open the pressure-relief valve.
c. Release latches to open metal case.
d. Unzip carry bag.

Continued on next page

Item 8 After attaching the electronic unit to the operator's LBV, what is the next step you would perform?

a. Adjust the shoulder strap.
b. Adjust position of search head.
c. Connect cables to electronic unit.
d. Extend the telescopic pole.

Item 9 During the initial adjustment of the SENSITIVITY knob, how high above ground should the search head be placed?

a. .5 meter
b. 1.5 meters
c. 2 meters
d. 3.5 meters

Item 10 For tiny horizontal metal pins, the tone is higher when the

a. inner ring is near the pin.
b. outer ring is near the pin.
c. pin is in the center of the ring.
d. inner ring is farther from the pin.

Item 11 How is the mine detector cleaned after using it in salt water?

a. Wipe it down with a clean rag.
b. Clean it with fresh water.
c. Clean it with dry solvent water.
d. Clean it with a light coat of oil.

Item 12 What is the last thing you do when you store the mine detector?

a. Make sure it is turned OFF.
b. Remove the batteries.
c. Close the pressure relief valve.
d. Remove the cable clamps.

Continued on next page

Solutions

The table below lists the answers to the exercise items. If you have questions about these items, refer to the reference page.

Item Number	Answer	Reference
1	a	3-51
2	c	3-54
3	d	3-54
4	c	3-55
5	d	3-56
6	a	3-56
7	b	3-57
8	d	3-60
9	a	3-63
10	a	3-67
11	b	3-69
12	c	3-69

Lesson Summary

In this lesson, you learned about the components, principle of operation, assembly, and operation procedures, and operator maintenance and storage for the AN/PSS-12 mine detector.

In the next lesson, you will learn about the MK2 system.

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LESSON 3

MK2 MOD 0 SYSTEM

Overview

Introduction

The MK2 MOD 0 system consists of the M58 mine clearing line charge (MICLIC) and the MK353 trailer used to transport the charge to the demolition site. The M58 MICLIC is a rocket-propelled explosive line charge used to reduce minefields containing single-impulse, pressure-activated AT and AP mines.

Content

In this lesson, you learn about the skills and knowledge necessary to employ the linear demolition charge.

Learning Objectives

Upon completion of this lesson, you should be able to

- Identify the major components of the MK2 MOD 0 system.
- Identify operator controls on the MK2 MOD 0 system.
- Identify launcher operational checking procedures for the MK2 MOD 0 system.
- Identify the tasks to install the launcher.
- Identify the tasks to perform the electrical continuity checking.
- Identify the tasks for fuzing the M58 MICLIC.
- Identify the tasks to install the rocket on the MK 155 launcher.
- Identify the tasks to prepare the M58 MICLIC for firing.
- Identify the tasks to employ the M58 MICLIC.
- Identify the procedures for handling misfires.

Continued on next page

In This Lesson This lesson contains the following topics:

Description

Purpose

The MK2 system is a trailer mounted, rocket-towed mine clearing line charge (MICLIC). It is used to initially clear a lane through a minefield.

Effectiveness

The linear charges will not destroy 100 percent of the mines in its path. It has limited effect on mines that have magnetic, blast hardened, or multiple pulse fuzes.

Characteristics

The explosive charge is anchored to the original container on the trailer by an arresting cable that provides 62 meters of standoff distance. The electric detonating system is contained within the arresting cable and permits detonation of the linear explosive charge seconds after deployment from the storage tub. The descriptive data of the line charge is listed in the table below:

Data	Characteristic
Explosive	C4 plastic explosive
Explosive weight	1,750 pounds
Length	350 feet
Number blocks	700.00
Block weight	2.5 pounds
Core	.75-inch nylon rope with two strands of detonating cord

Major Components of the MK2 MOD 0 System

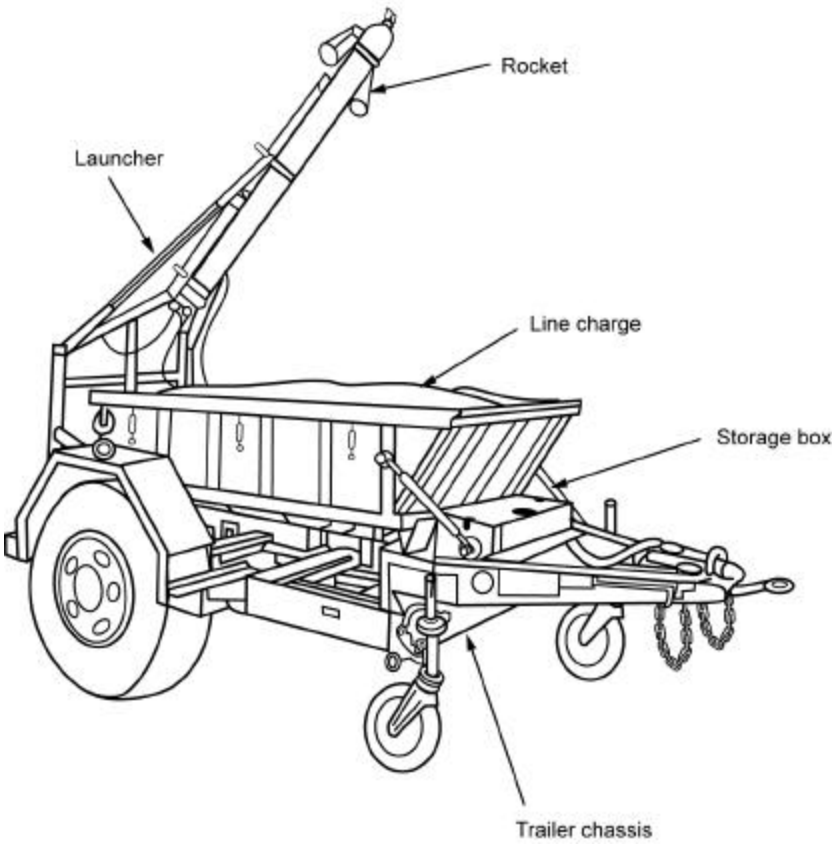
Components

There are five major components on the MK2 MOD 0 system:

- MK155 launcher
- MK22 rocket
- M58 line charge
- Storage box
- M353 trailer chassis

Diagram

The components of the MK2 MOD 0 system are identified in the diagram below:



Continued on next page

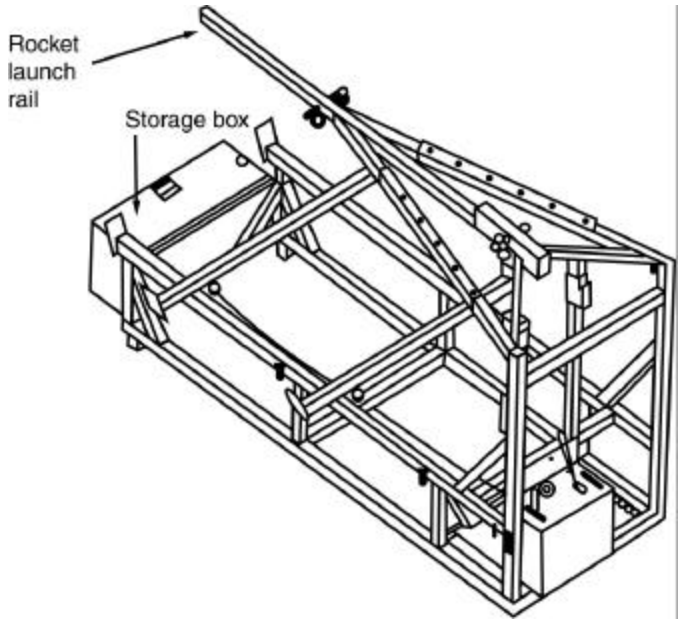
Major Components of the MK2 MOD 0 System, Continued

Launcher

The MK155 is a welded framework that holds the packaged linear charge and has a hydraulically elevated launcher rail for the towing rocket. The launcher holds the linear charge and the rocket motor securely during transport to the target minefield.

Diagram

The MK155 launcher is identified in the diagram below:



Continued on next page

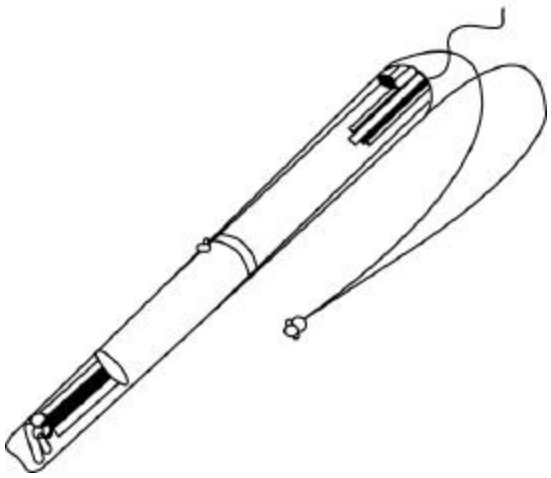
Major Components of the MK2 MOD 0 System, Continued

Rocket

The MK22, Mod 3 or Mod 4 is a 5-inch rocket motor designed to tow the linear charge over the target area.

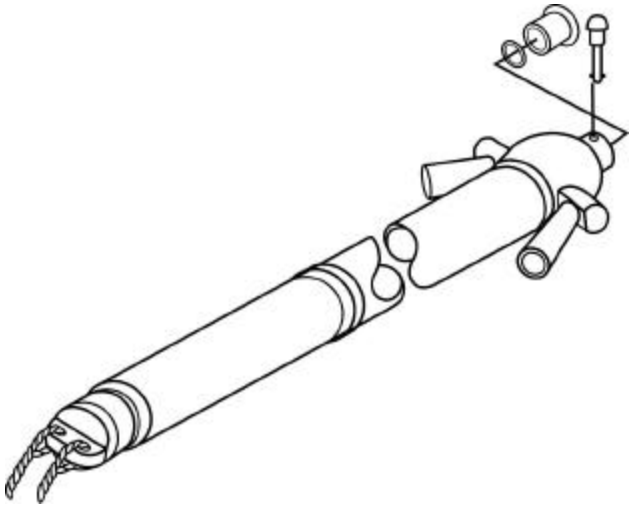
Mod 3 Diagram

Mod 3 rocket is identified in the diagram below:



Mod 4 Diagram

Mod 4 rocket is identified in the diagram below:



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Major Components of the MK2 MOD 0 System, Continued

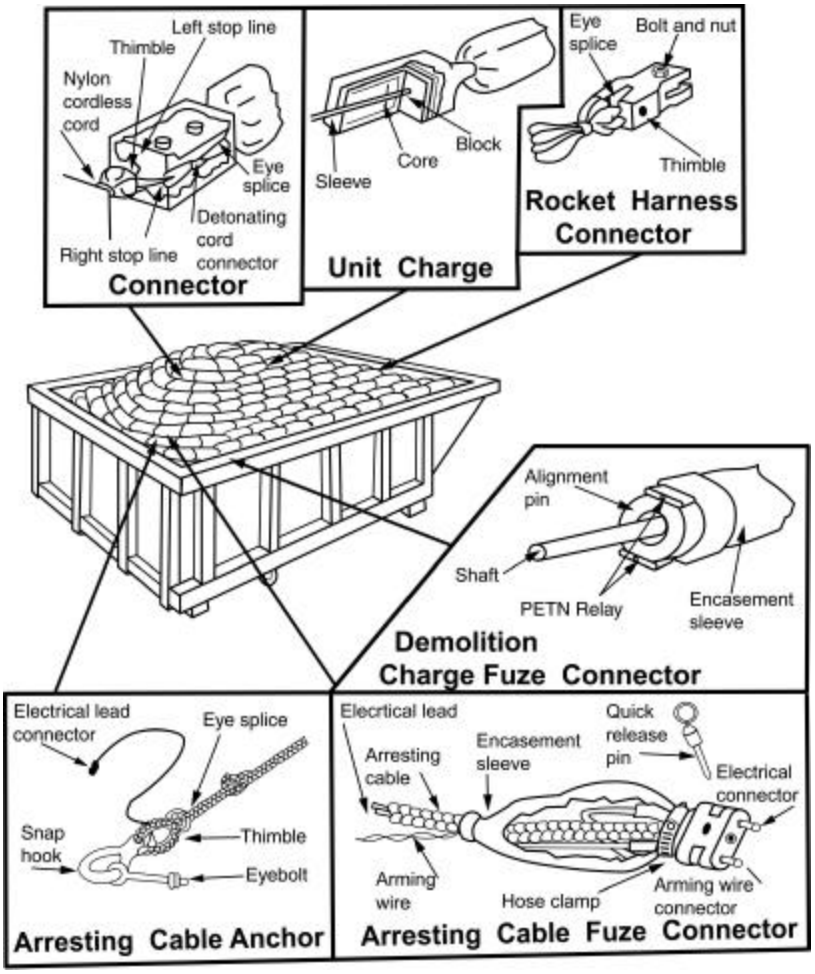
Line Charge

The M58 line charge consists of the

- Connector
- Unit charge
- Rocket harness connector
- Arresting cable anchor
- Arresting cable fuze connector
- Demolition charge fuze connector

Diagram

The components of the M58 line charge are identified in the diagram below:



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Major Components of the MK2 MOD 0 System, Continued

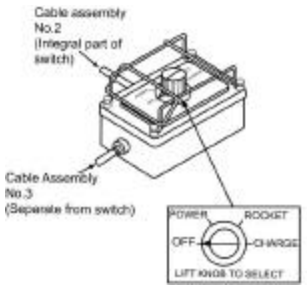
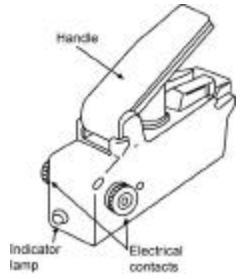
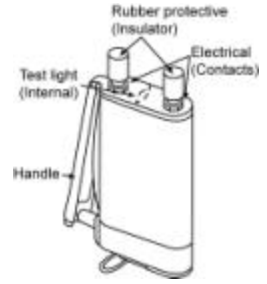
Storage Box

The storage box contains the following items:

- SL-3 components
  - Selector switch assembly (commonly known as the hell box)
  - M51 test set
  - M34 blasting machine
- Lifting sling
- Protective nylon cover
- Turnbuckles and U-bolts
- 75-foot power cable

Components

The components and their functions are identified in the table below:

Component	Function	Diagram
Selector switch assembly (hell box)	Directs power flow through a 73-foot cable to the rocket motor or linear charge	
M51 test set	Tests the circuit on the entire electrical system	
M34 blasting machine	Provides the electrical power source to launch the rocket motor and to detonate the linear demolition charge	

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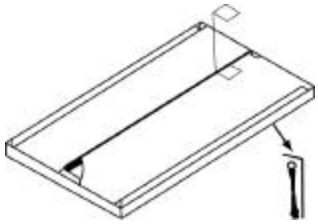
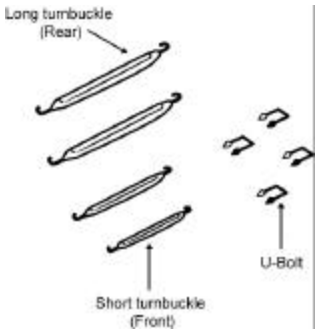
Major Components of the MK2 MOD 0 System, Continued

Components, continued

Component	Function	Diagram
Lifting sling	For loading and unloading the linear charge container and launcher on the trailer chassis	
Protective nylon cover	Covers the linear charge container after the hard cover is removed	
Turnbuckles and U-bolts	• Turnbuckles secure the linear charge container to the trailer chassis • U-bolts secure the launcher to the chassis	

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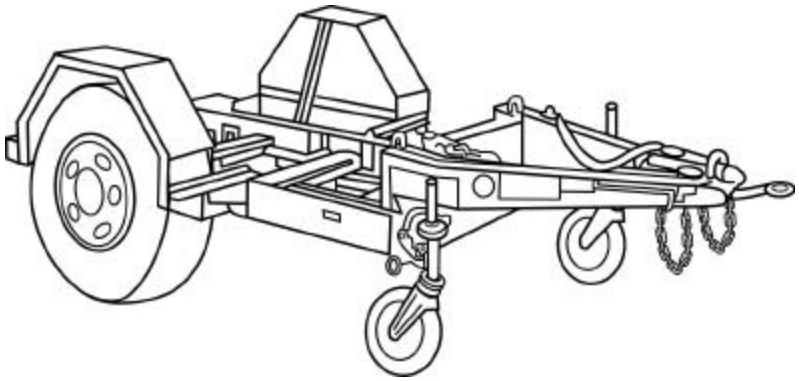
Major Components of the MK2 MOD 0 System, Continued

Trailer Chassis

The MK353 trailer chassis is a general purpose, 3.5-ton trailer that holds the mine clearing launcher and transports the launcher to the target minefield.

Diagram

The MK353 trailer chassis is identified in the diagram below:



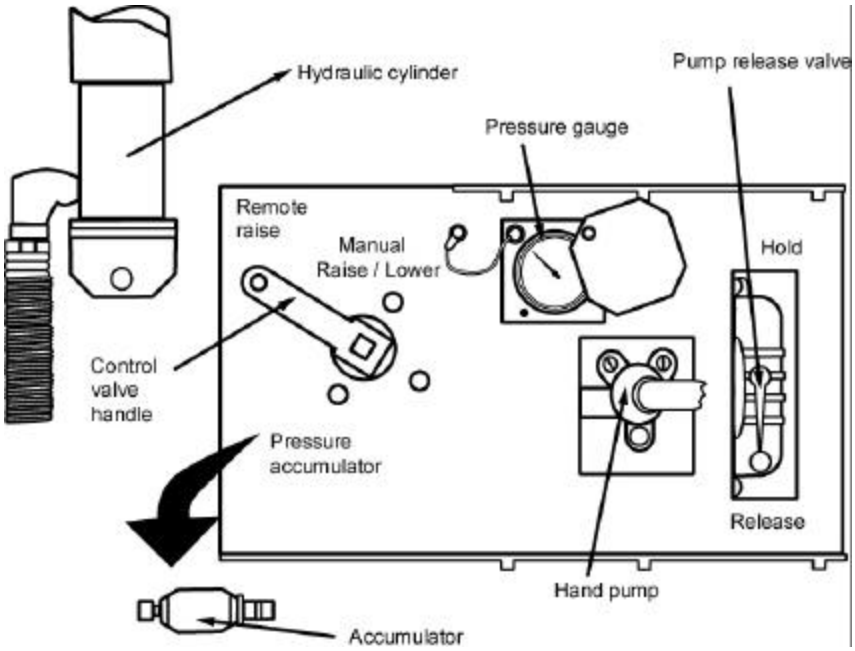
Operator's Controls and Indicators

Hydraulic System

The hydraulic system, located near the rear of the launcher, is used to raise and lower the launcher rail.

Diagram

The components of the hydraulic system are identified in the diagram below:



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Hydraulic System Components

The hydraulic system components and their functions are listed in the table below:

Component	Function
Control valve handle	Directs the flow of fluid to the manual, pressure accumulator, and remote raise positions
Pressure gauge	Measures the hydraulic pressure in the accumulator Note: Normal operating pressure is between 3,200 and 3,500 psi.
Hand pump	Pressurizes the accumulator or pumps hydraulic fluid to activate the cylinder and raise the rail
Pump release valve	When the hand pump release valve is • Closed or in the HOLD position, it allows the hand pump to deliver hydraulic fluid. • Open or in the RELEASE position, it causes fluid to flow back into the reservoir and release pressure.
Accumulator	Stores hydraulic pressure needed to raise the launcher rail when the hydraulic control valve handle is in the REMOTE RAISE position

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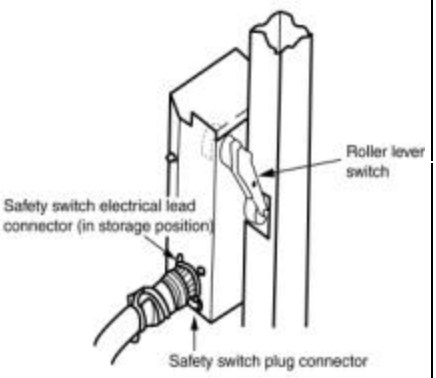
Safety Switch Assembly

The safety switch assembly prevents the rocket motor and linear charge from firing when the launcher rail is not elevated to firing position. The components and their functions are identified in the table below:

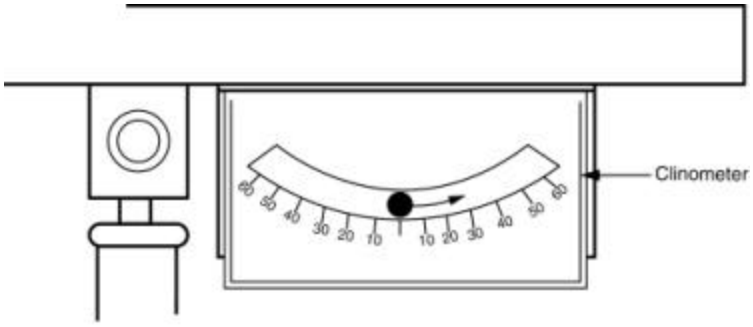
Component	Function	Diagram
Electrical lead connector	Plugs into receptacle No. 1 to provide electrical current for the linear demolition charge container during operation	
Roller lever switch	Completes the circuit to the rocket as the launcher rail approaches 45 to 47 degrees	
Safety switch plug connector	Provides a connection for the 75-foot special purpose electrical cable	

Clinometer

The clinometer indicates the degree of angle the launcher rail is raised. The launcher must be level for the clinometer to be accurate.

Diagram

The clinometer is identified in the diagram below:



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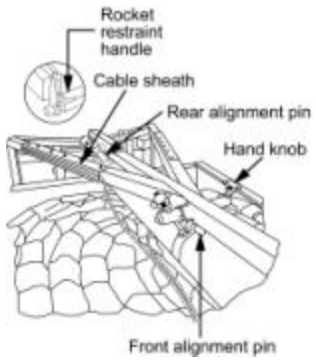
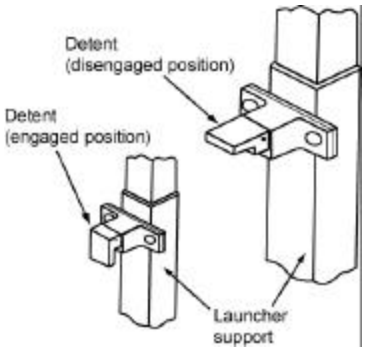
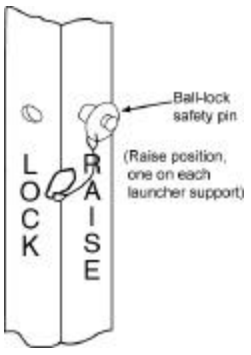
Launcher Rail and Support

The launcher rail and support provides a mobile platform for the MICLIC. The components and their functions are identified in the table below:

Component	Function	Diagram
Hand knobs (front and rear)	Secures rocket in place to prevent lateral movement during transportation	
Alignment pins (front and rear)	• Attaches to the rail to support the weight of the rocket • Keeps rocket centered	
Cable sheaths	Prevents rocket bridle cables from becoming entangled	
Rocket restraint handle	Restrains the rocket on the launcher rail during transportation	
Detent assemblies	• Engaged position—prevents the launcher rail from lowering. • Disengaged position—allows the launcher rail to lower	
Ball-lock pins	• Lock position—allows the launcher rail to rise to different elevations • Raise position—prevents the launcher rail from rising above 47 degrees	

Launcher Operational Check

Tasks

There are two tasks listed below you must perform to conduct the launcher operational check:

Task	Description
1	Initial Inspection
2	Operational Check

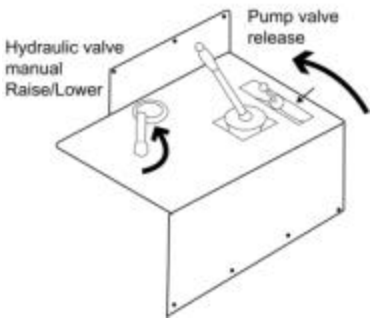
Task 1: Initial Inspection

To conduct the initial inspection, complete the steps listed in the table below:

Step	Action
1	Make sure all components are present and undamaged.
2	Check to be sure that all hydraulic system components are secured to the launcher.
3	Check the pump, accumulator, valve, cylinder, and hose for leaks.
4	Check the hydraulic fluid level in the hand pump.

Task 2: Operational Check

Perform the launcher operational check before mounting. To conduct the MK155 launcher operational check, complete the steps listed in the table below:

Step	Action
1	Check to be sure that the launcher is on level ground.
2	Set the detents to the ENGAGE (down) position.
3	Set the hydraulic control valve handle to the MANUAL RAISE/LOWER position and rotate the pump valve handle to the HOLD position. 

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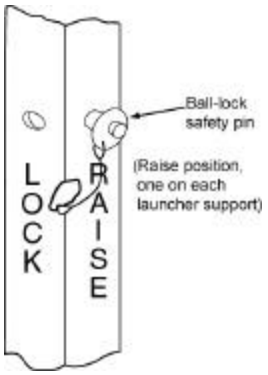
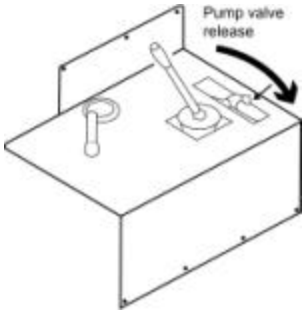
Task 2: Operational Check, continued

Step	Action
4	Remove the ball-lock safety pins from the LOCK position. If the pins are hard to move, slowly actuate the hand pump while simultaneously attempting to remove the pins. 
5	Operate the hand pump and raise the launch rail to approximately 60 degrees. Note: Serviceable detents will move and click when the rail is raised.
6	Set the detents to the DISENGAGE (up) position.
7	Rotate the pump valve handle to the RELEASE position and allow the launch rail to return to the down position. 
8	Set the detents to the ENGAGED (down) position.
9	Insert the ball-lock safety pins in the LOCK position.
10	Set the hydraulic control valve handle to the PRESSURIZE ACCUMULATOR position.

Continued on next page

Task 2: Operational Check, continued

Step	Action
11	Rotate the pump valve handle to the HOLD position.
12	Disengage the ball-lock pin on the hydraulic pressure gauge cover and rotate the cover aside.
13	Actuate the hand pump handle until the hydraulic pressure gauge indicates 3,200 to 3,500 psi.
14	Rotate the gauge cover over the pressure gauge and install the ball-lock pin.
15	Relocate the ball-lock safety pins from the LOCK position to the RAISE position.
16	Pull the lanyard (attached to the hydraulic control valve handle) to move the hydraulic control valve handle from the PRESSURE ACCUMULATOR TO REMOTE RAISE position. Visually monitor the clinometer to be sure it reaches an approximate elevation of 45 to 47 degrees.
17	Set the detents to the DISENGAGED (up) position.
18	Move the hydraulic control valve handle to the MANUAL RAISE/LOWER position.
19	Rotate the pump valve handle to the RELEASE position.
20	Set the detents to the ENGAGED (down) position when the launch rail has lowered to 0 degrees.
21	Relocate the ball-lock safety pins from the RAISE position to the LOCK position.

Installing the Launcher

Tasks

There are three tasks listed below you must perform to install the launcher:

Task	Description
1	Install the Launcher on the MK353 Trailer
2	Install the Charge Container on the Launcher
3	Secure the Charge Container on the Launcher

Task 1: Install the Launcher on the MK353 Trailer

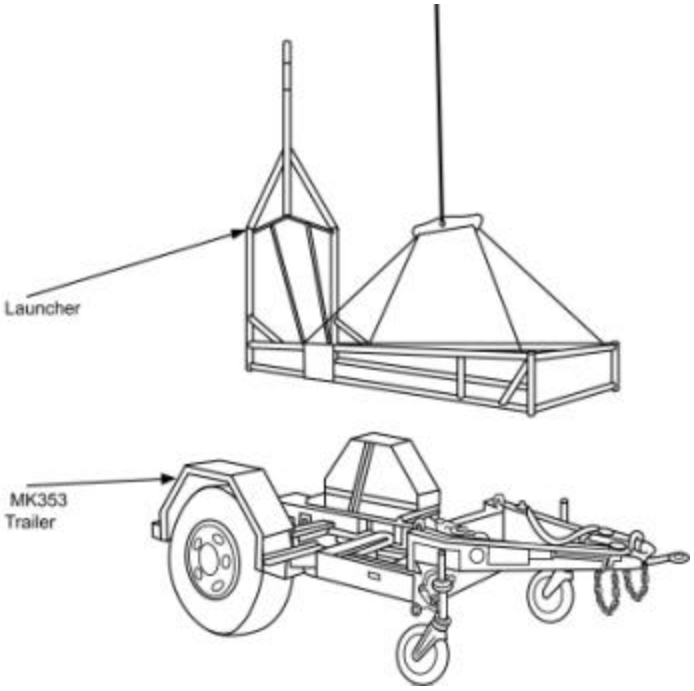
To install the launcher on a trailer chassis, complete the steps listed in the table below:

Step	Action
1	Set the hydraulic control valve handle to the MANUAL RAISE/LOWER position.
2	Rotate the pump valve handle to the HOLD position.
3	Operate the hand pump handle and raise the launch rail to an elevation adequate to install the lifting sling.

Continued on next page

Task 1: Install the Launcher on the MK353 Trailer, continued

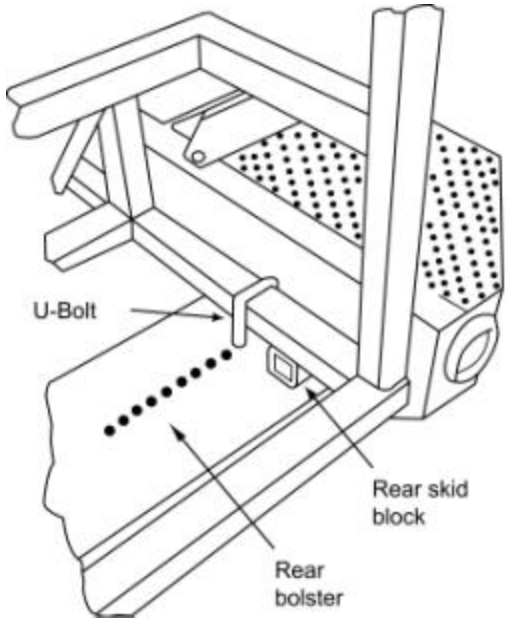
Step	Action
4	Adjust the bar of the lifting sling with its long axis parallel to the long axis of the launcher.
5	Attach the four snap hooks of the lifting sling cables into the lifting rings located on each side of the launcher. Check to be sure the cables do not twist or bind.



If…	Then...
A forklift is used	Adjust the forks to fit under the lifting sling bar inside the cable attaching points
A crane is used	Attach the crane hook through the center hole of the lifting sling bar

Continued on next page

Task 1: Install the Launcher on the MK353 Trailer, continued

Step	Action
6	Lift the launcher above the trailer with the rail opening toward the front of the trailer. Load from the port or starboard side. CAUTION: Do not try to load the launcher from the front or back of the trailer.
7	Lower the launcher slowly and align the rear of the kit flush with the rear of the trailer. When lowered, the bottom of the launcher supports will rest on the trailer's bolsters.
8	Make sure the rear skid blocks on the launcher rest to the rear of the trailer's rear bolster. The bolster has holes for securing U-bolts. 

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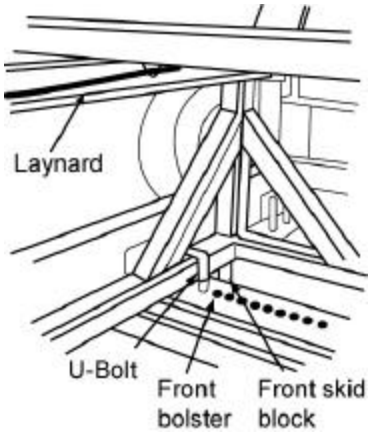
Task 1: Install the Launcher on the MK353 Trailer, continued

Step	Action
9	Make sure the two front skid blocks on the bottom of the launcher rest forward of the trailer's front bolster. The bolster has holes for securing U-bolts. 

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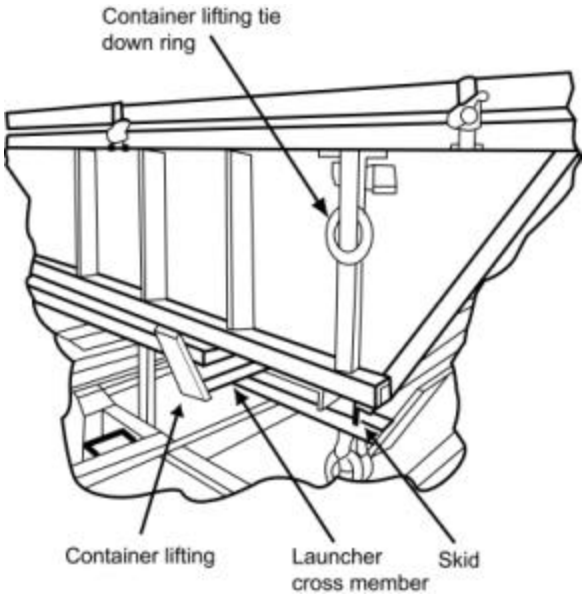
Task 2: Install the Charge Container on the Launcher

To install a charge container on the trailer-mounted launcher, complete the steps listed in the table below:

Step	Action
1	Operate the hydraulic system and raise the launch rail to a maximum elevation of 75 degrees. CAUTION: Never raise the launcher rail above 75 degrees or you may damage the hydraulic cylinder**.**
2	Remove the lifting sling from the launcher and adjust the bar of the lifting sling with its long axis container parallel to the long axis of the charge container.
3	Attach the four snap hooks of the sling cables into the lifting rings located on each side of the charge container. CAUTION: Check to be sure that the forklift or crane can lift approximately 3,100 pounds. Never load the charge container and the launcher together onto a trailer.

Continued on next page

Task 2: Install the Charge Container on the Launcher, continued

Step	Action
4	Lift and align the charge container with the electrical connections pointing toward the rear of the trailer.
5	Lower the charge container slowly while guiding the charge container skids onto the launcher. The charge container lifting bar guides should rest between the cross members of the launcher supports. 

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Task 3: Secure the Charge Container on a Launcher

To secure a charge container on the trailer-mounted launcher, complete the steps listed in the table below:

Step	Action
1	Remove the lifting sling from the charge container lifting rings and stow it in the storage box.
2	Attach long turnbuckles to the left and right rear padeyes of the trailer and to the container lifting rings.
3	Attach short turnbuckles to the left and right front padeyes of the trailer and to the container lifting rings.
4	Set the detents to the DISENGAGE (up) position.
5	Rotate the pump valve handle to the RELEASE position, and allow the rail to return 0 degrees.
6	Set the detents to the ENGAGED (down) position.
7	Insert the ball-lock safety pins in the LOCK position.

Electrical Circuit Continuity Check

Purpose

Perform an electrical circuit continuity check on all components of the linear charge and launcher to

- Make sure a complete circuit exists.
- Identify electrical system malfunctions before employment.
- Avoid electrical system malfunctions before employment.

Tasks

There are four tasks listed below you must perform for checking the electrical circuit continuity:

Task	Description
1	Prepare for the Test
2	Test the Cable Assembly
3	Test the Rocket Connections
4	Test the Charge Containers

Task 1: Prepare for the Test

To prepare for the electrical continuity check, complete the steps listed in the table below:

Step	Action
1	Place SL-3 components necessary to perform a continuity check at the rear of the charge container.
2	Set the hydraulic control valve to the MANUAL RAISE/LOWER position.
3	Rotate the pump valve handle to the HOLD position.
4	Remove ball-lock safety pins from the LOCK position.
5	Raise the launch to allow removal of the container hard cover.
6	Remove the charge container hard cover.

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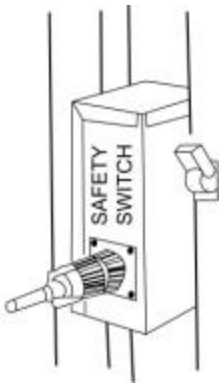
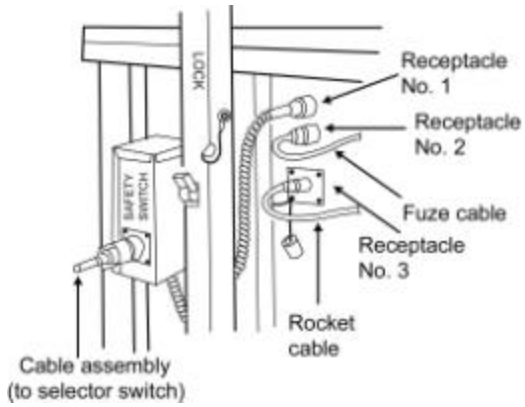
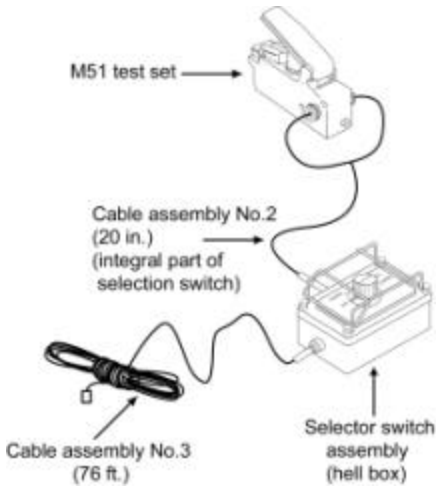
Task 2: Test the Cable Assembly

To test the cable assembly, complete the steps listed in the table below:

Step	Action
1	Disconnect the cable at the launcher safety switch electrical assembly. 
2	Remove the protective cap and shorting plugs from receptacle Nos. 1 and 2. CAUTION: Do not remove the protective cap and shorting plugs from receptacle No. 3. 
3	Attach the female plug of the launcher safety switch electrical cable to receptacle No. 1 of the charge container.
4	Attach cable assembly No. 3 to the male connector on the launcher safety switch electrical assembly.

Continued on next page

Task 2: Test the Cable Assembly, continued

Step	Action
5	Attach the opposite end of cable assembly No. 3 to the selector switch assembly. 
6	Attach cable assembly No. 2 to the M51 test set. Note: Elevation of launcher rail should be less than 40 degrees to complete check.
7	Set the selector switch to the POWER position. Squeeze the handle of the M51 test set several times. The small light on the front of the test set should register by blinking.
8	Set the selector switch to the ROCKET position. Squeeze the handle of the M51 test set several times. The small light on the front of the test set should not register.
9	Set the selector switch to the CHARGE position. Squeeze the handle of the M51 test set several times. The small light on the front of the test set should not register.
10	Return the selector switch to the OFF position.

Continued on next page

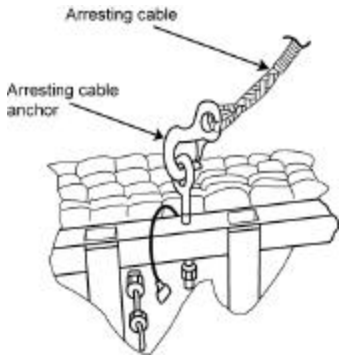
Task 3: Test the Rocket Connections

To test the rocket connections, complete the steps listed in the table below:

Step	Action
1	Make sure the selector switch is in the OFF position.
2	Install ball-lock safety pins to the RAISE position on the launcher.
3	Raise the launch rail to the LAUNCH position (ball-lock safety pins will stop the launcher at 45 degrees).
4	Set the selector switch to the ROCKET position. Squeeze the handle of the M51 test set several times. The small light on the front of the test set should register by blinking.
5	Remove the protective shorting cap from receptacle No. 3. Squeeze the handle of the M51 test set several times. The small light on the front of the test set should not register.
6	Return the selector switch to the OFF position.

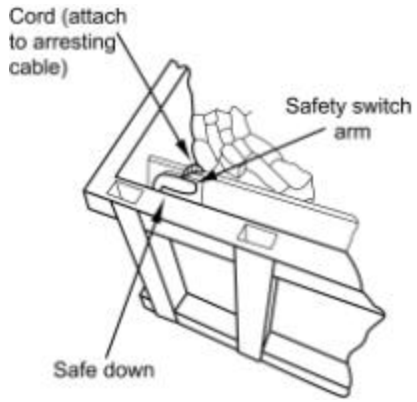
Task 4: Test the Charge Container

To test the charge container, complete the steps listed in the table below:

Step	Action
1	Remove the hook end of the arresting cable from its storage location so the line charge electrical lead can connect to receptacle No. 2. 
2	Set the selector switch to the CHARGE position. Squeeze the handle of the M51 test set several times. The small light on the front of the test set should not register.

Continued on next page

Task 4: Test the Charge Container, continued

Step	Action
3	• Open the charge container safety switch (located in the left rear corner of the container and shown below) by releasing the arm from the spring catch mechanism. • Squeeze the handle of the M51 test set several times. • The small light on the front of the test set should not register. 
4	• Remove the jumper assembly plug from the utility kit (in the charge container). • Connect the jumper plug to the arresting cable fuze connector on the fuze end of the arresting cable. • Squeeze the handle of the M51 test set several times. • The small light on the front of the test set should register by blinking.
5	• Close and latch the charge container safety switch arm. • Squeeze the handle of the M51 test set several times. • The small light on the front of the test set should not register.
6	Set the selector switch to the OFF position.

Fuzing the M58 MICLIC

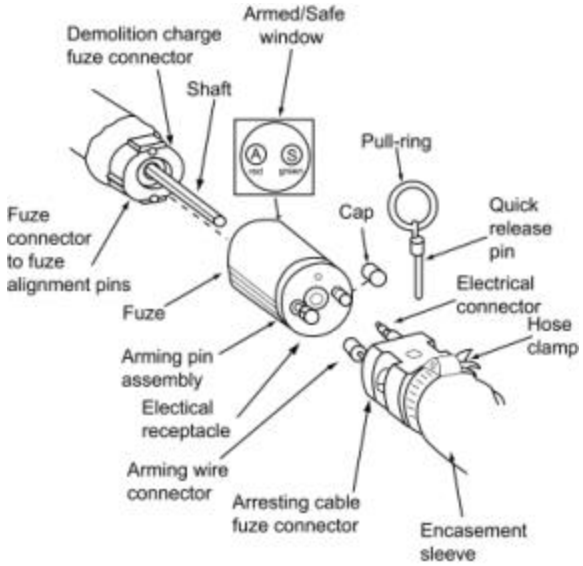
Fuze Assembly

The fuze assembly consists of the

- Demolition charge fuze connector
  - Shaft
  - Fuze connector to fuze alignment pins
- Fuze
  - Armed/safe window
  - Aiming pin assembly
  - Electrical receptacle
  - Cap
- Arresting cable fuse connector
  - Aiming wire connector
  - Pull-ring
  - Quick release pin
  - Electrical connector
  - Hose clamp
  - Encasement sleeve

Diagram

The components of the fuze assembly are identified in the diagram below:



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Fuzing the M58 MICLIC, Continued

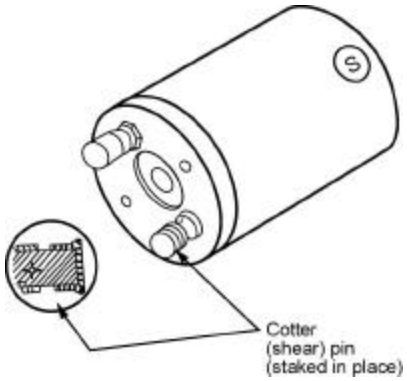
Tasks

There are two tasks listed below you must perform to fuze the M58 MICLIC:

Task	Description
1	Inspect the Fuze
2	Fuze the MICLIC

Task 1: Inspect the Fuze

To inspect the fuze, complete the steps listed in the table below:

Step	Action
1	Remove the fuze from the package.
2	Check for moisture and corrosion.
3	Check the arming window. It should be green with letter "S" showing. **WARNING:** Do not use the fuze if the window is red and the letter "A" is showing.
4	Make sure the shear pin is in place. 

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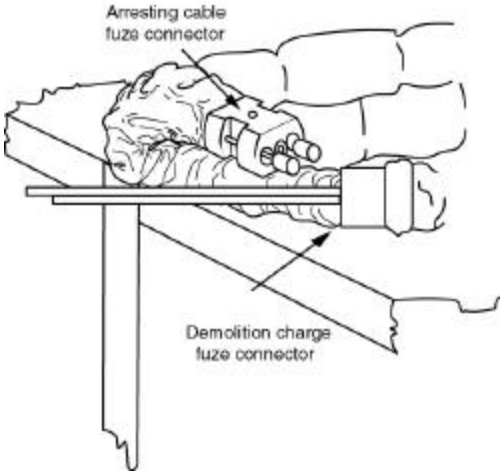
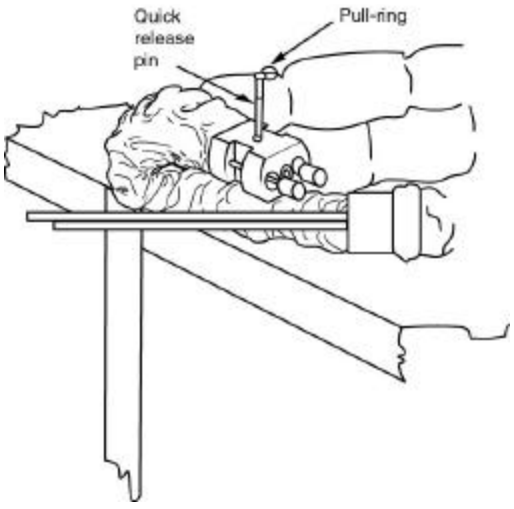
Task 2: Fuze the MICLIC

To fuze the MICLIC, complete the steps listed in the table below:

Step	Action
1	Place the arresting cable fuze connector on the linear demolition charge. 
2	Remove the quick release pin by pushing the detent button and pulling on the pull-ring. 

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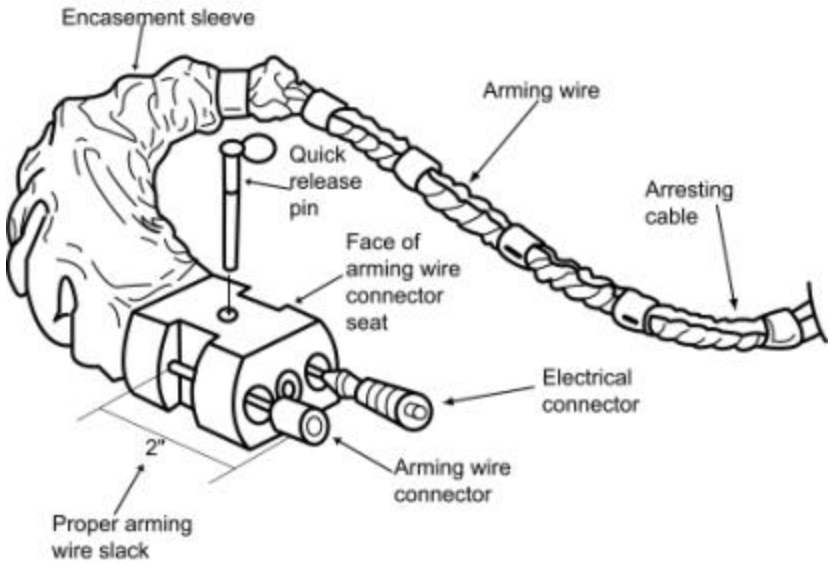
Task 2: Fuze the MICLIC, continued

Step	Action
3	Stretch the electrical and arming wire connectors until they are straight and measuring 2 inches from the face of the arming wire connector seat to the face (front) of the arming wire connector. Note: If the arming wire slack is not 2 inches, loosen both hose clamps and adjust the arming wire position on the arresting cable until you have 2 inches of slack. This measurement also applies to the electrical connector. The measurement is used to set both the arming wire and electrical connectors at the plant where the charge container is loaded. 

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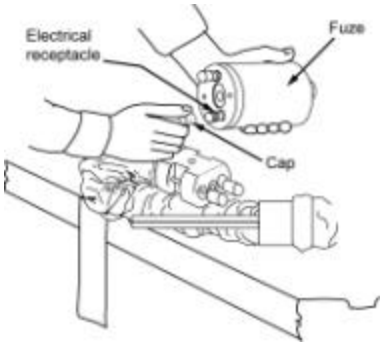
Task 2: Fuze the MICLIC, continued

Step	Action
3, cont.	**<u>WARNINGS</u>:** • Before deploying, make sure that both hose clamps attaching the arming wire to the arresting cable are secure. If they are not secure, tighten with a flat-tip screwdriver. If clamps are loose, the fuze will not arm. • Never allow the front end of a connected fuze to point toward anyone. The pulling force of deployment will activate the arming pin assembly and arm the fuze. • Before handling the fuze, make sure a white "S" on a green background is visible in the fuze window and that the shear pin is properly placed in the pin assembly. A black "A" on a red background or the absence of the shear pin indicates that the fuze may be armed and should not be handled except by EOD or ordnance personnel. • Before firing, make sure the fuze is not armed and the shear pin is in place.
4	Slide the fuze onto the shaft of the fuze connector and mesh the slots in the fuze connector with the fuze to show the orientation the fuze must be in during final hook up. Remove the fuze from the shaft, but do not rotate.
5	Remove the cap from the fuze's electrical receptacle. 

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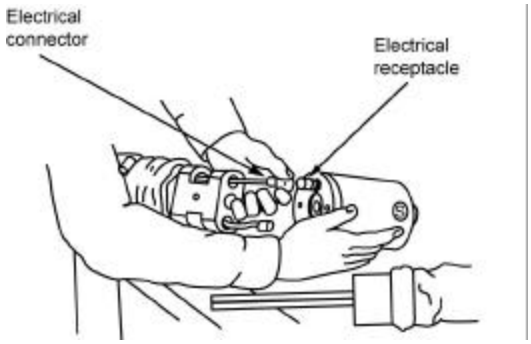
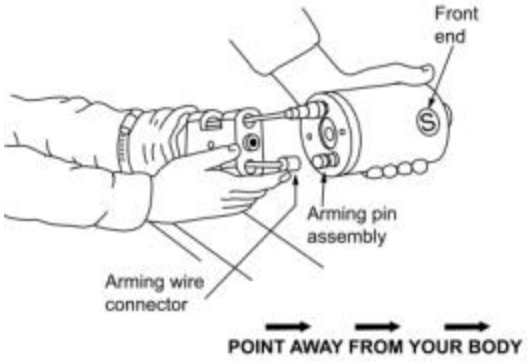
Task 2: Fuze the MICLIC, continued

Step	Action
6	Attach the electrical connector. 
7	Thread the arming wire connector onto the arming pin assembly. 

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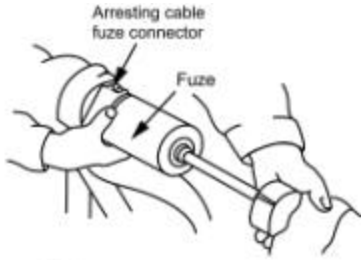
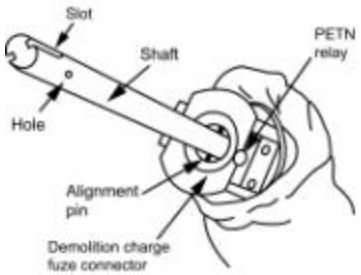
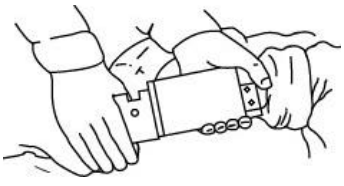
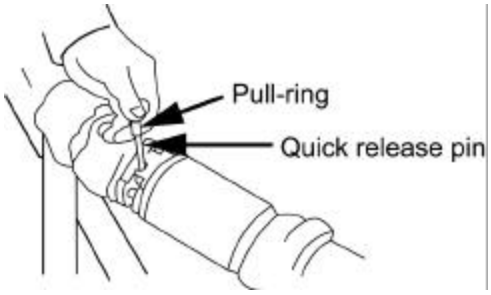
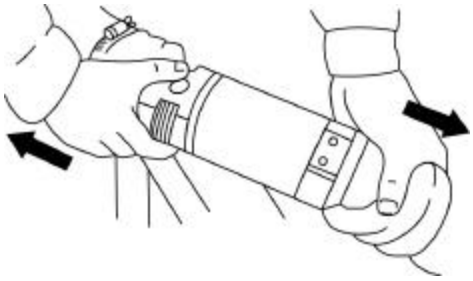
Task 2: Fuze the MICLIC, continued

Step	Action
8	• Slide the demolition charge fuze connector shaft into the center hole of the fuze. Keep the fuze's orientation in mind. • Remove the tape from the rear of the encasement sleeve and take up the slack on the electrical connector wire between the fuze and the arresting cable connector. • Make sure the arming wire is not entangled around the arresting cable or the electrical connector wires before securing the encasement sleeve back to the arresting cable. • Replace tape on encasement sleeve with No. 33 Scotch tape or equivalent.  
9	Mesh the demolition charge fuze connector pins with the slots in the fuze and the demolition charge fuze connector shaft slots with the arresting cable fuze connector key. 

Continued on next page

Task 2: Fuze the MICLIC, continued

Step	Action
10	Insert the ball-lock pin into the arresting cable fuze connector until seated in the demolition charge fuze connector shaft hole. Push the pull-ring over the pin to lock it. Note: Do not pound it in, simply remove the shaft and try again. 
11	Test the connection by pulling the connectors in opposite directions.  **WARNING:** When separating the connectors, take extra care not to separate the fuze from the arresting cable fuze connector.
12	Stow the assembly in the right rear corner of the charge container or fuze holder, as applicable.

Installing the Rocket

Introduction

Before you install the rocket motor, take the following considerations into account:

- Do not expose the rocket to direct sunlight for extended periods of time. If the rocket has been exposed for long periods of time, place it in the shade for 6 hours minimum before firing.
- The temperature limits for firing the rocket are 40 degrees to 125 degrees.
- Do not try to modify the rocket in any manner.
- If the rocket is dropped from a height of 2 feet or more, do not use it. Mark and return the rocket to the ammunition supply point (ASP).

Tasks

There are two tasks listed below you must perform to install the rocket:

Task	Description
1	Raise the Launcher
2	Install the Rocket

Task 1: Raise the Launcher

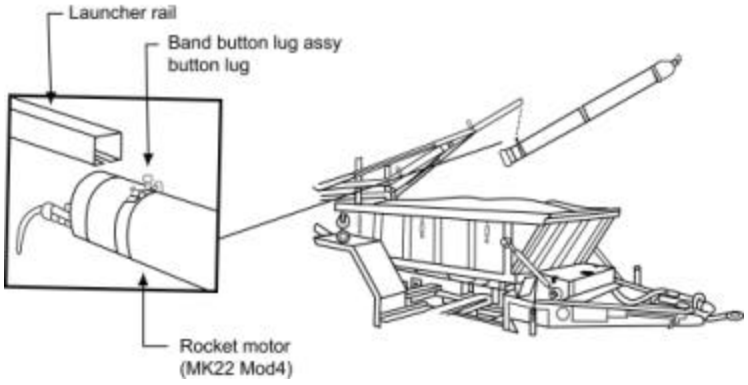
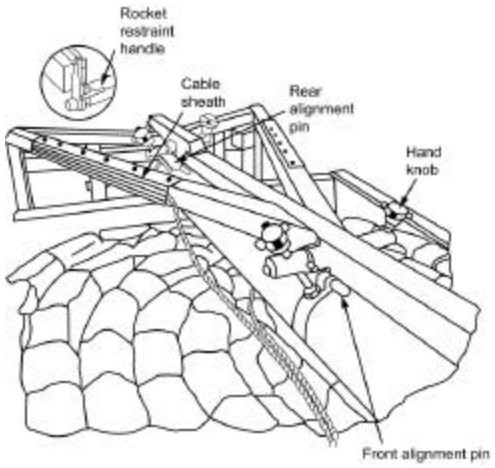
To raise the launcher, complete the steps listed in the table below:

Step	Action
1	Set the detents to the DISENGAGE position.
2	Remove ball-lock safety pins from the RAISE position.
3	Set the hydraulic control valve to the MANUAL RAISE position.
4	Elevate the launch rail to approximately 10 degrees.
5	Insert ball-lock safety pins in the LOCK position.
6	Remove the rocket from the packing box, keeping the cable clear of mud or snow.

Continued on next page

Task 2: Install the Rocket

To install the rocket onto the launcher, complete the steps listed in the table below:

Step	Action
1	Insert the rocket's rear band button lug assembly (button lug) into launch rail groove. 
2	Slide the rocket motor onto the launcher rail while pulling back on the rocket restraint handle. Make sure • Both rear alignment pins engage the rear button lug • The front button lug is fully engaged on the front hinged alignment pins
3	Rotate the front and rear hand knobs into the VERTICAL position and hand-tighten, keeping the rocket centered. 

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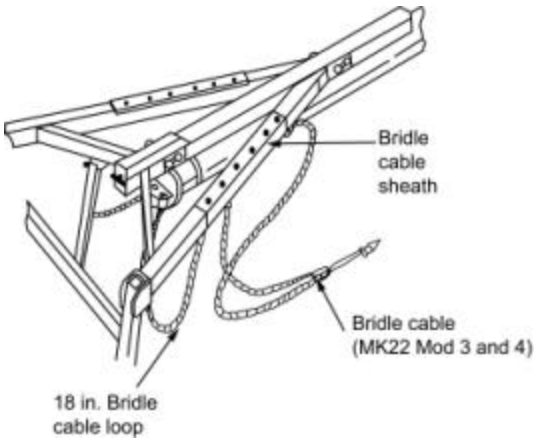
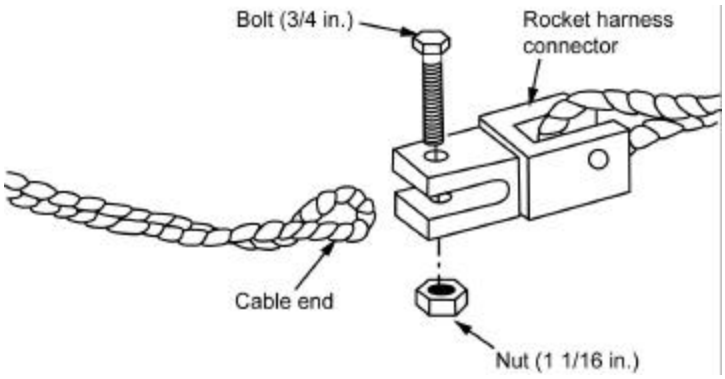
Task 2: Install the Rocket, continued

Step	Action
4	Insert the left and right bridle cables into the retaining sheaths on either side of the launch rail.  Note: To prevent entanglement, begin at the rear of the rocket, form an 18-inch loop in each bridle cable, and insert the cables into their respective sheaths throughout the entire length of each sheath.
5	Connect the rocket bridle cable to the rocket harness connector (part of the linear demolition charge) and secure with the bolt and nut. 

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Preparing the M58 MICLIC for Firing

Introduction

Before connecting the electrical cables to the charge container, make sure the charge container safety switch arm is in the down (safe) position.

Check all mechanical connections and functional preparations of the launcher system are complete (pressure accumulator, install rocket on rail, secure bridle to charge, install fuze) before making any electrical connections to the charge container. The secure arresting cable should not be installed on the container retainer screw (Mod 3) or ball-lock pin (Mod 4).

Before completing required electrical connections, the launcher rail should be in the 10-degree position with the detents in the ENGAGED position and the ball-lock safety pins in the LOCK position.

Tasks

There are four tasks listed below you must perform to prepare the M58 MICLIC for firing:

Task	Description
1	Inspect the MICLIC
2	Prepare Electrical Connections
3	Prepare the Rocket
4	Prepare the Selector Switch

Task 1: Inspect the MICLIC

To inspect the MICLIC, complete the steps listed in the table below:

Step	Action
1	Inspect electrical cables for cuts and abrasions.
2	Check electrical connectors for corrosion or presence of foreign material.
3	Check the selector switch by lifting and actuating the switch through its operation positions.
4	Check the M51 test set for evidence of physical damage.
5	Check the M34 blasting machine for evidence of physical damage.

Continued on next page

Task 2: Prepare Electrical Connections

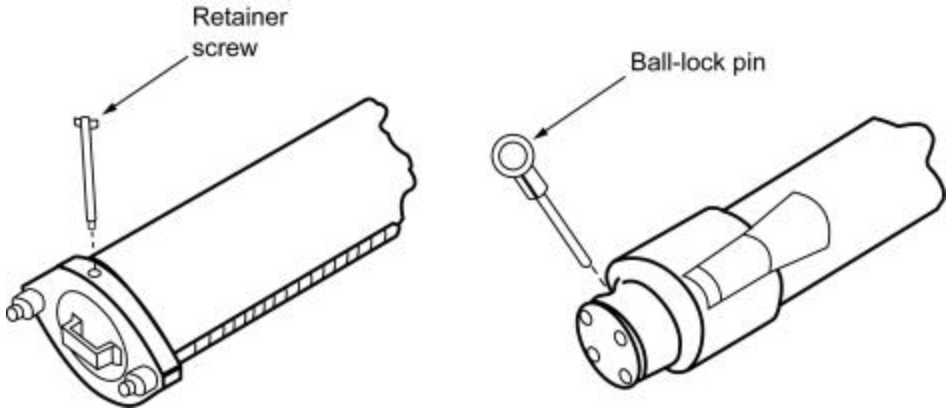
To prepare electrical connections for deployment, complete the steps listed in the table below:

Step	Action
1	Route the 75-foot cable assembly No. 3 (safety switch connector end) along the left side of the launcher frame and insert the cable into the electric cable retainers.
2	Secure the cable to the launcher frame at a point near the safety switch using a half-hitch knot. Leave adequate slack in the cable to allow connection with the switch.
3	Route the selector switch connector end of the cable assembly No. 3 and the remainder of cable into the host vehicle.
4	Set the selector switch to the OFF position, then attach cable assembly No. 3 to the selector switch inside the host vehicle.
5	Shunt the two leads of the cable assembly No. 2 by clipping them together.
6	Attach cable assembly No. 3 to the safety switch assembly housing. **WARNING**: Do not attach the female connector of the safety switch assembly to the charge container.
7	Check the selector switch to be certain it is in the OFF position.
8	Connect the line charge electrical lead to receptacle No. 2 on the charge container.
9	• Remove the rocket nozzle protective cap; retain it for reuse. • Uncoil the rocket electrical lead from the rocket (MK22 Mod 3) • Remove the protective cap from the connector, and connect the electrical lead to receptacle No. 3 of the charge container.
10	Remove the ball-lock safety pins from the LOCK position and install them in the RAISE position.
11	Remove the cap or shorting plug as applicable to the line charge model from receptacle No. 1 of the charge container.
12	Connect the female connector of the launcher safety switch to receptacle No. 1 of the charge container. Note: The system is now prepared for movement to target location.

Continued on next page

Task 3: Prepare the Rocket

To prepare the rocket for deployment, install the retainer screw (Mod 3) or ball-lock pin (Mod 4) on the rocket before firing.



WARNING: Install the retainer screw (Mod 3) or ball-lock pin (Mod 4) just before final movement to target location. Failure to install retainer screw (Mod 3) or ball-lock pin (Mod 4) will result in non-flight of the rocket motor.

Task 4: Prepare the Selector Switch

To prepare the selector switch for firing, make sure the selector switch is in the OFF position and connect the selector switch No. 2 cable assembly to the M34 blasting machine. The system is now prepared for firing.

WARNING: Do not connect the M34 blasting machine until deployment of the charge and rocket, unless you are in a critical tactical situation.

Employment Procedures

Introduction

During emergency situations, the rocket mounted on the rail may be transported to the launch site in an elevated (LAUNCH) position (45 degrees, detents engaged, ball-lock pins in RAISE position). In the elevated (LAUNCH) position, the electrical circuit is completed from the selector switch to the charge container (receptacle No. 1). The blasting machine should *not* be attached.

Perform a complete electrical continuity check to make sure the line charge system electrical circuits are totally operable before moving to the LAUNCH position. Electrical connection of the rocket and charge should *not* be attempted until the complete electrical continuity check has determined that all circuitry is complete.

Connecting the blasting machine may be delayed until arrival at the target location depending on the tactical situation. When time is critical, the blasting machine may be connected in advance.

Tasks

There are two tasks listed below you must perform to employ the M58 MICLIC:

Task	Description
1	Position the Vehicle
2	Achieve Operator Functions

Task 1: Position the Vehicle

To position the vehicle, drive the training vehicle and launcher straight ahead to the target minefield. Stop 60 meters from the edge of the minefield.

Continued on next page

Task 2: Achieve Operator Functions

To achieve operator functions, complete the steps listed in the table below:

Step	Action
1	Get rid of slack in the lanyard to minimize tangling.
2	Pull the lanyard and allow 5 seconds for rail elevation.
3	Make sure the rocket is elevated to the proper firing angle and the selector switch is in the OFF position. **WARNING:** Do not launch the rocket if the angle is less than 45 degrees, otherwise you may be injured.
4	Issue a warning command to personnel inside the host vehicle of operations by means of the line charge operator. **WARNING:** All personnel must take cover.
5	Connect cable assembly No. 2 to the M34 blasting machine.
6	Call out, "Hooking up blasting machine."
7	Set the selector switch to the ROCKET position.
8	Call out, "Switching to rocket."
9	Operate the M34 blasting machine to launch the rocket.
10	Call out, "Rocket fired." Note: Allow approximately 15 seconds for completion of charge and rocket launch.
11	Check to be sure that the charge is fully extended.
12	Call out, "Switching to charge."
13	Set the selector switch to the CHARGE position. Warn unprotected personnel of the line charge detonation. Operation personnel should be positioned within the protection of the host vehicle. **WARNING:** Detonation will throw fragments as far as 600 meters to the sides and 90 meters to the rear.
14	Call out, "Fire in the hole!"
15	Operate the M34 blasting machine to detonate the charge. If detonation • Occurred: Call out, "All clear." • Did not occur: Call out, "Misfire."

Danger Zones

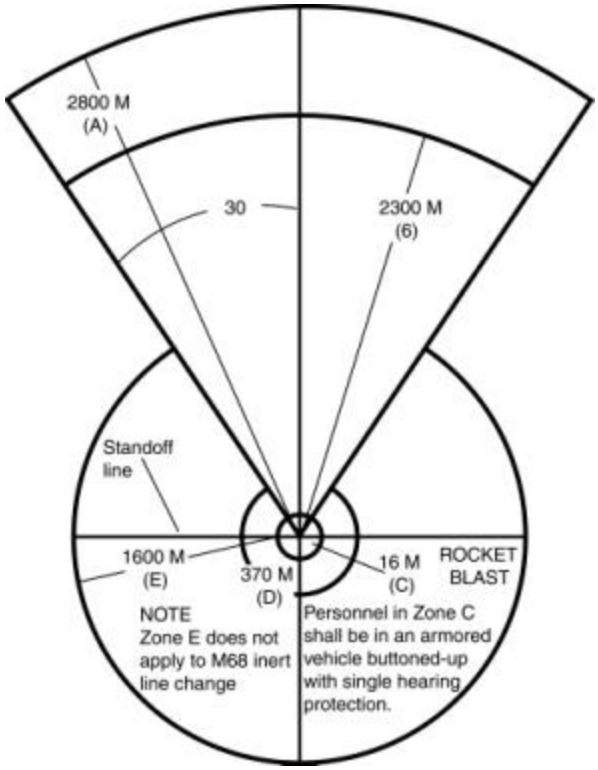
Five Zones

The five danger zones are listed in the table below:

Zone	Notes
A	Most probable impact zone for a totally unrestricted rocket motor flight
B	Most probable impact zone if the line charge bridle cable separates
C	Effect of rocket blast at launch point: 18 meters
D	Bursting rocket effect: personnel within 370 meters of launcher must be under cover with single hearing protection
E	Line charge explosion effect: spectators within 1,600 meters of launcher must wear single hearing protection. *No spectators forward of standoff line.*

Diagram

The danger zones are identified in the diagram below:



Misfire Procedures

Rocket Misfire To handle rocket misfires, complete the steps listed in the table below:

Step	Action
1	Check connections to the M34 blasting machine. Attempt to fire rocket again.
2	Try a backup M34 blasting machine if rocket misfires. Attempt to fire the rocket again.
3	Make sure the M34 blasting machine is disconnected and the selector switch is set to the OFF position if the rocket still misfires.
4	Keep the launcher aimed at the target minefield for 30 minutes in case of hangfire.
5	After 30 minutes • Approach the launcher. • Remove the rocket cable from receptacle No. 3. • Secure the protective cap on the rocket cable connector.
6	Install the shunt into receptacle No. 3, connect M51 to the selector switch, rotate the selector switch to ROCKET, and then test the circuit. If M51 lamp did not flash, fault is in the circuit or safety switch. Further fault isolation is necessary.
7	Set the selector switch to OFF and disconnect. Remove the shunt and install the protective cap on receptacle No. 3.
8	Move the control valve handle to the MANUAL/RAISE/LOWER position and pull the handle of the release valve to lower the rocket. Remove the ball-lock pin from the rocket head cap.
9	Tow the launcher out of the danger area to avoid exposing personnel.
10	Remove the rocket from the launcher.
11	Paint "MISFIRED" on the rocket.
12	Repack the rocket in the original box, if available, or in another available container.
13	Paint "MISFIRED ROCKET" on the container.
14	Return the rocket to ASP and submit to QDR.

Note: Steps 9 through 12 apply for rockets known to be misfires. If something obvious is found in disassembly indicating the misfire was not the fault of the rocket (such as a cut cable), the unit commander may decide to turn in the rocket as a *field return.*

Continued on next page

Line Charge Misfire

To handle line charge misfires, complete the steps listed in the table below:

Step	Action
1	Make sure the M34 blasting machine is disconnected and the selector switch is set to the OFF position.
2	Report misfires to the breach commander or OIC.
3	Check all electrical connections to the linear charge for proper assembly. Correct any problems immediately and repeat the firing sequence.
4	Wait 30 minutes if the charge has not detonated at this point.
5	Request permission to hand prime the linear charge if the charge still has not detonated.
6	Disconnect the M34 blasting machine. With one block of C4 or TNT, an appropriate length of time fuze, one blasting cap, and fuze igniter, carefully follow the path of the linear charge and place a charge on the second block of C4.
7	Check the fuze for arming while down range; if conditions allow, recover the fuze.
8	Pull the fuze igniter and carefully return to safety.
9	Submit an ammunition deficiency report.

WARNINGS: Never use a line charge to sympathetically detonate another line charge that has failed to explode during peacetime training.

Never fire a line charge into an area where brush or other material is aflame.

Lesson 3 Exercise

Directions Complete exercise items 1 through 18 by performing the action required. Check your answers against those listed at the end of the lesson.

Item 1 The five major components of the M58 MICLIC are

- MK155 launcher
- MK22 rocket
- M58 line charge
- Storage box

a. M353 trailer chassis.
b. trailer chassis, hydraulic system, storage box rocket, and line charge.
c. launcher, hydraulic system, lifting sling, trailer, and line charge.
d. rocket motor, lifting sling, storage box, rocket, and trailer.

Item 2 Which SL-3 component tests the circuit on the entire electrical system?

a. M34 blasting machine
b. M51 rocket motor
c. Selector switch assembly
d. M51 test set

Item 3 Which hydraulic system component stores hydraulic pressure needed to raise the launcher rail when the hydraulic control valve handle is in the REMOTE RAISE position?

a. Control valve
b. Hand pump
c. Accumulator
d. Pump release valve

Item 4 Which of the following operator's controls include the electrical lead connector, roller lever switch, and the safety switch plug connector?

a. Clinometer system
b. Hydraulic system
c. Safety switch assembly
d. Launcher rail assembly

Continued on next page

Item 5 What is step 1 in the initial inspection of the launcher operational check?

a. Make sure all components are present and undamaged.
b. Check the pump, accumulator, valve cylinder, and hose for leaks.
c. Be sure hydraulic system components are secured to the launcher.
d. Check the hydraulic fluid level in the hand pump.

Item 6 When the detents are down, what position are they in during the launcher operational check?

a. ENGAGE
b. RAISE
c. DISENGAGE
d. LOWER

Item 7 After installing the launcher on the MK353 trailer, what is the next task?

a. Install the launcher on a trailer chassis.
b. Install the charge container on the launcher.
c. Secure the container on the launcher.
d. Secure the launcher on the charge container.

Item 8 Identify the first step to install the launcher on the MK353 trailer.

a. Lift the launcher above the trailer with the rail opening toward the front of the trailer.
b. Rotate the pump valve handle to the HOLD position.
c. Set the hydraulic control valve handle to the MANUAL RAISE/LOWER position.
d. Adjust the bar of the lifting sling with its long axis parallel to the long axis of the launcher.

Continued on next page

Item 9

When installing the launcher on the M353 trailer, what position should you load the launcher onto the trailer?

a. Front or back
b. Front or side
c. Port or starboard side
d. Back or starboard side

Item 10

Identify the tasks to perform the electrical circuit continuity check.

a. Prepare for the test, test the cable assembly, test the rocket connections, and test the charge container.
b. Prepare for the test, test the cable, attach the cable assembly, and test the charge container.
c. Test the cable assembly, test the rocket connections, test the charge container, and test the fuze.
d. Test the cable assembly, test the connections, test the charge container, and test the rocket.

Item 11

During the electrical circuit continuity check, the step *install ball-lock safety pins to the RAISE position on the launcher* is performed in which task?

a. Test the charge container.
b. Prepare for the test.
c. Test the rocket connections.
d. Test the cable assembly.

Item 12

During the electrical circuit continuity check, the step *remove the hook end of the arresting cable from the storage location so the line charge electrical lead can connect to receptacle No. 2* is performed in which task?

a. Prepare for the test.
b. Test the cable assembly.
c. Test the rocket connections.
d. Test the charge container.

Continued on next page

Item 13

When fuzing the M58 MICLIC, the step *check the arming window* is performed in which task?

a. Fuze the MICLIC.
b. Inspect the fuze.
c. Remove the fuze.
d. Install the fuze.

Item 14

When fuzing the MICLIC, what happens if both hose clamps attaching the arming wire to the arresting cable are not secured?

a. The shear pin prevents the fuze from arming.
b. The fuze will not arm.
c. The shear pin will fall off.
d. The fuze will prematurely arm.

Item 15

When installing the rocket, the step *slide the rocket motor on the launcher rail while pulling back on the rocket restraint handle* is performed in which task?

a. Raise the launcher.
b. Prepare the rocket.
c. Install the rocket.
d. Install the launcher.

Continued on next page

Item 16

The first task to prepare the M58 MICLIC for firing is *inspect the MICLIC.* Select the correct sequence listed below for preparing the M58 MICLIC for firing.

a. Prepare electrical connections, prepare the rocket, and prepare the selector switch.
b. Prepare the electrical connections, prepare the selector switch, and prepare the rocket.
c. Prepare the rocket, prepare the selector switch, and prepare the electrical connections.
d. Prepare the electrical connections, prepare the rocket, and prepare the indicator switch.

Item 17

Operator's functions during employment procedures specify that once the lanyard is pulled, the operator must allow _____ seconds for the launch rail to elevate.

a. 5
b. 10
c. 15
d. 20

Item 18

The first step in handling misfires is *check connections to the M34 blasting machine*. What is the third step in handling misfires?

a. Make sure the M34 blasting machine is disconnected and the selector is set to the OFF position.
b. Remove the rocket launcher.
c. Set the selector switch to the OFF position and disconnect.
d. Shunt the wires.

Continued on next page

Solutions

The table below lists the answers to the exercise items. If you have questions about these items, refer to the reference page.

Item Number	Answer	Reference
1	a	3-78
2	d	3-82
3	c	3-86
4	c	3-87
5	a	3-89
6	a	3-89
7	b	3-92
8	c	3-92
9	c	3-94
10	a	3-99
11	c	3-102
12	d	3-102
13	b	3-105
14	b	3-108
15	c	3-113
16	a	3-115
17	a	3-119
18	a	3-121

Lesson Summary

In this lesson, you learned about the M58 major components, charge installation, rocket installation, continuity check, operator controls, operational checking, firing, continuity check, employment, and misfires.

In the next lesson, you will learn about mine clearing operations.

LESSON 4

MINE CLEARING OPERATIONS

Overview

Introduction

Clearing is the total elimination or neutralization of mines from an area. Breaching operations are usually conducted under enemy fires while clearing operations are not. Clearing operations are conducted by engineers during war or after hostilities as part of nation assistance.

Content

In this lesson, you learn the skills and knowledge necessary to be an effective member of a mine clearing operation.

Learning Objectives

Upon completion of this lesson, you should be able to

- Identify at what time a limited clearing operation can be conducted.
- Identify the four methods of mine detection.
- Define upgrading breach lanes.
- Identify when mine clearing operations occur.
- Identify the two types of sweep operations.
- Identify the number of personnel normally in a sweep team configuration.
- Select which member of the sweep team decides what to do with a mine after one is detected.
- Identify at what time mines can be neutralized by hand.
- Identify the gear worn when conducting mine clearing operations.
- Identify when a spot report is given.

In This Lesson

This lesson contains the following topics:

Limited Clearing Operations

Introduction

The most extensive clearing operations occur as part of post-war nation assistance. Procedures and techniques for clearing operations contained in this lesson provide fundamentals for large-scale operations.

When to Perform

Limited clearing operations are performed after the breaching force has reduced the minefield and secured the area. The clearing operation

- Improves existing breach lanes by widening and marking them
- Clears and marks new lanes through the minefield
- Supports continued passage of forces

Minefield Removal

A clearing operation eliminates all mines in a minefield previously identified, reported, and marked in a friendly area of operation that hinders mobility or maybe a hazard to friendly forces or civilians.

Detection

Introduction

Detection is the actual confirmation and location of mines. It is accomplished through reconnaissance or it could be unintentional, such as when a vehicle detonates a mine. Mine detection is used in conjunction with

- Intelligence gathering operations
- Minefield bypass reconnaissance
- Breaching and clearing operations

Four Methods of Mine Detection

The four methods of mine detection are listed below:

- Visual
- Probing
- Electronic
- Mechanical

Continued on next page

Visual Detection

Visual detection is part of all combat operations, and is an ongoing process. At all times, you should inspect the area. Some indicators that an area is mined are listed in the table below:

Indicator	Example
Trip wires	Areas where they are not normally found
Signs of road repair	• New road fill • Paving • Ditching • Culvert work
Signs placed on trees, posts, or stakes	Threat forces mark their minefields to protect their own forces
Wires leading away from the side of the road	May be command-detonation wires that are partially buried
Odd features in the ground or patterns not present in nature	• Plant growth—wilted or changed color • Rain—part of the cover could be washed away or the cover may sink and crack around the edge • Mounds of dirt
Questioning the civilians	Areas not trafficked by the local population
Pieces of wood or other debris in the road	Indicate placement of mines, and not necessarily directly under the object, but perhaps to the side of the road
Patterns of objects that might be used as sighting lines	Search road shoulders and areas close to them for command-detonated ordnance

Continued on next page

Probing

Probing is very time consuming and is used primarily for clearing operations or covert breaching operations. It is used to confirm detection by electronic and visual methods. The steps for probing mines are listed in the table below:

Step	Action
1	Roll up sleeves and remove jewelry to increase sensitivity.
2	Wear a kevlar helmet with the chinstrap fastened.
3	Stay close to the ground; move on hands and knees or in a prone position.
4	Use sight and touch to detect trip wires, fuzes, and pressure tongs.
5	Use a slender, nonmetallic object as a probe.
6	Probe every 2 inches across a 1-meter front.
7	Push gently into the ground at an angle less than 45 degrees.
8	Apply just enough pressure to penetrate the ground surface.
9	If the probe encounters resistance, pick the soil away with the probe tip and remove the loose dirt with your hand.
10	When a solid object is touched, stop probing and carefully remove the surrounding soil to determine what the object is.
11	If the object is a mine, remove enough soil to determine the type of mine and mark its location. Do not attempt to disarm the mine.

Diagram

The way to use a probe is identified in the diagram below:

Continued on next page

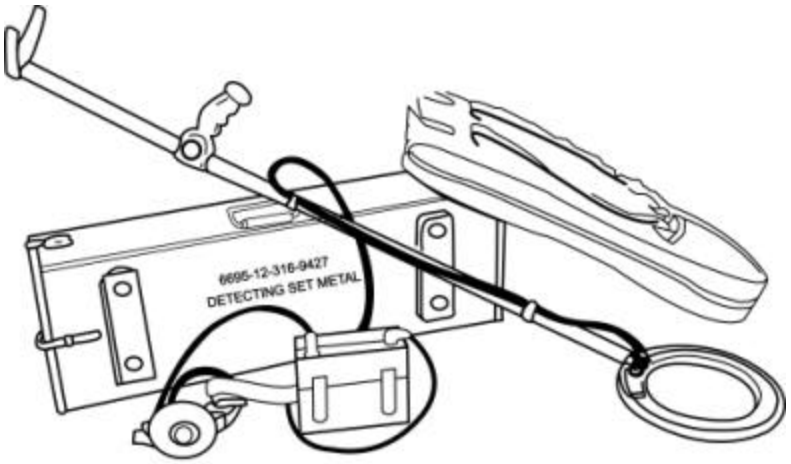
Detection, Continued

Electronic

Electronic mine detectors are effective for locating mines; however, they are time consuming and expose personnel to enemy fire. In addition, the mine location must be confirmed by probing. Currently, the AN/PSS-12 is the electronic detector used in the U.S. Marine Corps.

Diagram

The AN/PSS-12 mine detector is identified in the diagram below:



Mechanical

Track-width mine rollers and plows and full-width mine rakes are all examples of mechanical means of detection. They can be used singularly, but are most effective when used in multiples.

Upgrading Breach Lanes

Introduction

Upgrading breach lanes is limited mine clearance conducted by follow-on engineers to improve existing lanes through minefields and reduce new lanes. Additionally, this operation reduces the minefield so follow-on units can pass through it as quickly as possible. Follow-on engineers can expect lane widths of 4 to 5 meters. The total number of lanes will depend on the size of the initial breach and assault forces.

Lane Size and Spacing

If forces continue to pass through existing lanes while further reducing and clearing is conducted, the follow-on engineers can begin reducing new lanes. At a minimum, the lane requirements are listed below:

- Battalion—four lanes
- Division—eight lanes

Lanes reduced during the clearing operation require a minimum distance of 100 meters apart.

Lane Improvement and Multiplication

Traffic control is critical during new lane reduction and while shifting lanes to improve existing lanes. After additional lanes are reduced and marked, forces can begin using them. The upgraded breach lanes provide

- Widened initial lanes to approximately 16 meters
- Improved marking system to reflect the new lane widths
- Guides at the lanes where the engineers conducted the reduction and clearance operations

Mine Clearance

Introduction

Clearing operations occur when engineers receive a mission to clear an area of mines or a specific minefield in a friendly area of operation. In this case, the minefield was reported and may be marked on all sides. The worst case scenario would be the minefield was reported, not marked, and its physical boundaries were unknown. The engineer unit prepares and plans according to the information received.

Minefield Reconnaissance

Actions at the minefield begin with a thorough reconnaissance to identify minefield limits and types of mines. A systematic approach to the task will ensure all mines are located and destroyed. The procedure will depend on the mine type and whether the mines are surface-laid or buried. If the mines have seismic or magnetic type fuzes, mechanical assets are used. Pressure activated mines can be destroyed using hand-emplaced explosives. Eliminate all trip wires with grapnel hooks prior to moving forward to detect mines.

Route Clearance

Introduction

The ability to move forces and material to any point in an area of operation is basic to combat power and critical to the outcome of combat operations. It is necessary to conduct road and route clearance operations to ensure safe passage of combat and support organizations. Sweep teams conduct route clearance.

Types of Sweep Operations

There are two types of sweep operations:

- Hasty
- Deliberate

Hasty Sweep

A hasty sweep is used when METT-TSL analysis does not permit a deliberate sweep or when there is an urgent need for a road to be opened. Time and distance factors may be imposed. An average of 1.86 to 3.1 miles can be covered per hour. The sweep team is responsible for

- Inspecting and searching the road surface, culverts, ditches, and bridges
- Looking for mines, wire, or any other sign of recent mining activity
- Using electronic detectors to check suspected areas

Deliberate Sweep

A deliberate sweep is very thorough and includes a complete electronic and visual sweep of the road, to include ditches, shoulders, culverts, and bridges. It is done before opening the road to traffic. There is no set time limit. An average of .62 to 1.86 miles can be covered per hour.

Continued on next page

Sweep Team Members

The organization of a sweep team depends on the type of mission and the length and difficulty of the road. A sweep team consists of trained personnel that search for mines and explosive devices:

- One security
- One NCOIC
- Two markers or probers
- One detector operator
- One radio operator
- Two demolition

Additional team members may include

- One vehicle driver
- Two detector operators
- One corpsman

Sweep Team Equipment

Equipment used by the sweep team is as follows:

- One panel marker
- One map
- Four smoke grenades (minimum)
- Four detectors (includes two backup detectors) and extra batteries
- Two grappling hooks and two 60-meter lengths of cord
- One demolition kit or demolition bag per man
- Four nonmetallic probes

Continued on next page

Security Element

The sweep team is escorted by a security element to the sweep site. The security element composition is dictated by the tactical situation. The enemy often mines or remines areas recently cleared by sweep teams. Rear security elements must be alert to this technique and be prepared to react. If a sweep team is attacked, the security element

- Deploys men and return fire immediately
- Assumes command upon enemy attack
- Organizes the defense or counterattack and requests support as needed via the commander

Types of Sweep Teams

There are two types of sweep teams:

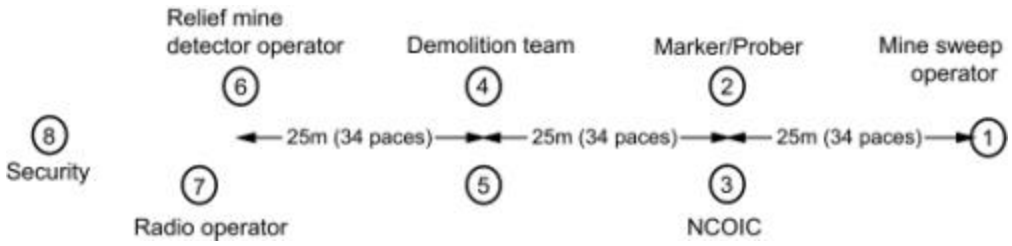
- Column
- Echelon

Column Team

The normal sweep team configuration is eight Marines in a column for route clearing. This configuration is best suited to sweep routes in friendly territories that are not under constant surveillance.

Diagram

The diagram below illustrates a sweep team in a column:



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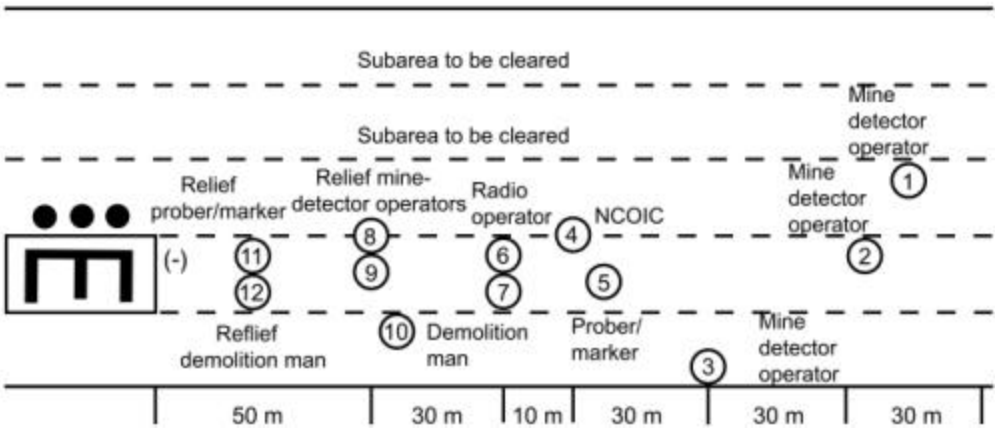
Echelon Team

If the sweep team clears a minefield rather than a single lane or road, it is organized with several clearance teams working in echelon. The sweep team formation can be modified for manual minefield clearance operations. A combination of visual, electronic, physical, and a mine clearing roller make the most effective sweep.

Diagram

The diagram below illustrates a sweep team in echelon:



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Mine Detection

When a suspected mine is found, the sweep team takes the following actions:

- Pinpoint the mine location; do not leave any mine unmarked.
- Search for wires in immediate area. Trace wire in both directions to determine what is attached to them. If nothing is attached, cut *loose* trip wires.
- Probe the suspected location and uncover the object for identification. Expose enough to see whether it is a mine or debris. Other personnel stay back at least 25 meters.
- If the object is debris, get in a protected position and carefully remove debris with a grappling hook and rope. Be alert for boobytraps or AHDs wired to debris.
- If the object is a mine, withdraw and notify the OIC who decides whether to bypass it, destroy it in place, remove it by grappling hook, or notify EOD personnel for removal by hand.

Mine Removal Techniques

Any of the following methods can be used once a mine is detected:

- Mark clearly and bypass
- Detonate in place
- Remove by rope or wire
- Neutralize and remove by hand

The method used depends on the location of the mine, its identity, fuze type, and tactical situation.

Continued on next page

Hand Neutralization

If foreign mines and boobytraps are detected, EOD personnel will neutralize them by hand when

- A covert breach is being conducted.
- The mine is located on a bridge, building, or other facility required for use by friendly forces.
- Neutralization by other means is not authorized.
- The mine can be positively neutralized by hand and is required for reuse.
- The mine type is unknown and recovery must be attempted for intelligence purposes.
- Chemical mines are located in areas where contamination would restrict use of the area for friendly troops.

Safety

The enforced safety procedures are listed below:

- All sweep team members wear helmets and flak jackets.
- All vehicle floorboards are sandbagged.
- Vehicles are dispersed at 50-meter intervals when enroute to and from a sweep area.
- Only one person at a time is allowed in a suspected mine location.
- Assume mines and explosive devices are equipped with AHDs until proven otherwise.
- Do not run.
- Move only in previously cleared areas.

Continued on next page

Route Clearance, Continued

Spot Report

The sweep team NCOIC submits the *spot report* to higher headquarters when any explosive device or mine is discovered or detonated. A spot report is also made on any enemy activity seen in the sweep area.

NCOIC Actions

The NCOIC submits status of progress and completion reports until the team has completed the road sweep. Progress reports must be timely and accurate to permit effective movement by a reacting force, if needed, and to speed notification of road clearance to the parent unit. The mine and boobytrap incident report is given to the commander to document each incident. It is forwarded through intelligence channels at the end of the sweep operation.

Lesson 4 Exercise

Directions Complete exercise items 1 through 10 by performing the action required. Check your answers against those listed at the end of the lesson.

Item 1 When are limited clearing operations performed?

a. After the breach force has reduced the minefield and secured the area
b. Immediately following the assault force
c. After the lanes have been marked
d. After EOD arrives

Item 2 The four methods of mine detection are visual, probing, electronic, and

a. mechanical.
b. aerial.
c. vehicular.
d. infrared.

Item 3 The definition of upgrading breach lanes is to

a. reduce lanes during clearing operation and to make sure all lanes were kept at minimum of 200 meters apart.
b. limited mine clearance conducted by follow-on engineers to improve existing lanes through minefields and reduce new lanes.
c. improve the marking system to reflect the new lane widths and increase the number of lanes.
d. clear a lane through a minefield less than 150 meters deep requires time and confirmation by the reconnaissance.

Continued on next page

Item 4 A mine clearing operation occurs when

a. engineers receive a mission to clear an area of mines or a specific minefield in a friendly area of operation.
b. mines are activated and can be located and destroyed by using hand-emplaced explosives.
c. minefields were reported but not marked and their physical boundaries were unknown.
d. the mine team fails to locate and destroy the mine areas.

Item 5 What are the two types of sweep operations?

a. Hasty and deliberate
b. Day and night
c. Limited and full
d. Mounted and dismounted

Item 6 How many personnel are normally in a column sweep team configuration?

a. 13
b. 10
c. 8
d. 5

Item 7 After a mine is detected, who decides what will be done with the mine?

a. NCOIC
b. Prober
c. Mine detector operator
d. OIC

Continued on next page

Item 8

In the case of foreign mines and boobytraps, who performs hand neutralization?

a. EOD personnel
b. NCOIC
c. Prober
d. Detector

Item 9

During mine clearing operations, which two pieces of equipment are worn by all sweep team members?

a. Helmets and flak jackets
a. Eye protection and ear plugs
b. Utility uniforms and gloves
c. Ear plugs and mouth pieces

Item 10

A *spot report* is submitted to higher headquarters when an explosive device or mine is found. What other time is it submitted?

a. Enemy activity is anticipated in the sweep area
b. Prior to and after every sweep operation
c. When enemy activity is seen in the sweep area
d. Sweep operations are complete

Continued on next page

Solutions

The following table lists the answers to the exercise items. If you have questions about these items, refer to the reference page.

Item Number	Answer	Reference
1	a	3-130
2	a	3-131
3	b	3-135
4	a	3-136
5	a	3-137
6	c	3-139
7	d	3-141
8	a	3-142
9	a	3-142
10	c	3-143

Lesson Summary

In this lesson, you learned the skills and knowledge necessary to be an effective member of a mine clearing operation.

In the next study unit, you will learn about special mining.

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STUDY UNIT 4

SPECIAL MINING

Overview

Introduction

Expedient mines and boobytraps are constructed in the field with locally available material. They are employed against vehicles or personnel in the same manner as conventional mines.

Scope

The purpose of this study unit is to provide you with the skills and knowledge necessary to employ expedient mines and boobytraps, and to identify foreign mines.

In This Study Unit

This study unit contains the following lessons:

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LESSON 1

EXPEDIENT MINES

Overview

Introduction

Expedient mines can supplement a unit's low supply of conventional mines; hinder reconnaissance, clearance, and neutralization of minefields; and they can create enemy attitudes of uncertainty and suspicion, which lowers morale and slows movement.

Content

In this lesson, you learn about the various types and construction of expedient mines.

Learning Objectives

Upon completion of this lesson, you should be able to

- Match each of the improvised Claymore AP expedient mine characteristics to their components.
- Identify the first item placed in the container of the Grapeshot AP expedient mine.
- Identify the Grapeshot AP expedient mine.
- Identify the FDs used to activate the Grapeshot AP expedient mine.
- Identify the characteristics of the platter charge expedient mine.
- Identify the platter charge expedient mine.
- Select the purpose of the wooden block in the Barbwire AP fragmentation expedient mine.
- Match the Barbwire AP fragmentation expedient mine characteristics to their components.
- Identify the preferred igniter for the improvised flame expedient mine.
- Identify how the high explosive (HE) artillery shell is adapted to expedient mining.
- Identify the three modes of activation for the HE artillery shell AT expedient mine.

Continued on next page

Overview, Continued

In This Lesson This lesson contains the following topics:

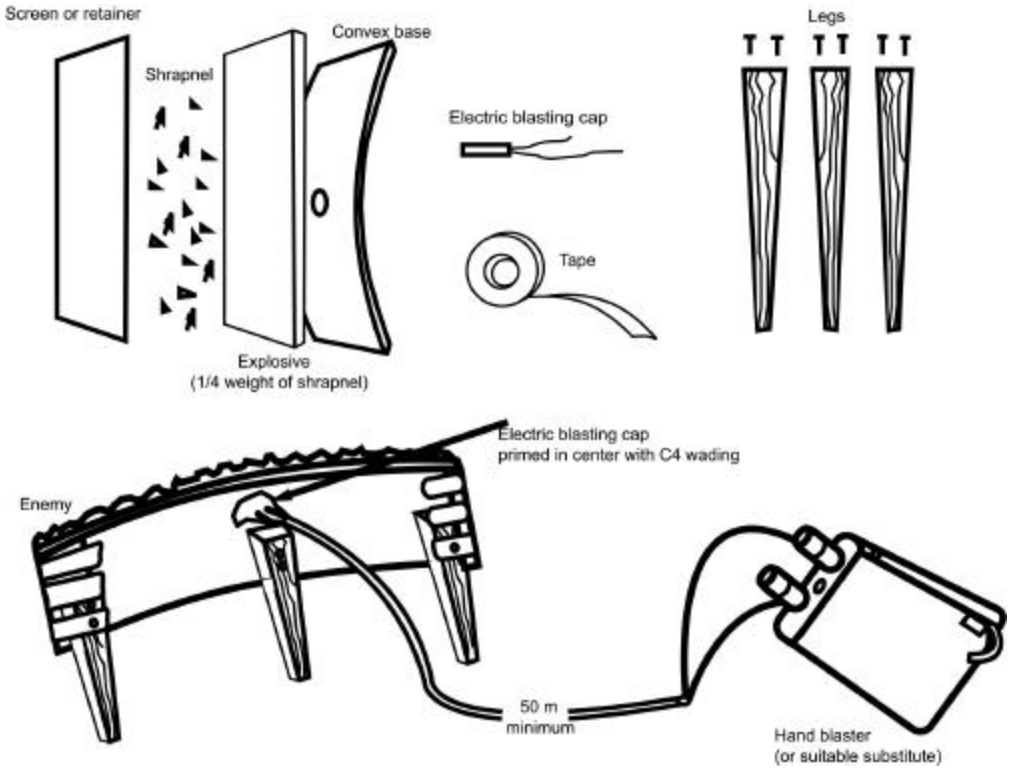
Improvised Claymore AP Expedient Mine

Background

The improvised Claymore AP expedient mine consists of a layer of plastic explosives attached to a convex side of a suitable dense curved base, such as wood or metal. A hole must be made in the exact center rear of the base. A blasting cap is placed in the hole to prime the device. Shrapnel is fixed to the explosive with a suitable retainer, such as cloth, tape, or mesh screen.

Diagram

The necessary components of the improvised Claymore AP expedient mine are identified in the diagram below:



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Improvised Claymore AP Expedient Mine, Continued

Characteristics The characteristics of the improvised Claymore AP expedient mine are listed in the table below:

Component	Characteristic
Shrapnel	Bits of metal, wire, or rocks
FD	Electric detonator
Explosive	C4 plastic explosive
Explosive weight	Equals 1/4 weight of shrapnel
Priming	Electric blasting cap centered rear of charge
Range	Approximately 100 meters

Grapeshot AP Expedient Mine

Background

When using the Grapeshot AP expedient mine, shrapnel is the first item inserted in the bottom of a cylindrical container. The shrapnel is then tamped-down and held in place by a suitable separator (wadding). Next, the explosive is packed to a uniform density behind the wadding. The mine is primed in the center of the explosive with a nonelectric blasting cap.

Activation

The Grapeshot AP expedient mine can be activated in several modes by using one of the following FDs:

- M1A1 Pressure FD
- M1 Pull FD
- M3 Pull Tension Release FD
- M142 Multipurpose FD

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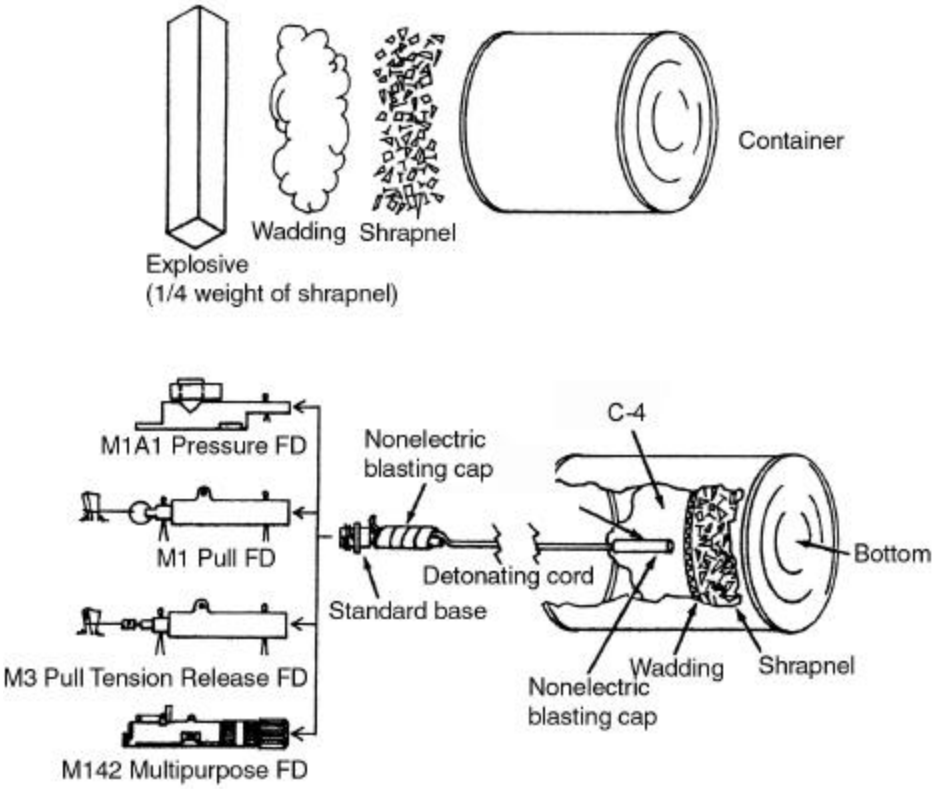
Grapeshot AP Expedient Mine, Continued

Diagram

The components of the Grapeshot AP expedient mine are identified in the diagram below:



Characteristics

The characteristics of the Grapeshot AP expedient mine are listed in the table below:

Component	Characteristic
Shrapnel	Bits of metal, wire, or rocks
Explosive	C4 plastic explosive
Explosive weight	Equals 1/4 weight of shrapnel
Priming	Nonelectric blasting cap
Range	Approximately 30 meters

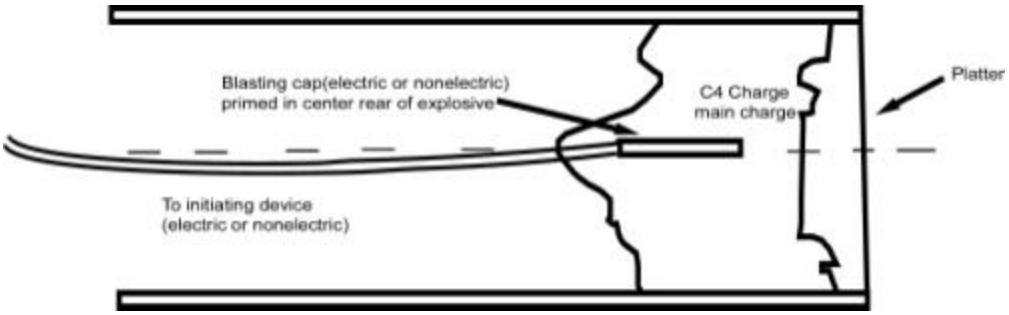
Platter Charge Expedient Mine

Background

The platter charge expedient mine consists of a suitable container filled with explosive that is packed uniformly behind a platter. The platter is made of metal, preferably round but square is satisfactory. A container is not necessary if the explosive can be held firmly against the platter with tape. This charge is primarily effective against "thin-skinned" vehicles such as the HMMWV, 5-ton truck.

Diagram

The components of the platter charge expedient mine are identified in the diagram below:



Characteristics

The characteristics of the platter charge expedient mine are listed in the table below:

Component	Characteristic
Platter weight	2 to 6 pounds
Explosive	C4 Plastic explosive
Explosive weight	Equals weight of platter
Priming	Electric or nonelectric blasting cap
Range charge	Approximately 35 meters

Barbwire AP Fragmentation Expedient Mine

Background

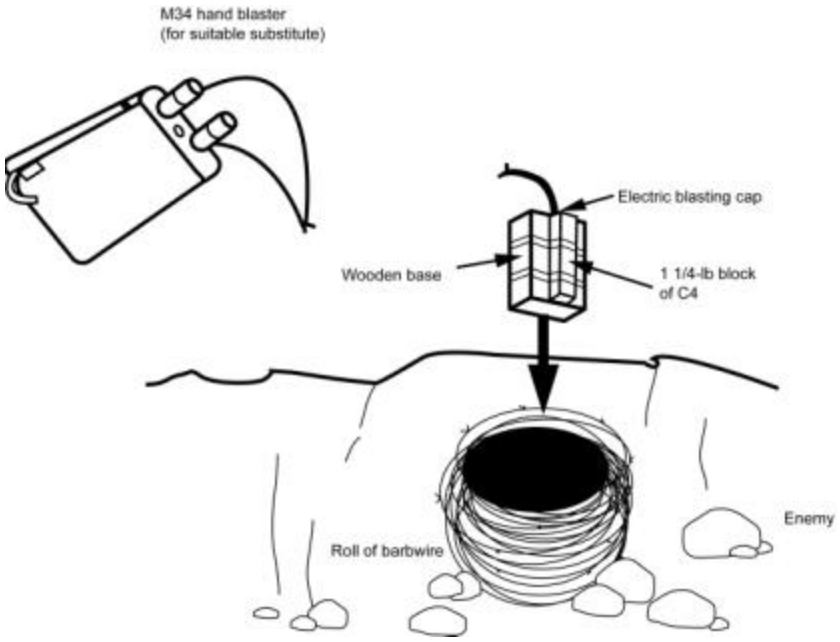
The barbwire AP fragmentation expedient mine consists of one roll of standard barbwire placed into position and one block of C4 explosive placed in the center of the roll and primed.

Blast Effectiveness

By placing the wire against an embankment or fixed object the blast can be made directional, improving the effectiveness of the blast. A wooden block or stake can be used to make the charge directional. This causes the force of the explosive to expel the barbwire fragments in the desired direction. The mine can be suspended over a suspected enemy patrol route or in a clearing in a wooded area.

Diagram

The components of the barbwire AP fragmentation expedient mine are identified in the diagram below:



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Barbwire AP Fragmentation Expedient Mine, Continued

Characteristics The characteristics of the barbwire AP fragmentation expedient mine are listed in the table below:

Component	Characteristic
Shrapnel	Barbwire roll
Electric FD	Hand blaster
Explosive	Block of C4 plastic explosive
Priming	Electric blasting cap inserted in explosive
FD	Hand blaster

Improvised Flame Expedient Mine

Background

Exploding flame devices and flame fougasses employed for target or command detonation are considered as improvised flame mines. Variations and adaptations of the basic flame field expedients are limited only to the imagination and your initiative.

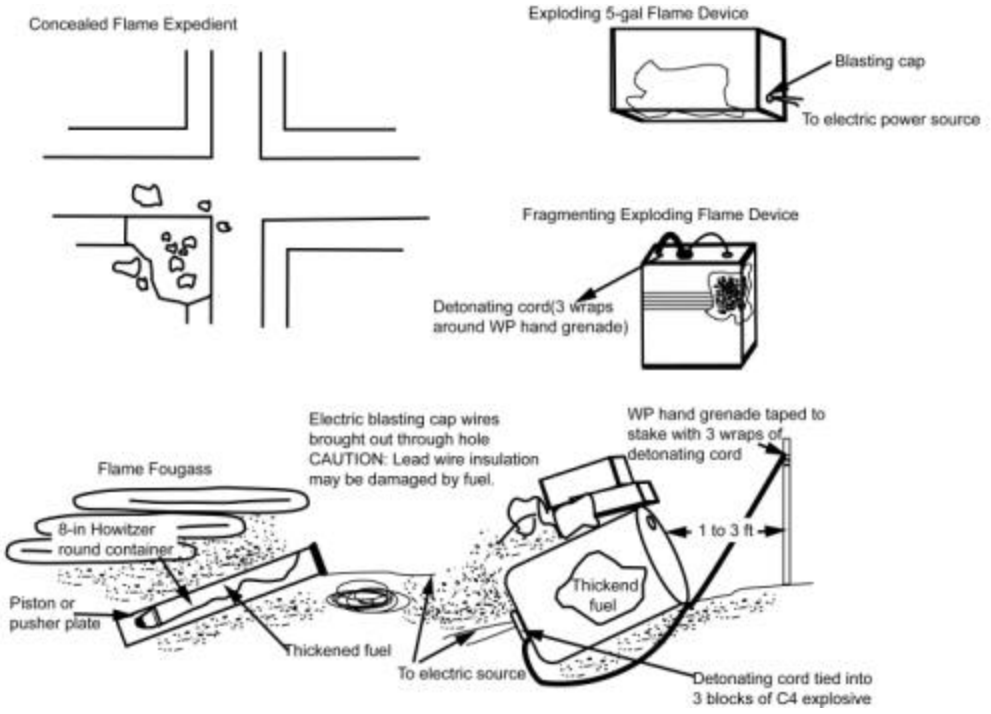
These mines normally consist of a container, an incendiary fuel, usually thickened gasoline, and a firing system to scatter and ignite the fuel. The size of the covered area depends on the container size and firing system.

Igniter

An M4 incendiary burster or another available explosive may detonate the mine. Preferably, the white phosphorous (WP) hand grenade serves as an igniter.

Diagrams

The components and variations of the improvised flame expedient mine are identified in the diagram below:



High Explosive (HE) Artillery Shell AT Expedient Mine

Background

The HE artillery shell is readily adapted to expedient mining by removing the artillery fuze and replacing it with a standard FD, length of detonating cord, priming adapter, and nonelectric blasting cap. A properly assembled destructor may also be used. If a destructor is not available, firmly pack the detonating cord and nonelectric blasting cap into the fuze well with C4 explosive as illustrated with the M1 pull FD and electrical firing system.

Activation

Depending on the firing device, the HE artillery shell AT expedient mine can be activated in one of three modes:

- Pressure
- Pull
- Electrical

Continued on next page

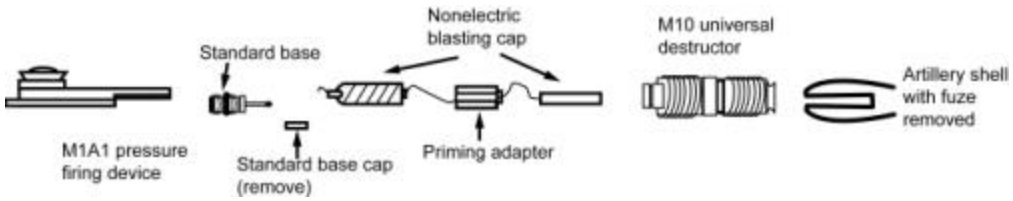
High Explosive (HE) Artillery Shell AT Expedient Mine,
Continued

Diagrams

The components and variations of the three modes of activation for the HE artillery shell AT expedient mine are identified in the diagrams below:

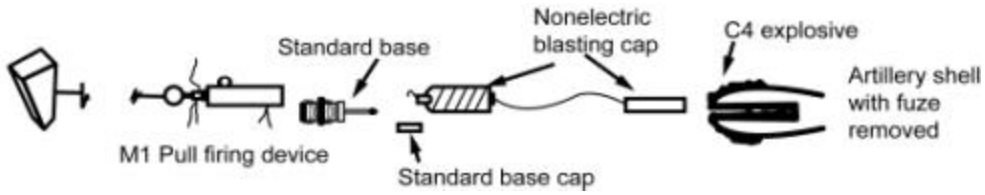
M1A1 Pressure FD Activation

The M1A1 pressure FD activation with a destructor is illustrated below:



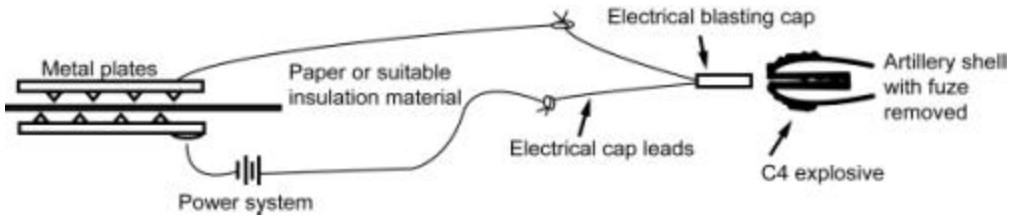
M1 Pull FD Activation

The M1 pull FD activation with a C4 explosive is illustrated below:



Electrical Firing System Activation

The electrical firing system activation is illustrated below:



Lesson 1 Exercise

Directions

Complete exercise items 1 through 21 by performing the action required. Check your answers against those listed at the end of the lesson.

Item 1 Through Item 6

Matching: For items 1 through 6, match the improvised Claymore AP expedient mine component in column 1 with its characteristic in column 2. Place your response in the space provided.

Column 1	**Column 2**
Component	**Characteristic**
___ 1. Explosive	a. Approximately 100 meters
___ 2. Explosive weight	b. Bits of metal, wire, or rocks
___ 3. Priming	c. Electric blasting cap centered rear of charge
___ 4. Range	d. C4 plastic explosive
___ 5. Shrapnel	e. Equals 1/4 weight of shrapnel
___ 6. FD	f. Electric detonator

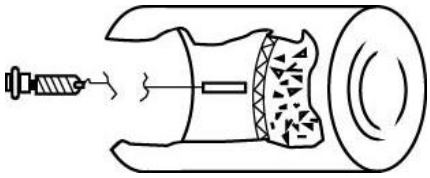
Item 7

What is the first item inserted in the container for the Grapeshot AP expedient mine?

a. FD
b. Explosive
c. Wadding
d. Shrapnel

Continued on next page

Item 8 Identify the mine illustrated below:



a. Grapeshot
b. Flame shot
c. Platter charge
d. Improvised Claymore AP

Item 9 What FDs are used to activate the Grapeshot AP expedient mine?

a. M1 Pull FD, M1A1 Pressure FD, M3 Pull Tension Release FD, M142 Multipurpose FD
b. M1 Pull FD, M1A2 Multipurpose FD, M124 Multipurpose FD, M3 Pull Tension Release FD
c. M1 Pull FD, M111 Pressure FD, M142 Multipurpose FD, M3 Pull Tension Release FD
d. M1 Pull FD, M111 Pressure FD, M142 Multipurpose FD, M3 Pull Tension Release FD

Item 10 What is the platter weight for the platter charge expedient mine?

a. 2 to 6 pounds
b. 2 to 8 pounds
c. 3 to 8 pounds
d. 8 to 10 pounds

Continued on next page

Item 11 The explosive weight of the platter charge expedient mine is equal to

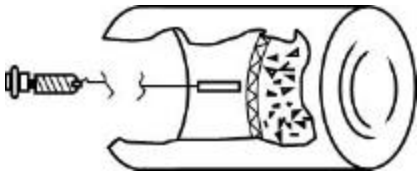
a. the weight of the platter.
b. the weight of the platter charge.
c. half the weight of the platter.
d. half the weight of the platter charge.

Item 12 The range charge of the platter charge expedient mine is approximately

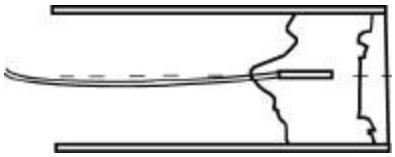
a. 25 meters.
b. 28 meters.
c. 30 meters.
d. 35 meters.

Item 13 Which diagram illustrates the platter charge expedient mine?

___ a.



___ b.



Item 14 When making a barbwire AP fragmentation expedient mine, what is the block of wood used for?

a. To make the charge directional
b. To mount the explosive
c. As additional shrapnel
d. To wrap the wire around

Continued on next page

Item 15 Through Item 18

Matching: For items 15 through 18, match the barbwire AP fragmentation expedient mine component in column 1 to its characteristic in column 2. Place your response in the space provided.

Column 1	**Column 2**
Component	**Characteristic**
___ 15. Explosive	a. Barbwire roll
___ 16. Shrapnel	b. Blasting cap inserted in explosive
___ 17. Priming	c. Block of C4 plastic explosive
___ 18. FD	d. Electric detonator

Item 19

What is the preferred igniter for the improvised flame expedient mine?

a. Electrical spark
b. WP hand grenade
c. Matches
d. Lighter

Item 20

The HE artillery shell is adapted for expedient mining by

a. removing the shell's primer, inserting an electrical blasting cap, length of detonating cord, priming adapter, and nonelectric blasting cap.
b. taping a block of C4 to the side of the shell, inserting a length of detonating cord, destructor, and a firing device.
c. removing the artillery fuze and replacing it with a standard FD, length of detonating cord, priming adapter, and nonelectric blasting cap.
d. wrapping the shell with 10 rounds of detonation cord, removing the shell's primer, and inserting an electrical blasting cap.

Item 21

What are the three activation modes for the HE artillery shell AT expedient mine?

a. Pressure, pull, electrical
b. Pressure, pull tension, electrical
c. Pressure-release, pull tension, electrical tension
d. Pull, pull tension, electrical

Solutions

The table below lists the answers to the exercise items. If you have questions about these items, refer to the reference page.

Item Number	Answer	Reference
1	d	4-6
2	e	4-6
3	c	4-6
4	a	4-6
5	b	4-6
6	f	4-6
7	d	4-7
8	a	4-8
9	a	4-8
10	a	4-9
11	a	4-9
12	d	4-9
13	b	4-9
14	a	4-10
15	c	4-11
16	a	4-11
17	b	4-11
18	d	4-11
19	b	4-12
20	c	4-13
21	a	4-13

Lesson Summary

In this lesson, you learned about the identification, construction, and activation methods for expedient mines.

In the next lesson, you will learn about boobytraps.

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LESSON 2

BOOBYTRAPS

Overview

Introduction

Boobytraps are cunning, explosive devices in nature. They actuate when an unsuspecting person disturbs an apparently harmless object or performs a presumably safe act.

Content

In this lesson, you learn about the types of boobytraps, their purpose, installation, actuation methods, and recording procedures. Additionally, this lesson describes the procedures to construct boobytraps.

Learning Objectives

Upon completion of this lesson, you should be able to

- Identify boobytrap categories.
- Identify the principles of boobytraps.
- Identify the standard components of a boobytrap.
- Identify actuation methods of a boobytrap.
- Identify the steps for installing a boobytrap.
- Identify the boobytrap recording form.

In This Lesson

This lesson contains the following topics:

Purpose, Categories, and Principles

Purpose

The purpose of a boobytrap is to

- Cause random, unexpected casualties and damage
- Create an attitude of uncertainty and suspicion
- Restrict or slow enemy movement

Categories

The category and description of different boobytraps are listed in the table below:

Category	Description
Bait	Consists of objects that arouse someone's interest. Those attractive or interesting items that are left behind or discarded during a rapid evacuation.
Decoy	Consists of two traps—one designed for the enemy to detect and the other is actuated while the enemy deals with the first. The first trap can be a dummy. A classic form of a decoy is to place boobytraps or nuisance mines in locations from which the decoy mine can be removed.
Bluff	Consists of a dummy trap—a hoax.
Double Bluff	Appears to be a bluff. The person thinks the trap is safe or can be disarmed. For example, the enemy can set a number of traps that are disarmed when the detonation cord is removed from the charge. The double bluff is achieved by setting another trap that appears to be the same, but it actually explodes when the detonating cord is removed from the charge.

Principles

The basic principles to get the optimum benefits from boobytraps are listed in the table below:

Principle	Description
Appearances	Concealment is mandatory to success. All litter and other evidence of boobytrapping must be removed.
Firing	An obvious firing assembly that may distract attention from a cunningly hidden boobytrap.
Likely Areas	Defiles or other constricted areas are excellent locations.

Types and Components

Types

The two types of explosive boobytraps are

- Electrical
- Nonelectrical

Both types can be constructed using many different FDs. The FD can be secured to the charge (direct connection) or located some distance from it (remote connection).

Components

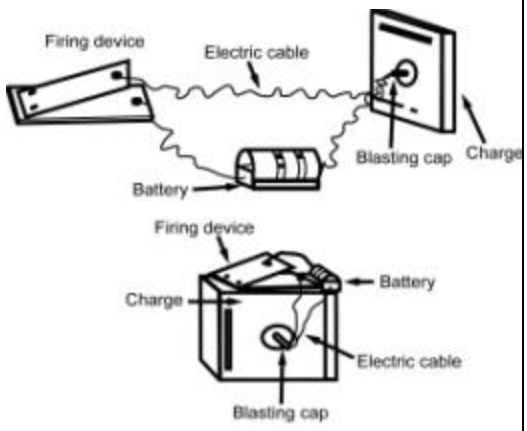
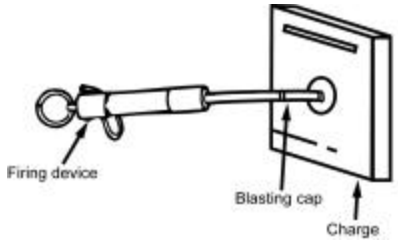
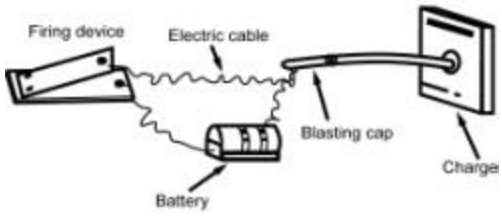
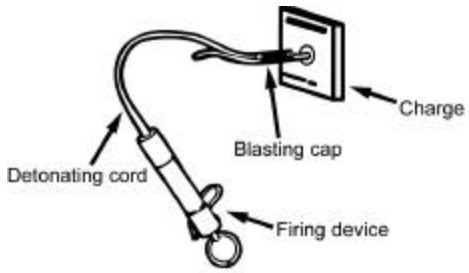
Standard components for a boobytrap are

- Firing device
- Power source
- Connection (usually a detonating cord or an electrical wire)
- Blasting cap
- Main charge

Continued on next page

Diagrams

Examples of direct and remote connections of typical electrical and nonelectrical boobytraps are identified in the diagrams below:

Electrical (Direct Connection)	Nonelectrical (Direct Connection)
	
Electrical (Remote Connection)	**Nonelectrical (Remote Connection)**
	

Methods of Actuation

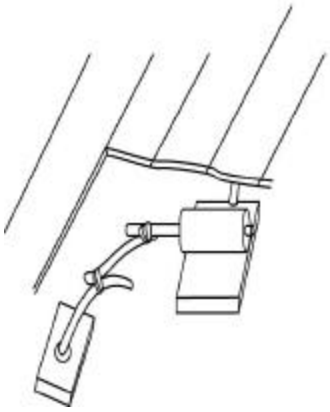
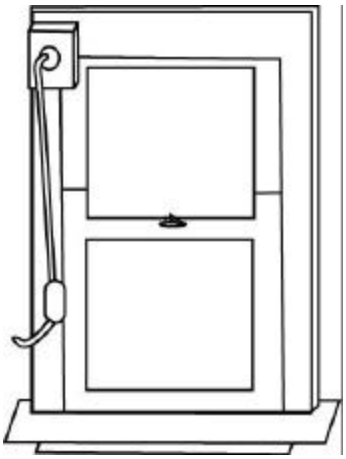
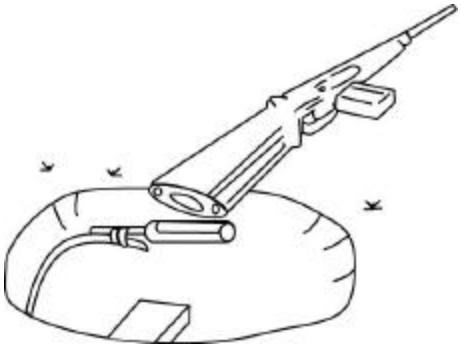
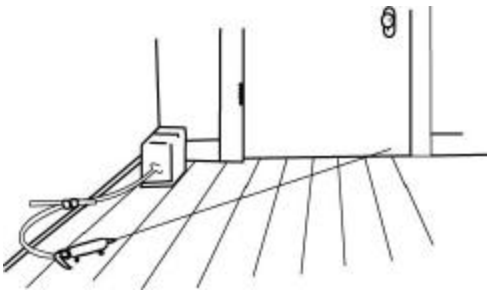
Background

Occasionally, boobytraps are actuated by electric devices that detect interrupted light beams, variation in acoustic levels, or magnetic influence. Most FDs found in combat zone boobytraps are simple mechanisms designed to be armed in one of four modes:

- Pressure
- Pull
- Pressure release
- Tension release

Diagram

The simple methods of actuation are identified in the diagrams below:

Pressure	Pull
	
Pressure Release	**Tension Release**
	

Installing a Boobytrap

Tasks

There are three tasks you must perform to install a boobytrap listed in the table below:

Task	Description
1	Inspect Boobytrap
2	Place a Boobytrap
3	Record Boobytrap

Task 1: Inspect Boobytrap

Inspect all boobytrap materials for defects.

Task 2: Place a Boobytrap

To place a boobytrap, complete the steps listed in the table below:

Step	Action
1	Select the site that will produce the optimum effect when the boobytrap is actuated.
2	Lay the charge.
3	Anchor the boobytrap securely, with nails, wire, rope, or wedges, if necessary.
4	Camouflage or conceal, if necessary.
5	Arm boobytraps systematically, working toward a safe area.
6	Leave the boobytrap area clean. Carry away all items that might betray the location of the boobytrap such as loose dirt, empty boxes, tape, broken vegetation, and footprints.

Task 3: Record Boobytrap

Complete DA Form 1355, Minefield-Record in triplicate and submit it to higher headquarters. If a single form is not large enough to record all traps set in a definable area, clearly note this fact and reference serial numbers of adjacent records.

Minefield Record (DA Form 1355)

Background

To record boobytraps, the DA Form 1355, Minefield-Record is used. The form is prepared and held as a record at the company level. Copies are forwarded to the approving headquarters, normally battalion-level. The number of copies will be dependent upon the unit's SOPs and minefield classification levels.

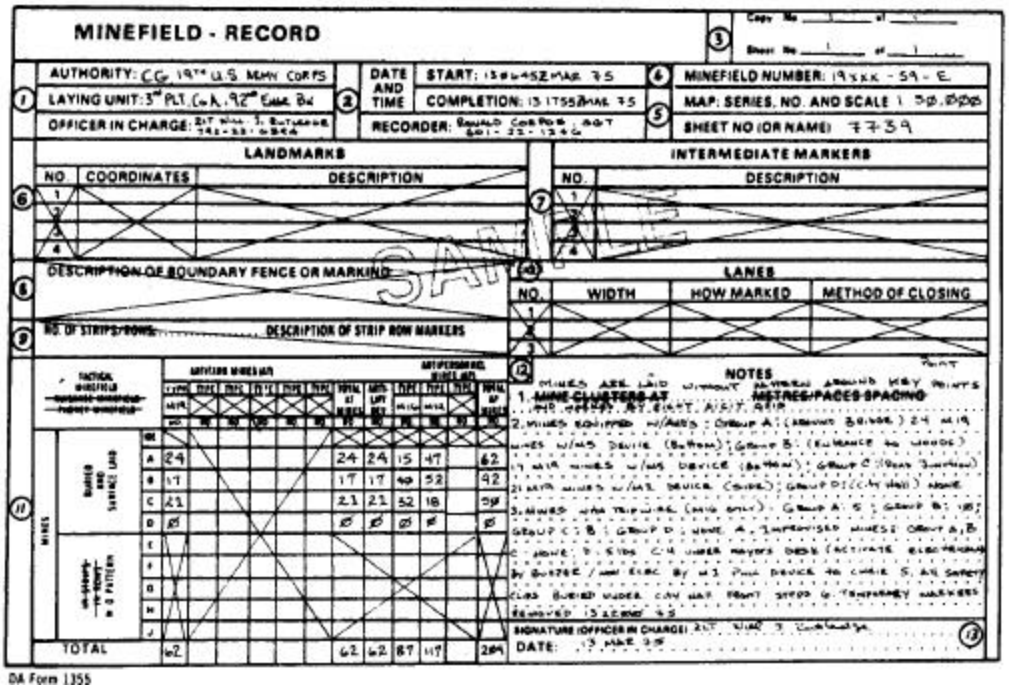
Purpose

Boobytrap records provide

- Detailed information about the composition of an area
- The area to be cleared quickly and with minimum casualty risk
- Complete information on the number and types of traps set, accurate and precise details on the location, and the design of individual traps

Front View of DA Form 1355

The diagram below shows the front view of a DA Form 1355, Minefield Record filled out:

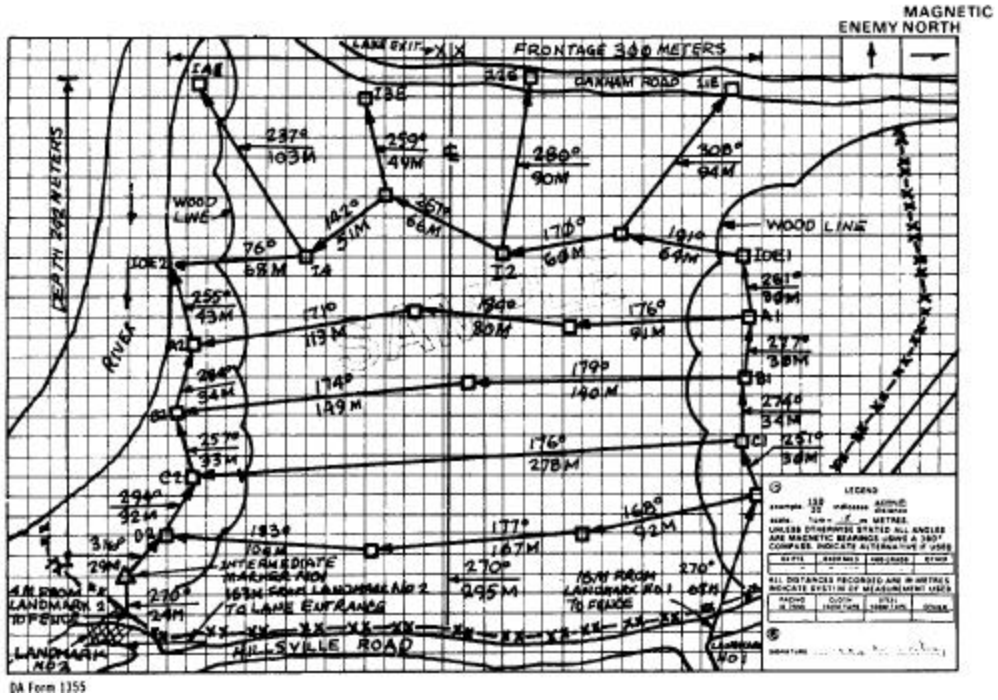


Continued on next page

Minefield Record (DA Form 1355), Continued

Back View of DA Form 1355

The diagram below shows the back view of a DA Form 1355, Minefield Record filled out:



DA Form 1355

Lesson 2 Exercise

Directions Complete exercise items 1 through 10 by performing the action required. Check your answers against those listed at the end of the lesson.

Item 1 The description *consists of objects that arouse someone's interest* falls under which boobytrap category?

a. Decoy
b. Bait
c. Bluff
d. Double bluff

Item 2 Which description clearly defines a bluff?

a. Consists of objects that arouse someone's interest
b. Setting another trap that appears to be the same, but it actually explodes when the detonating cord is removed from the charge
c. Consists of two traps—one designed for the enemy to detect and the other is actuated while the enemy deals with the first
d. Consists of a dummy trap—a hoax

Item 3 Which principle best describes *concealment is mandatory to success?*

a. Firing
b. Likely areas
c. Appearances
d. Bait

Continued on next page

Item 4

Defiles or other constricted areas are excellent locations best describes which principle in boobytraps?

a. Likely areas
b. Appearances
c. Bait
d. Decoy

Item 5

The two types of explosive boobytraps are

a. remote connection and direct connection.
b. electrical and nonelectrical.
c. natural and manmade.
d. decoy and bait.

Item 6

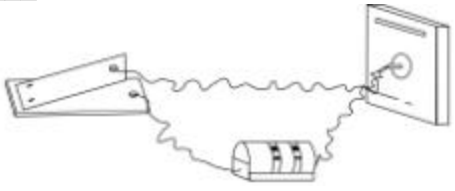
The standard components of a boobytrap are the firing device, power source, connection, blasting cap, and

a. main charge.
b. nails.
c. wire.
d. rope.

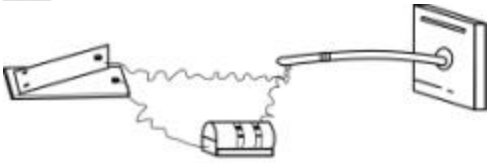
Item 7

Which diagram illustrates an electrical remote connection?

___ a.



___ b.



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Item 8 Which of the following are simple methods of actuation?

a. Pull, pressure, remote, and pressure release
b. Pressure, pull, pressure release, and tension
c. Pressure, pull, pressure release, and tension release
d. Tension release, pull, pressure, and remote release

Item 9 When installing a boobytrap, the last step is

a. camouflage or conceal, if necessary.
b. leave the boobytrap area clean.
c. anchor the boobytrap securely with nails, wire, rope, or wedges, if necessary.
d. lay the charge.

Item 10 What form is used to record boobytraps?

a. DA 1533, Minefield Record
b. BT 1355, Minefield Record
c. DA 1355, Minefield Record
d. DA 1355-R-1, Hasty Protective Minefield Record

Continued on next page

Solutions

The table below lists the answers to the exercise items. If you have questions about these items, refer to the reference page.

Item Number	Answer	Reference
1	b	4-22
2	d	4-22
3	c	4-22
4	a	4-22
5	b	4-23
6	a	4-23
7	b	4-24
8	c	4-25
9	b	4-26
10	c	4-27

Lesson Summary

In this lesson, you learned about the categories, principles, components, activation methods, installation procedures, and recording for boobytraps.

In the next lesson, you will learn about foreign mines.

LESSON 3

FOREIGN MINES

Overview

Introduction

The technical information presented in this lesson is primarily for use in identification of foreign mines and is not intended to provide detailed guidance for disarming the mines.

Mines and fuzes can be set in many different configurations and disarming modes. A configuration and disarming mode that works for one mine may not necessarily work for the same mine when armed with a different fuze or AHD.

Content

In this lesson, you learn about the characteristics necessary to identify foreign mines.

Learning Objectives

Upon completion of this lesson, you should be able to

- Identify the Soviet mine(s) that have a blast kill type effect.
- Identify the kill radius of the Soviet POMZ-2.
- Identify the Soviet AP mine that is pressure-initiated.
- Identify the Soviet MON-100 Soviet mine.
- Identify the Soviet mine(s) that have a bounding fragmentation kill type effect.
- Identify the Soviet PFM-1 scatterable mine.
- Identify the Soviet AT mine that self-destructs from zero to 24 hours.
- Identify the type kill effect of the Italian SB-33 mine.
- Identify the Italian SB-33 scatterable AP mine.
- Identify the type kill effect for the SB-MV and VS-HCT Italian AT mines.
- Identify the Italian VS-HCT AT mine.
- Identify the Italian SB-81 scatterable AT mine.
- Identify the United Kingdom barmine AT mine.

Continued on next page

Overview, Continued

In This Lesson This lesson contains the following topics:

PMN AP Mines (Soviet)

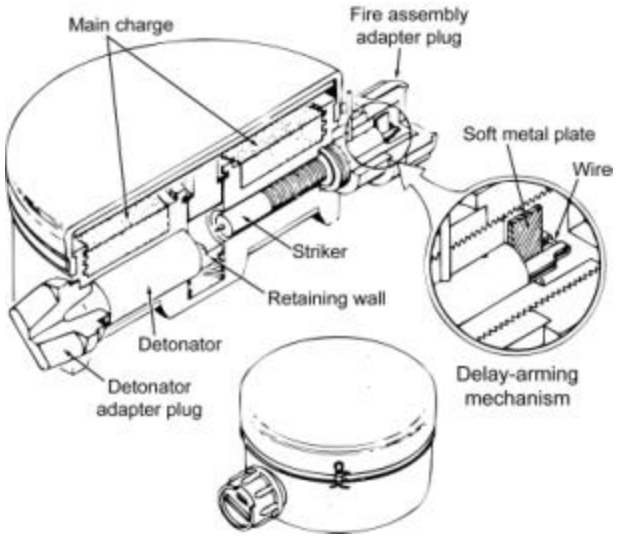
Intelligence Information

The characteristics of the PMN AP mine (Soviet) are listed in the table below:

Characteristics	Height	2.2 inches
	Diameter	4.4 inches
	Mine Weight	1 pound 3.4 ounces
	Explosive Weight	7.1 ounces
	Color	Sand or black rubber cover, bakelite body
Description	Fuze Type	• Delay-armed • Pressure-initiated
	Sensitivity	11.0 to 17.6 pounds of pressure
	Detectability	With hand held metallic detector; fair amount of metal in fuze assembly and cover retainer
Capability	Type Kill Effect	Blast
	AHD	None
Breaching Guidance	Mine Plow	Removes mines from plowed area; some will detonate
	Linear Charge	Blast overpressure readily defeats this simple pressure fuze
	Charge Placement	Adjacent to the mine

Diagram

The components of the PMN AP mine (Soviet) are identified in the diagram below:



PMN-2 AP Mines (Soviet)

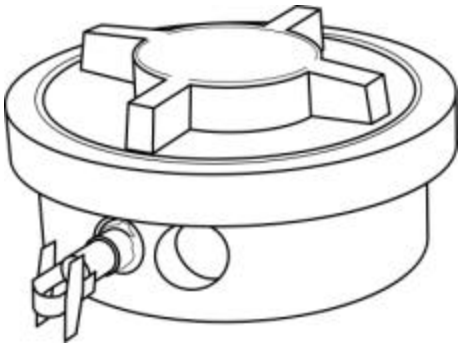
Intelligence Information

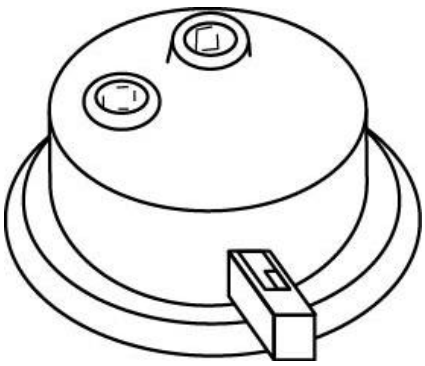
The characteristics of the PMN-2 AP mine (Soviet) are listed in the table below:

Characteristics	Height	2.1 inches
	Diameter	4.9 inches
	Mine Weight	15.9 ounces
	Explosive Weight	4.1 ounces
	Color	Black rubber cover, green body
Description	Fuze Type	• Delay-armed • Blast resistant • Pressure-initiated
	Sensitivity	11.0 pounds of pressure
	Detectability	With hand held metallic detector; fair amount of metal in fuze assembly
Capability	Type Kill Effect	Blast
	AHD	None
Breaching Guidance	Mine Plow	Removes mines from plowed area; some will detonate
	Linear Charge	Drastically reduces the effectiveness against PMN-2 for blast-resistant
	Charge Placement	Adjacent to the mine

Diagram

The PMN-2 AP mine (Soviet) is identified in the diagrams below:





PMD-6, PMD-6M AP Mines (Soviet)

Intelligence Information

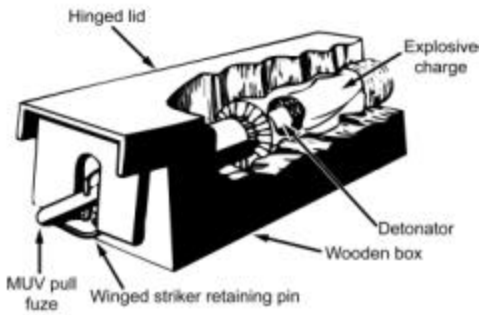
The characteristics of the PMD-6, PMD-6M AP mine (Soviet) are listed in the table below:

Characteristics	Length	7.7 inches
	Width	3.4 inches
	Height	2.0 inches
	Mine Weight	14.1 ounces
	Explosive Weight	7.1 ounces
	Color	Natural wood
Description	Fuze Type	Pressure-initiated
	Sensitivity	2.2 to 22.0 pounds; depends upon condition of release pin in MUV fuze
	Detectability	With hand held detector; fair amount of metal in MUV-type fuze and detonator assembly
Capability	Type Kill Effect	Blast
	AHD	None
Breaching Guidance	Mine Plow	Removes mines from plowed area; some will detonate
	Linear Charge	Blast overpressure readily defeats a SHU-type mine, which is a wooden rectangular box-type AP pressure-blast mine similar in appearance and size of a shoe box.
	Charge Placement	Adjacent to the mine

Note: Delay-armed if MUV-2, MUV-3, or MUV-4 fuzes are used. Probing for small SHU-type mines with low-pressure thresholds is a very hazardous operation.

Diagram

The components of the PMD-6, PMD-6M AP mine (Soviet) are identified in the diagram below:



POMZ-2, POMZ-2M AP Mines (Soviet)

Intelligence Information

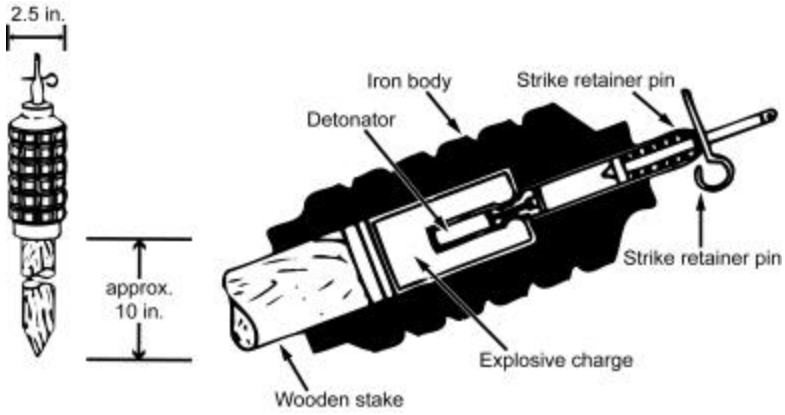
The characteristics of the POMZ-2, POMZ-2M AP mine (Soviet) are listed in the table below:

Characteristics	Height	4.2 inches without fuze
	Diameter	2.4 inches
	Mine Weight	• 3.9 pounds POMZ-2M • 5.1 pounds POMZ-2
	Explosive Weight	2.6 ounces
	Color	Olive drab
Description	Fuze Type	Trip-wire-initiated
	Sensitivity	4.4 to 11.0 pounds; depends upon condition of release pin in MUV fuze
	Detectability	Visual, stake mounted
Capability	Type Kill Effect	Fragmentation
	Kill Radius	4 meters
	AHD	None
Breaching Guidance	Mine Plow	Removes mines from plowed area; some will detonate
	Linear Charge	Heavy line charges readily defeat trip-wire-initiated mines
	Charge Placement	Adjacent to the mine

Note: Weathered or rotten mounting stakes (wood) present a hazard to clearance teams (falling POMZ type bodies are heavy enough to initiate a MUV fuze).

Diagram

The components of the POMZ-2, POMZ-2M AP mine (Soviet) are identified in the diagram below:



MON-50 AP Mines (Soviet)

Intelligence Information

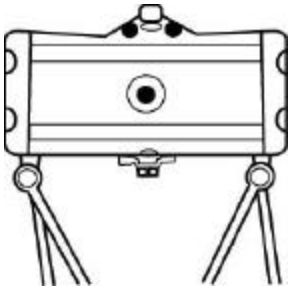
The characteristics of the MON-50 AP mine (Soviet) are listed in the table below:

Characteristics	Width	8.7 inches
	Depth	1.8 inches
	Height	4.1 inches without legs
	Mine Weight	4.3 pounds
	Explosive Weight	1.6 pounds
	Color	Green
Description	Fuze Type	• Trip-wire • Command-initiated
	Sensitivity	4.4 to 11.0 pounds of pressure; depends upon condition of release pin in MUV
	Detectability	Visual; stands on own steel legs
Capability	Type Kill Effect	Directed fragmentation
	Kill Radius	50 meters, a 60-degree area of coverage (fragmentation: 455 steel cylinders)
	AHD	None
Breaching Guidance	Mine Plow	Removes mines from plowed area; some will detonate
	Linear Charge	Heavy line charges readily defeats this type fuze
	Charge Placement	Adjacent to the mine

Note: Two fuze wells provide opportunity for multiple trip lines or the use of detonating cord for series connection to adjacent mines. A threaded steel well located at the base of the mine is used in conjunction with a heavy mounting spike for attachment to trees and buildings.

Diagram

The MON-50 AP mine (Soviet) is identified in the diagram below:



MON-100 AP Mines (Soviet)

Intelligence Information

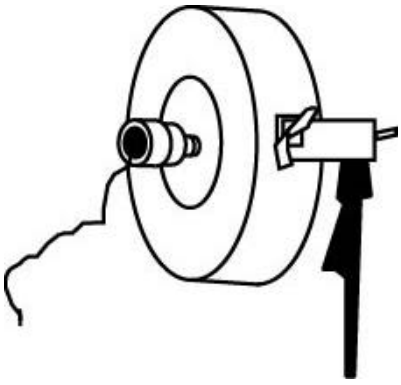
The characteristics of the MON-100 AP mine (Soviet) are listed in the table below:

Characteristics	Diameter	9.4 inches
	Depth	3.1 inches
	Mine Weight	11.9 pounds without bracket
	Explosive Weight	4.4 pounds
	Color	Olive drab
Description	Fuze type	Trip-wire and command-initiated
	Sensitivity	4.4 to 11.0 pounds; depends upon condition of release pin in MUV use
	Detectability	Visual; stands on a heavy steel spike
Capability	Type Kill Effect	Directed fragmentation
	Kill Radius	100 meters, a 15-degree area of coverage (fragmentation: 405 steel cylinders 10mm x 10mm)
	AHD	None
Breaching Guidance	Mine Plow	Removes mines from plowed area; some will detonate
	Linear Charge	Heavy line charges readily defeat trip-wire and command-initiated mines
	Charge Placement	Adjacent to the mine

Note: A heavy steel mounting spike is used for attachment to trees and buildings.

Diagram

The MON-100 AP mine (Soviet) is identified in the diagram below:



MON-200 AP Mines (Soviet)

Intelligence Information

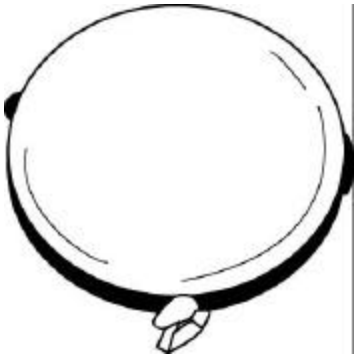
The characteristics of the MON-200 AP mine (Soviet) are listed in the table below:

Characteristics	Diameter	17.7 inches
	Depth	5.1 inches
	Mine Weight	55.1 pounds without bracket
	Explosive Weight	26.5 pounds
	Color	Olive drab
Description	Fuze Type	Trip-wire and command-initiated
	Sensitivity	4.4 to 11.0 pounds; depends upon condition of release pin in MUV fuze
	Detectability	Visual; stands on a heavy steel spike
Capability	Type Kill Effect	Directed fragmentation
	Kill Radius	200 meters, a 15-degree area of coverage (fragmentation: 910 steel cylinders 12mm x 12mm)
	AHD	None
Breaching Guidance	Mine Plow	Removes mines from plowed area; some will detonate
	Linear Charge	Heavy line charges readily defeat trip-wire and command-initiated mines
	Charge Placement	Adjacent to the mine

Note: A heavy steel mounting spike is available.

Diagram

The MON-200 AP mine (Soviet) is identified in the diagram below:



OZM-72 AP Mines (Soviet)

Intelligence Information

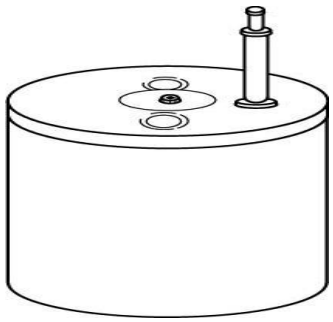
The characteristics of the OZM-72 AP mine (Soviet) are listed in the table below:

Characteristics	Height	5.9 inches without fuze
	Diameter	4.2 inches
	Mine Weight	11.0 pounds
	Explosive Weight	1.5 pounds
	Color	Olive drab
Description	Fuze Type	Trip-wire and command-initiated
	Sensitivity	4.4 to 11.0 pounds; depends upon condition of release pin in MUV use
	Detectability	Visual by identification of trip and command wire; significant metallic mass helps when using hand held detectors
Capability	Type Kill Effect	Bounding fragmentation
	Kill Radius	30 meters, a 360-degree area of coverage (fragmentation: 2,300 steel cylinders 5mm x 5mm)
	AHD	None
Breaching Guidance	Mine Plow	Removes mines from plowed area; some will detonate
	Linear Charge	Heavy line charges readily defeat trip-wire and command-initiated mines
	Charge Placement	Adjacent to the mine

Note: Delay-armed if MUV-2, MUV-3, or MUV-4 fuzes are used.

Diagram

The OZM-72 AP mine (Soviet) is identified in the diagram below:



OZM-4 AP Mines (Soviet)

Intelligence Information

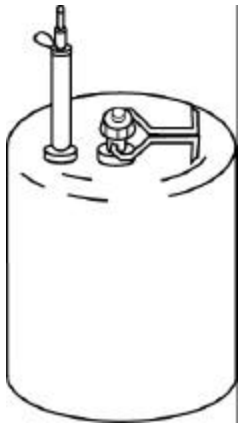
The characteristics of the OZM-4 AP mine (Soviet) are listed in the table below:

Characteristics	Height	5.5 inches without fuze
	Diameter	3.6 inches
	Mine Weight	11.0 pounds
	Explosive Weight	6.5 ounces
	Color	Olive drab
Description	Fuze Type	Trip-wire and command-initiated
	Sensitivity	4.4 to 11.0 pounds; depends upon condition of release pin in MUV fuze
	Detectability	Visual by identification of trip and command wire; significant metallic mass helps when using hand held detectors
Capability	Type Kill Effect	Bounding fragmentation
	Kill Radius	15 meters, a 360-degree area of coverage
	AHD	None
Breaching Guidance	Mine Plow	Removes mines from plowed area; some will detonate
	Linear Charge	Heavy line charges readily defeat trip-wire and command-initiated mines
	Charge Placement	Adjacent to the mine

Note: Delay-armed if MUV-2, MUV-3, or MUV-4 fuzes are used.

Diagram

The OZM-4 AP mine (Soviet) is identified in the diagram below:



OZM-3 AP Mines (Soviet)

Intelligence Information

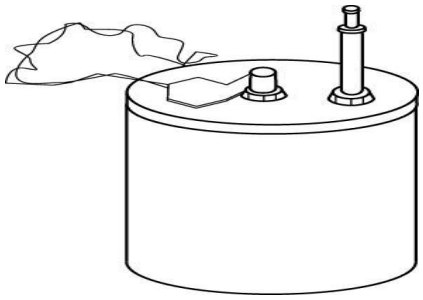
The characteristics of the OZM-3 AP mine (Soviet) are listed in the table below:

Characteristics	Height	4.7 inches without fuze
	Diameter	3.0 inches
	Mine Weight	6.6 pounds
	Explosive Weight	2.6 ounces
	Color	Olive drab
Description	Fuze Type	Trip-wire and command-initiated
	Sensitivity	4.4 to 11.0 pounds; depends upon condition of release pin in MUV fuze
	Detectability	Visual by identification of trip and command wire; significant metallic mass helps when using hand held detectors
Capability	Type Kill Effect	Bounding fragmentation
	Kill Radius	100 meters, a 15-degree area of coverage (fragmentation: 405 steel cylinders)
	AHD	None
Breaching Guidance	Mine Plow	Removes mines from plowed area; some will detonate
	Linear Charge	Heavy line charges readily defeat trip-wire and command-initiated mines
	Charge Placement	Adjacent to the mine

Note: Delay-armed if MUV-2 fuze is used.

Diagram

The OZM-3 AP mine (Soviet) is identified in the diagram below:



PFM-1 Scatterable AP Mines (Soviet)

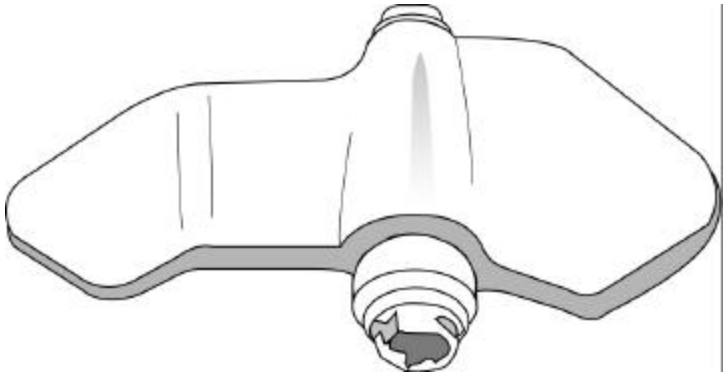
Intelligence Information

The characteristics of the PFM-1 scatterable AP mine (Soviet) are listed in the table below:

Characteristics	Height	.75 inches
	Length	4.75 inches
	Width	2.4 inches
	Mine Weight	2.37 ounces
	Explosive Weight	1.28 ounces
	Color	Green, sand, or white
Description	Fuze Type	Pressure-initiated (delay arming)
	Sensitivity	11.0 pounds
	Detectability	Scattered: visual identification
Capability	Type Kill Effect	Blast
	AHD	None
Breaching Guidance	Mine Plow	Removes mines from plowed area; some will detonate
	Linear Charge	Blast overpressure will defeat this fuze
	Charge Placement	Adjacent to the mine

Diagram

The PFM-1 scatterable AP mine (Soviet) is identified in the diagram below:



TM-46, TMN-46, M/71 AT Mines (Soviet, Egyptian)

Intelligence Information

The characteristics of the TM-46, TMN-46, M/71 AT mine (Soviet, Egyptian) are listed in the table below:

Characteristics	Height	4.3 inches
	Diameter	12.0 inches
	Mine Weight	19 pounds
	Explosive Weight	12.6 pounds
	Color	Sand brown, olive drab
Description	Fuze Type	• Pressure-initiated (no delay arming) • Truncated tilt rod, contact-initiated
	Sensitivity	396.8 pounds
	Detectability	Visual for truncated tilt rods; remaining by hand held detectors (significant metallic content in mine body)
Capability	Type Kill Effect	Blast
	AHD	Secondary fuze well (TMN-46 only) on side of mine body
Breaching Guidance	Mine Plow	• Removes armed mines from plowed area • Detonates boobytrapped mines
	Linear Charge	Detonates mines with simple pressure fuzes
	Charge Placement	Adjacent to the mine

Note: All three mines are virtually identical in design, easily detectable, and only one, the TMN-46 has a secondary fuze well for boobytrap purposes.

Diagram

The TM-46, TMN-46, M/71 AT mine (Soviet, Egyptian) is identified in the diagram below:

TM-57 AT Mines (Soviet)

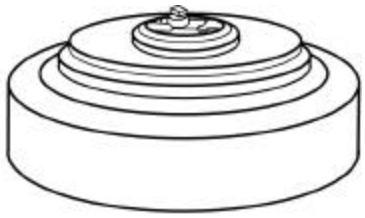
Intelligence Information

The characteristics of the TM-57 AT mine (Soviet) are listed in the table below:

Characteristics	Height	4.0 inches
	Diameter	12.4 inches
	Mine Weight	18.7 pounds
	Explosive Weight	14.0 pounds
	Color	Olive drab
Description	Fuze Type	• Delay-armed, blast-resistant, pressure-initiated • Truncated tilt rod, contact-initiated
	Sensitivity	440.9 pounds
	Detectability	Visually (truncated tilt rods) and hand held detectors (significant metallic content in mine body)
Capability	Type Kill Effect	Blast
	AHD	Secondary fuze well on side of mine available for boobytrap purposes
Breaching Guidance	Mine Plow	Removes mines from plowed area; some will detonate
	Linear Charge	Drastic reduction in effectiveness (blast-resistant)
	Charge Placement	Adjacent to the mine

Diagram

The TM-57 AT mine (Soviet) is identified in the diagram below:



TM-62M AT Mines (Soviet)

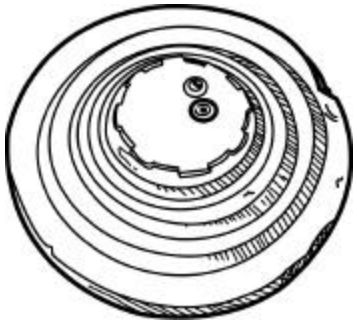
Intelligence Information

The characteristics of the TM-62M AT mine (Soviet) are listed in the table below:

Characteristics	Height	4.0 inches
	Diameter	12.6 inches
	Mine Weight	18.7 pounds
	Explosive Weight	15.9 pounds
	Color	Olive drab
Description	Fuze Type	• Delay-armed, blast-resistant, pressure-initiated • Delayed-armed magnetic influence • Seismic-influence fuze type
	Sensitivity	440.9 pounds
	Detectability	With hand held detectors (significant amount of metal in mine body)
Capability	Type Kill Effect	Blast
	AHD	No secondary fuze wells. The magnetic and seismic fuze has inherent anti-disturbance features. Additionally, antilift devices are associated with the TM-62 series mines.
Breaching Guidance	Mine Plow	Removes mines from plowed area; some will detonate
	Linear Charge	Drastic reduction in effectiveness (blast-resistant)
	Charge Placement	Adjacent to the mine

Diagram

The TM-62M AT mine (Soviet) is identified in the diagram below:



PGMDM Scatterable AT Mines (Soviet)

Intelligence Information

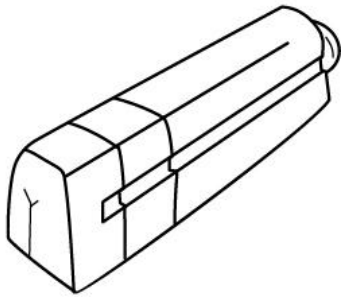
The characteristics of the PGMDM scatterable AT mine (Soviet) are listed in the table below:

Characteristics	Length	11.8 inches
	Height	2.5 inches
	Mine Weight	3.7 pounds
	Explosive Weight	3.3 pounds
	Color	Green, khaki, white
Description	Fuze Type	Delay-armed, pressure-activated
	Sensitivity	Single pressure or accumulation of slight pressure; weight unknown
	Detectability	Scattered: visual identification
Capability	Type Kill Effect	Blast
	AHD	None; self-destruct 0 to 24 hours
Breaching Guidance	Mine Plow	Removes mines from plowed area; some will detonate
	Linear Charge	Blast overpressure will defeat this fuze
	Charge Placement	Adjacent to the mine

WARNING: This mine is extremely sensitive and cannot be disarmed. **Do not** touch the mine. If absolutely necessary, approach the mine only after the self-destruction period has elapsed.

Diagram

The PGMDM scatterable AT mine (Soviet) is identified below:



P-40 AP Mines (Italian)

Intelligence Information

The characteristics of the P-40 AP mine (Italian) are listed in the table below:

Characteristics	Height	7.9 inches with fuze
	Diameter	3.5 inches
	Mine Weight	3.3 pounds
	Explosive Weight	1.1 pounds
	Color	Green, sand brown
Description	Fuze Type	Trip-wire-initiated
	Sensitivity	11.0 pounds tension
	Detectability	Visual by identification of trip wire (significant metallic mass helps when using hand held detectors)
Capability	Type Kill Effect	Bounding fragmentation
	Kill Radius	22 meters
	AHD	None
Breaching Guidance	Mine Plow	Removes mines from plowed area; some will detonate
	Linear Charge	Heavy line charges readily defeat trip-wire and command-initiated mines
	Charge Placement	Adjacent to the mine

Diagram

The P-40 AP mine (Italian) is identified in the diagram below:

Valmara 69 AP Mines (Italian)

Intelligence Information

The characteristics of the Valmara 69 AP mine (Italian) are listed in the table below:

Characteristics	Height	8.1 inches with fuze
	Diameter	5.1 inches
	Mine Weight	7.3 pounds
	Explosive Weight	1.3 pounds
	Color	Green, sand brown
Description	Fuze Type	Trip-wire and pressure-initiated
	Sensitivity	• Pressure: 22.0 pounds • Tension: 13.2 pounds
	Detectability	Visual by identification of trip wire (significant metallic mass helps when using hand held detectors)
Capability	Type Kill Effect	Bounding fragmentation
	Kill Radius	27 meters, a 360-degree area of coverage (fragmentation: 1,200 steel cubes 5x5x5mm)
	AHD	None
Breaching Guidance	Mine Plow	Removes mines from plowed area; some will detonate
	Linear Charge	Heavy line charges readily defeat trip-wire and command-initiated mines
	Charge Placement	Adjacent to the mine

Diagram

The Valmara 69 AP mine (Italian) is identified in the diagram below:

SB-33, SB-33/AR, EM20 Scatterable AP Mines (Italian, Greek)

Intelligence Information

The characteristics of the SB-33, SB-33/AR, EM20 scatterable AP mine (Italian, Greek) are listed in the table below:

Characteristics	Height	1.3 inches with fuze
	Diameter	3.5 inches
	Mine Weight	4.9 ounces
	Explosive Weight	1.2 ounces
	Color	Sand brown, olive drab
Description	Fuze Type	Blast-resistant, pressure-initiated
	Sensitivity	11.0 to 44.1 pounds of pressure
	Detectability	• Scattered: Visual identification • Buried: Difficult with hand held metallic detector (approximately 86 gram metal, all nonmagnetic)
Capability	Type Kill Effect	Blast
	AHD	The SB-33/AR includes an electronic package with antiremoval features
Breaching Guidance	Mine Plow	Removes mines from plowed area; some will detonate
	Linear Charge	Drastic reduction in effect against SB-33 (blast resistant)
	Charge Placement	Adjacent to the mine

Diagram

The SB-33, SB-33/AR, EM20 scatterable AP mine (Italian, Greek) is identified in the diagram below:

VS-50, TS-50, T/79 Scatterable AP Mines (Italian)

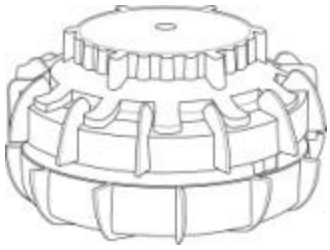
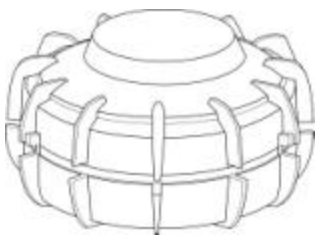
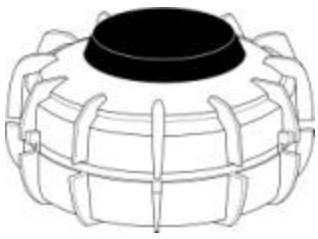
Intelligence Information

The characteristics of the VS-50, TS-50, T/79 scatterable AP mines (Italian) are listed in the table below:

Characteristics	Height	1.8 inches
	Diameter	3.5 inches
	Mine Weight	6.6 ounces
	Explosive Weight	1.8 ounces
	Color	Sand brown, olive drab
Description	Fuze Type	Blast-resistant, pressure-initiated
	Sensitivity	22.0 to 26.4 pounds of pressure
	Detectability	• Scattered: Visual identification • Buried: Difficult with hand held metallic detector (approximately .86 gram metal, all nonmagnetic)
Capability	Type Kill Effect	Blast
	AHD	VS-50-A version includes an electronic package with anti-removal features
Breaching Guidance	Mine Plow	Removes mines from plowed area; some will detonate
	Linear Charge	Drastically reduces the effectiveness for blast-resistant trip-wire and command-initiated mines
	Charge Placement	Adjacent to the mine

Diagram

The VS-50, TS-50, T/79 scatterable AP mines (Italian) are identified in the diagrams below:

VS-50	TS-50	T/79
		

VS-MK2, VS-MK2-E Scatterable AP Mines (Italian)

Intelligence Information

The characteristics of the VS-MK2, VS-MK2-E scatterable AP mines (Italian) are listed in the table below:

Characteristics	Height	1.3 inches
	Diameter	3.5 inches
	Mine Weight	4.8 ounces
	Explosive Weight	• VS-MK2: 1.2 ounces • VS-MK2-E: 0.8 ounces
	Color	Sand brown, olive drab
Description	Fuze Type	Blast-resistant, pressure-initiated
	Sensitivity	22.0 pounds of pressure
	Detectability	• Scattered: Visual identification • Buried: Difficult with hand held metallic detector (approximately .86 gram metal, all nonmagnetic)
Capability	Type Kill Effect	Blast
	AHD	VS-MK2-E version includes an electronic package with anti-removal features
Breaching Guidance	Mine Plow	Removes mines from plowed area; some will detonate
	Linear Charge	Drastically reduces the effectiveness for blast-resistant
	Charge Placement	Adjacent to the mine

Diagram

The VS-MK2, VS-MK2-E scatterable AP mines (Italian) are identified in the diagram below:

SB-MV AT Mines (Italian)

Intelligence Information

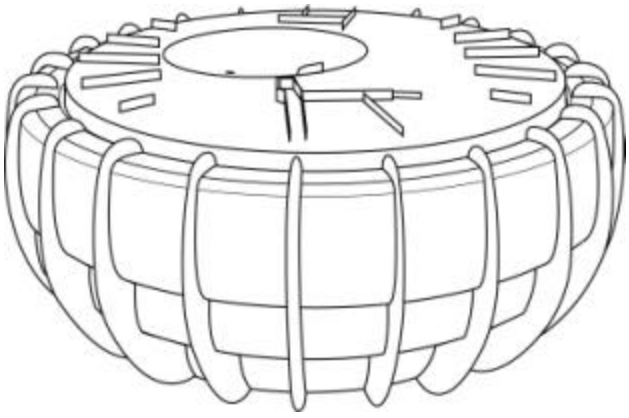
The characteristics of the SB-MV AT mine (Italian) are listed in the table below:

Characteristics	Height	4.0 inches with fuze
	Diameter	9.3 inches
	Mine Weight	11.0 pounds
	Explosive Weight	5.7 ounces
	Color	Sand brown, olive drab
Description	Fuze Type	Delay-armed, magnetic-influence initiated
	Sensitivity	Changing ambient magnetic fields
	Detectability	• Probing and visual identification of camouflage efforts • Operating hand held mine detectors may detonate this mine
Capability	Type Kill Effect	Shaped-charged
	AHD	Both antilift (tilt) and self-neutralization features
Breaching Guidance	Mine Plow	Removes mines from plowed area; some will detonate
	Linear Charge	Little effectiveness against magnetic fuzes in buried conventional mines
	Charge Placement	Adjacent to the mine

Note: Self-neutralization settings are programmable.

Diagram

The SB-MV AT mine (Italian) is identified in the diagram below:



VS-HCT AT Mines (Italian)

Intelligence Information

The characteristics of the VS-HCT AT mine (Italian) are listed in the table below:

Characteristics	Height	4.3 inches
	Diameter	11.4 inches
	Mine Weight	15.4 pounds
	Explosive Weight	11.0 pounds
	Color	Sand brown, olive drab
Description	Fuze Type	Delay-armed, magnetic-influence-initiated
	Sensitivity	Changing ambient magnetic fields
	Detectability	• Probing and visual identification of camouflage efforts • Operating hand held mine detectors may detonate this mine
Capability	Type Kill Effect	Shape-charged
	AHD	Both antilift (tilt) and self-neutralization features
Breaching Guidance	Mine Plow	Removes mines from plowed area; some will detonate
	Linear Charge	Little effectiveness against magnetic fuzes in buried conventional mines
	Charge Placement	Adjacent to the mine

Note: Ten self-neutralization settings range from 1 to 128 days.

Diagram

The VS-HCT AT mine (Italian) is identified in the diagram below:

TC-6, TCE-6, T.C. 6 AT Mines (Italian, Egyptian)

Intelligence Information

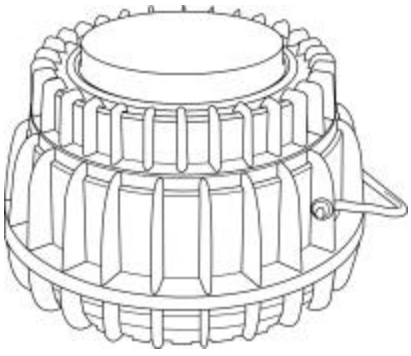
The characteristics of the TC-6, TCE-6, T.C. 6 AT mine (Italian, Egyptian) are listed in the table below:

Characteristics	Height	7.3 inches
	Diameter	10.6 inches
	Mine Weight	21.2 pounds
	Explosive Weight	13.2 pounds
	Color	Sand brown, olive drab
Description	Fuze Type	Blast resistant, pressure-initiated
	Sensitivity	396.8 pounds
	Detectability	Difficult with hand held detectors (total metallic content is 2.86 grams, stainless steel striker tip and retaining spring). Much easier detection if the "E" version with its electronics package is employed.
Capability	Type Kill Effect	Blast
	AHD	Secondary fuze well available for boobytrap purposes (on the bottom of the mine case)
Breaching Guidance	Mine Plow	Removes mines from plowed area; some will detonate
	Charge Placement	Adjacent to the mine

Note: The "E" version incorporates an electronics package primarily intended for remote activation or deactivation with a hand held remote controller. Currently, this version does not include antilift, antidisturbance, or self-destruct features. However, these are normal options in most Italian electronic fuzes.

Diagram

The TC-6, TCE-6, T.C. 6 AT mine (Italian, Egyptian) is identified in the diagram below:



SH-55 AT Mines (Italian)

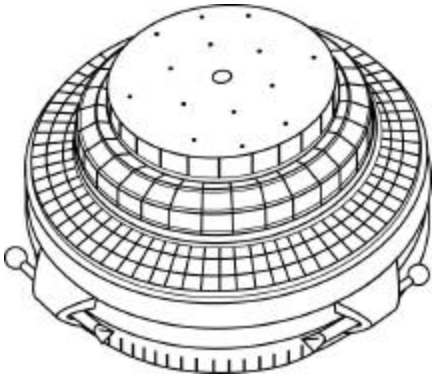
Intelligence Information

The characteristics of the SH-55 AT mine (Italian) are listed in the table below:

Characteristics	Height	4.8 inches
	Diameter	11.0 inches
	Mine Weight	16.1 pounds
	Explosive Weight	12.1 pounds
	Color	Sand brown
Description	Fuze Type	Blast-resistant, pressure-initiated
	Sensitivity	407.8 pounds
	Detectability	Difficult with hand held detectors (metallic content approximately 5.0 grams, steel striker tip)
Capability	Type Kill Effect	Blast
	AHD	Two secondary fuze wells are available for booby-trap purposes with one each on the side and bottom. If the VSN/AR-AN fuze is present, then removal of the fuze itself will detonate the mine.
Breaching Guidance	Mine Plow	Removes mines from plowed area; some will detonate
	Linear Charge	Drastically reduces the effectiveness for blast-resistant
	Charge Placement	Adjacent to the mine

Diagram

The SH-55 AT mine (Italian) is identified in the diagram below:



VS-2.2 AT Mines (Italian)

Intelligence Information

The characteristics of the VS-2.2 AT mine (Italian) are listed in the table below:

Characteristics	Height	4.7 inches
	Diameter	9.4 inches
	Mine Weight	7.7 pounds
	Explosive Weight	4.7 pounds
	Color	Sand brown, olive drab, green
Description	Fuze Type	Blast-resistant, pressure-initiated
	Sensitivity	396.8 to 485.0 pounds
	Detectability	Difficult with hand held detectors (metallic content approximately 5.0 grams, steel striker tip)
Capability	Type Kill Effect	Blast
	AHD	Bottom detonator well is available for boobytrap devices. If the VSN/AR-AN fuze is present, then removal of the fuze itself will detonate the mine.
Breaching Guidance	Mine Plow	Removes mines from plowed area; some will detonate
	Linear Charge	Drastically reduces the effectiveness for blast-resistant
	Charge Placement	Adjacent to the mine

Diagram

The VS-2.2 AT mine (Italian) is identified in the diagram below:

TC/2.4 M/80 Scatterable AT Mines (Italian, Egyptian)

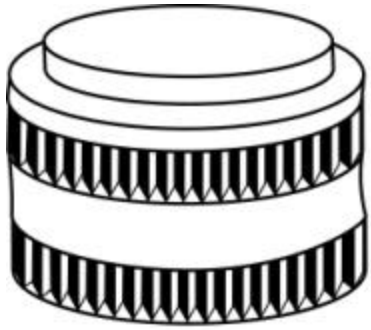
Intelligence Information

The characteristics of the TC/2.4 M/80 scatterable AT mine (Italian, Egyptian) are listed in the table below:

Characteristics	Height	4.3 inches
	Diameter	8.0 inches
	Mine Weight	7.3 pounds
	Explosive Weight	5.3 pounds
	Color	Sand brown, olive drab
Description	Fuze Type	Blast-resistant, pressure-activated
	Sensitivity	396.8 pounds
	Detectability	Difficult with hand held detectors (total metallic content is 2.46 grams)
Capability	Type Kill Effect	Blast
	AHD	If MUV-type or VS-AR-4 antilift is attached to bottom detonator well
Breaching Guidance	Mine Plow	Removes mines from plowed area; some will detonate
	Linear Charge	Drastically reduces the effectiveness for blast-resistant
	Charge Placement	Adjacent to the mine

Diagram

The TC/2.4 M/80 scatterable AT mine (Italian, Egyptian) is identified in the diagram below:



SB-81, SB-81/AR Scatterable AT Mines (Italian)

Intelligence Information

The characteristics of the SB-81, SB-81/AR scatterable AT mine (Italian) are listed in the table below:

Characteristics	Height	3.5 inches
	Diameter	9.1 inches
	Mine Weight	7.1 pounds
	Explosive Weight	4.4 pounds
	Color	Sand brown, olive drab
Description	Fuze Type	Blast-resistant, pressure-activated
	Sensitivity	330.7 pounds
	Detectability	• Scattered: Visual Identification • Buried: Difficult with hand held detectors (total metallic content is .91 grams)
Capability	Type Kill Effect	Blast

	AHD	• Scattered
		  • SB-81: No built-in AHD self-neutralization
		  • SB-81/AR: Has electronic package with options for both AHD and programmable self-neutralization
		• Buried
		  • SB-81: If MUV-type or VS-AR-4 antilift fuze is attached to bottom detonator well
		  • SB-81/AR: Has built-in capability for optional AHD and programmable self- neutralization

Breaching Guidance	Mine Plow	Scattered • SB-81: Removes mines from plowed area; some will detonate • SB-81/AR: Detonates armed mines when moved by plow

Diagram

The SB-81, SB-81/AR scatterable AT mine (Italian) is identified in the diagram below:

VS-1.6, VS-1.6/AR, VS-1.6/AN Scatterable AT Mines (Italian)

Intelligence Information

The characteristics of the VS-1.6, VS-1.6/AR, VS-1.6/AN scatterable AT mine (Italian) are listed in the table below:

Characteristics	Height	3.6 inches
	Diameter	8.7 inches
	Mine Weight	6.6 pounds
	Explosive Weight	4.1 pounds
	Color	Sand brown, olive drab with black rubber cover
Description	Fuze Type	Blast-resistant, pressure-activated
	Sensitivity	418.9 pounds
	Detectability	• Scattered: Visual identification • Buried: Difficult with hand held detectors (total metallic content is 2.46 grams)
Capability	Type Kill Effect	Blast
	AHD	Bottom detonator well is available for boobytrap devices. If the VSN/AR-AN fuze is present, then removal of the fuze itself will detonate the mine.
Breaching Guidance	Mine Plow	Removes mines from plowed area; some will detonate
	Linear Charge	Drastically reduces the effectiveness for blast-resistant
	Charge Placement	Adjacent to the mine

Diagram

The VS-1.6, VS-1.6/AR, VS-1.6/AN scatterable AT mine (Italian) is identified in the diagram below:

Barmine AT Mines (United Kingdom)

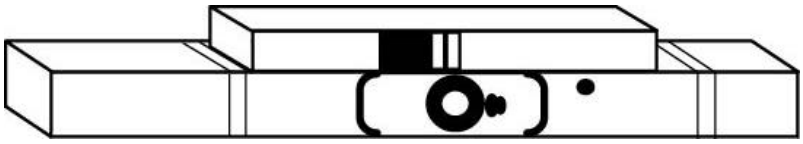
Intelligence Information

The characteristics of the barmine AT mine (United Kingdom) are listed in the table below:

Characteristics	Length	47.2 inches
	Width	3.2 inches
	Height	4.0 inches
	Mine Weight	22.9 pounds
	Explosive Weight	18.5 pounds
	Color	Olive drab
Description	Fuze Type	Both single and double impulse pressure fuzes are available
	Detectability	• Single impulse fuze: Transparent arming lever • Double impulse fuze: Black arming lever
Capability	Type Kill Effect	Blast
	AHD	None with fuzes. However, an additional fuze will incorporate magnetic sensing and antidisturbance.
Breaching Guidance	Mine Plow	Removes mines from plowed area; some will detonate
	Linear Charge	• Single impulse pressure fuze: None • Double impulse fuze: None
	Charge Placement	Adjacent to the mine

Diagram

The barmine AT mine (United Kingdom) is identified in the diagram below:



MK-7 AT Mines (United Kingdom)

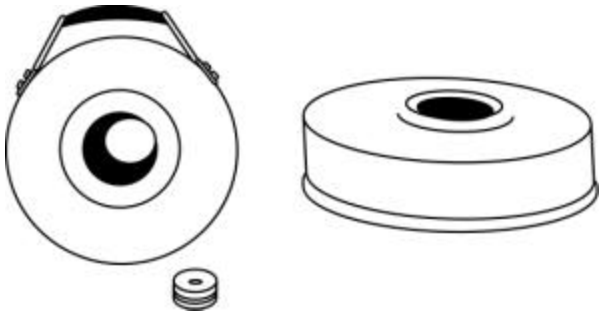
Intelligence Information

The characteristics of the MK-7 AT mine (United Kingdom) are listed in the table below:

Characteristics	Height	5.1 inches
	Diameter	12.8 inches
	Mine Weight	30.0 pounds
	Explosive Weight	19.6 pounds
	Color	Olive drab, brown
Description	Fuze Type	Both single and double impulse pressure fuzes available as well as a tilt-rod fuze
	Sensitivity	• Pressure: 330.7 pounds • Tilt: 6.1 to 39.7 pounds
	Detectability	Visual for tilt rods; remaining by hand held metallic detector (significant metallic content in mine body)
Capability	Type Kill Effect	Blast
	AHD	Secondary fuze well available for boobytrap purposes (located on the bottom of the mine body)
Breaching Guidance	Mine Plow	Removes mines from plowed area; some will detonate
	Linear Charge	• Single impulse pressure fuze: None • Double impulse fuze: None • Tilt rod fuze: None
	Charge Placement	Adjacent to the mine

Diagram

The MK-7 AT mine (United Kingdom) is identified in the diagram below:



MIACAH F1, L14A1 AT Mines (United Kingdom, French)

Intelligence Information

The characteristics of the MIACAH F1, L14A1 AT mine (United Kingdom, French) are listed in the table below:

Characteristics	Length	10.2 inches
	Height	13.8 inches
	Diameter	7.9 inches
	Mine Weight	26.5 pounds
	Explosive Weight	11.0 pounds
	Color	Olive drab
Description	Fuze Type	Break wire, infrared sensor, command-detonation initiation
	Sensitivity	Vehicle passage to 80 meters range
	Detectability	• Visual identification of break and command wires • Visual identification of off route mine location
Capability	Type Kill Effect	Shaped-charge (horizontal)
	AHD	None; however, command control must be neutralized.
Breaching Guidance	Mine Plow	Initiates off route mines and destroys host vehicle
	Linear Charge	Heavy explosive line charge will neutralize break and command wires, as well as overturning those mines fairly close to the line charge. It is not effective against infrared sensor unit.
	Charge Placement	Adjacent to the MIACAH F1 or L14A1 mines

Diagram

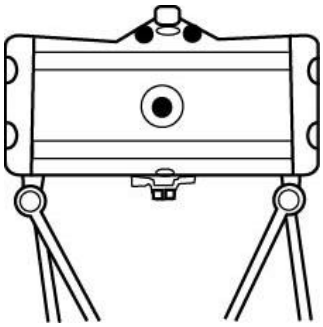
The MIACAH F1, L14A1 AT mine (United Kingdom, French) is identified in the diagram below:

Lesson 3 Exercise

Directions Complete exercise items 1 through 13 by performing the action required. Check your answers against those listed at the end of the lesson.

Item 1 Which of the Soviet mines illustrated below has a blast type kill effect?

___ a.



___ b.

Item 2 The kill radius of the POMZ-2 mine is

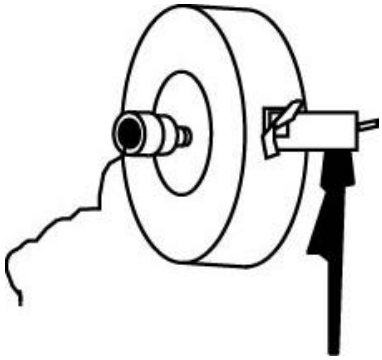
a. 4 meters.
b. 10 meters.
c. 50 meters.
d. 100 meters.

Item 3 Which Soviet AP mine is pressure-initiated?

a. PMN
b. MON-50
c. POMZ-2 and POMZ-2M
d. OZM-4 and OZM-3

Continued on next page

Item 4 Identify the Soviet mine in the illustration below:



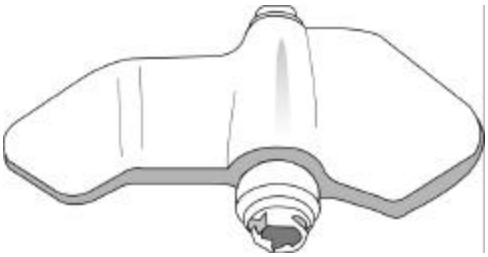
a. MON-100 AP mine
b. MON-200 AP mine
c. PFM-1 scatterable AP mine
d. TM-57 AT mine

Item 5 Which Soviet AP mines have a type kill effect, *bounding fragmentation*?

a. OZM-3 and OZM-4
b. MON-50, MON-100, and MON-200
c. POMZ-2 and POMZ-2M
d. PMN, PMN-2, and PMD-6

Continued on next page

Item 6 Identify the Soviet scatterable mine in the illustration below:



a. PMD-6
b. OZM-3
c. TM-57
d. PFM-1

Item 7 Which Soviet mine self-destructs within 0 to 24 hours?

a. PGMDM scatterable
b. TM-62M
c. TM-57
d. PFM-1 scatterable

Item 8 The SB-33 Italian mine has a type kill effect of a

a. bounding fragmentation.
b. shaped charged.
c. blast.
d. fragmentation.

Continued on next page

Item 9 Identify the Italian scatterable AP mine in the illustration below:

a. VS-50
b. SB-33
c. VS-HCT
d. TC/2

Item 10 The SB-MV and VS-HCT Italian AT mines have what type kill effect?

a. Shaped-charged
b. Blast
c. Fragmentation
d. Bounding fragmentation

.

Continued on next page

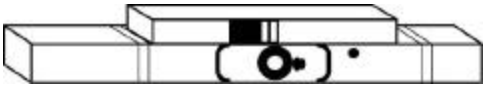
Item 11 Identify the Italian scatterable AT mine in the illustration below:

a. TC-6
b. SH-55
c. TC/2
d. VS-HCT

Item 12 Identify the Italian scatterable AT mine in the illustration below:

a. SB-81
b. SB-33
c. VS-MK2
d. VS-2.2

Item 13 Identify the mine in the illustration below:



a. Soviet PGMDM scatterable AT
b. Italian SB-81 AT
c. Soviet, Egyptian TM-46 AT
d. UK barmine AT

Continued on next page

Solutions

The table below lists the answers to the exercise items. If you have questions about these items, refer to the reference page.

Item Number	Answer	Reference
1	b	4-36
2	a	4-38
3	b	4-39
4	a	4-40
5	a	4-43 and 4-44
6	d	4-45
7	a	4-49
8	c	4-52
9	b	4-52
10	a	4-55 and 4-56
11	d	4-56
12	a	4-61
13	d	4-63

Lesson Summary

In this lesson, you learned how to identify AP and AT foreign mines.

You have completed lesson 3 and the last study unit in the course. Good luck on your final exam!

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LANDMINE WARFARE

REVIEW LESSON EXAMINATION

Review Lesson

Introduction

The purpose of the review lesson examination is to prepare you for the final examination. We recommend that you try to complete your review lesson examination without referring to the text, but for those items (questions) you are unsure of, restudy the text. When you finish your review lesson and are satisfied with your responses, check your responses against the answers provided at the end of this review lesson examination.

Directions

Select the ONE answer that BEST completes the statement or that answers the item. For multiple choice items, circle your response. For matching items, place the letter of your response in the space provided.

Item 1 Through Item 3

Matching: For items 1 through 3, match the type of safety in column 1 with its function in column 2. Place your responses in the spaces provided.

Column 1	**Column 2**
Type	**Function**
___ 1. Interlocking safety	a. Blocks any action or movement of moving parts
___ 2. Locking safety	b. Blocks the removal of the positive safety until the locking safety has been removed
___ 3. Positive safety	c. Prevents the striker from hitting the percussion cap

Continued on next page

Item 4 Through Item 8

Matching. For items 4 through 8, match the component in column 1 with its function in column 2. Place your responses in the spaces provided.

Column 1	**Column 2**
Component	**Function**
____4. Outer casing	a. Sets off the detonator or igniter charge
____5. Booster charge	b. Sets off the booster charge
____6. Detonator or igniter	c. Sets off the main charge
____7. Fuze	d. Causes the mine to produce its desired affect
____8. Main charge	e. Contains the booster charge, detonator or igniter, fuze, and the main charge

Item 9

List the four types of fuzes used in U.S. conventional mines.

(1) _____

(2) _____

(3) _____

(4) _____

Item 10

List the three methods of initiating actions for AP mines.

(1) _____

(2) _____

(3) _____

Continued on next page

Item 11 List the nine tasks in sequence to install the M181A (Claymore) AP mine.

(1) _____

(2) _____

(3) _____

(4) _____

(5) _____

(6) _____

(7) _____

(8) _____

(9) _____

Item 12 List the three types of AT mines used in the U.S. Marine Corps.

(1) _____

(2) _____

(3) _____

Continued on next page

Item 13 What are the effects of a K-kill?

_____

_____

_____

Item 14 When using the M15 AT mine for training, which fuze is used?

a. M624
b. M606
c. M604
d. M603

Item 15 The four steps necessary to remove the M15 AT mine are listed below in scrambled order.

(1) Install the M4 arming plug finger tight.
(2) Remove the mine from the hole.
(3) Use the M20 arming wrench to turn the arming plug counterclockwise and remove it.
(4) Remove the M603 fuze from the fuze well and replace the safety fork.

What is the correct sequence for removing the M15 AT mine?

a. 3, 4, 2, 1
b. 2, 1, 3, 4
c. 3, 4, 1, 2
d. 2, 4, 3, 1

Continued on next page

Item 16

The eight tasks to install the M19 AT mine are: inspect mine, test firing pin position, dig hole, _____, _____, _____, _____, and camouflage mine.

a. install detonator, install fuze, place mine, arm mine
b. place mine, install fuze, install detonator, arm mine
c. place mine, install detonator, install fuze, arm mine
d. install fuze, install detonator, arm mine, place mine

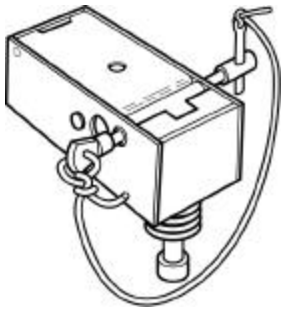
Item 17

What type of warhead is used in the M21 AT mine?

a. Blast
b. Direct energy
c. Fragmentation
d. K-kill

Item 18

What type of FD is illustrated below?



a. M1
b. M3
c. M5
d. M142

Continued on next page

Item 19 When removing the M5 Pressure Release FD, what is the first step in task 1 to *disarm mine*?

a. Remove the FD from its location.
b. Replace the positive safety pin.
c. Uncover the mine and carefully check the surrounding area for boobytraps, trip wires, and signs of tampering.
d. Unscrew the three pronged pressure head from the top of the trigger head.

Item 20 What are the four modes to arm the M142 Multipurpose FD?

a. Pressure release, tension release, vibration, timer rundown
b. Pressure release, vibration, magnetic-influence, frequency induction
c. Pressure release, tension release, pull, pressure
d. Pressure, electrical, vibration, pressure release

Item 21 What are the three types of minefields?

a. Protective, tactical, and phony
b. Protective, phony, and deliberate
c. Deliberate, hasty, and protective
d. Tactical, turn, and fixed

Item 22 Hasty and deliberate are characteristics of which type of minefield?

a. Tactical
b. Protective
c. Phony
d. Block

Continued on next page

Item 23 What DA form is required with the hasty minefield?

a. DA Form 1355
b. DA Form 1355-2-R
c. DA Form 1355-1-R
d. DA Form 1355-1-H

Item 24 A tactical minefield designed to slow the enemy within a specified area is known as the _____ minefield.

a. fix
b. turn
c. block
d. disrupt

Item 25 Which two tactical minefields use AHDs?

a. Disrupt and turn
b. Fix and turn
c. Block and fix
d. Block and disrupt

Item 26 When installing the hasty protective minefield in which task is *determining the necessary equipment* conducted?

a. Submit intention report.
b. Install minefield.
c. Perform area reconnaissance.
d. Record RP.

Continued on next page

Item 27 The row closest to the enemy is known as row

a. A.
b. B.
c. C.
d. D.

Item 28 How are azimuths shot when recording the minefield?

a. Left to right facing the enemy
b. Starting from the landmark
c. From row closest to the enemy
d. Right to left facing the enemy

Item 29 Why would you have two Marines shooting the azimuths and pacing the distances?

a. Help prevent mistakes
b. Debrief the junior personnel on job performance
c. Help speed up the process
d. Make sure that all the mines are removed

Item 30 What would you do if the distance between a mine or cluster and any turning point were less than the mine spacing for that row?

a. Nothing.
b. Omit the mine or cluster.
c. Notify your NCOIC.
d. Place the mine at the proper spacing.

Continued on next page

Item 31 How many vehicles does a platoon usually use to install row minefields?

a. One
b. Two
c. Three
d. Four

Item 32 What party is responsible for submitting a copy of DA Form 1355, Minefield Record to headquarters?

a. Supervisory personnel
b. Siting and recording party
c. Marking party
d. Mine dump party

Item 33 What is the approximate safe distance between vehicles while laying mines in a row minefield?

a. 30 meters
b. 40 meters
c. 50 meters
d. 60 meters

Item 34 When is the IOE placed concurrently with row A?

a. During the installation of the minefield
b. In laying mines method 2, an IOE is required and speed is essential
c. In laying mines method 1, an IOE is required and speed is essential
d. In laying mines methods 1 and 2, as required by the OIC

Continued on next page

Item 35

What are the four types of row minefield compositions?

a. Disrupt, fixed, turn, block
b. Disruptive, fixed, turn, block
c. Disrupt, fix, turn, block
d. Disrupt, fix, turn, blockout

Item 36

Which of the standard *block* row minefields have IOE strips?

a. Fix and disrupt
b. Disrupt and turn
c. Block and turn
d. Fix and block

Item 37 Through Item 39

Matching: For items 37 through 39, match the definition in column 1 with its term in column 2. Place your responses in the spaces provided.

Column 1	**Column 2**
Definition	**Term**
___ 37. Synchronized combined arms operation under the control of the maneuver commander	a. Breaching
___ 38. Actions taken against an obstacle that diminish or eliminate its original intended effect	b. Reduction
___ 39. When a mine has been made incapable of detonation upon passage of a target	c. Mine neutralization
	d. Breaching operations

Continued on next page

Item 40

What does SOSRR breaching fundamentals stand for?

a. Suppress, organize, synchronize, realize, and reduce
b. Suppress, obscure, secure, reduce, and resupply
c. Synchronize, obscure, support, report, and resupply
d. Support, organize, secure, report, and reduce

Item 41

What must the commander do to accomplish the breaching operation quickly and effectively?

a. Organize
b. Suppress
c. Assault
d. Mass

Item 42 Through Item 45

Matching: For items 42 through 45, match the description in column 1 with the type of breaching operation in column 2. Place your responses in the spaces provided.

Column 1	**Column 2**
Description	**Type of Breaching Operation**
___ 42. Uses element of surprise and initiative to get through the obstacle with minimal loss of momentum	a. Bypass b. In-stride c. Deliberate d. Assault e. Covert
___ 43. Used when forces required for support, breach, and assault are beyond the capability of a task-organized subordinate unit	
___ 44. Allows a force to penetrate the enemy's protective obstacles and destroy defender in detail	
___ 45. Executed silently to achieve surprise and minimize casualties	

Continued on next page

Item 46 Which mechanical mine clearing system consists of a plow arrangement to extract mines, a mold board to cast mines aside, and a leveling skid to control the depth of the plow?

a. Tank-mounted, track-width mine roller (TWMR)
b. Tank-mounted, track-width mine plow (TWMP)
c. M1A1/M1A2 AP obstacle breaching system (APOBS)
d. Mine clearing line charge MICLIC system

Item 47 When conducting manual reduction using a grapnel hook, engineers first

a. Use the hooks to check for trip wires in the desired lane.
b. Use mine detectors and probes to locate the mines.
c. Locate themselves in uncovered positions.
d. Make a visual check to estimate the width and depth of the obstacle.

Item 48 Which proofing method should only be conducted if the trough is shallow and straight?

a. Centerline
b. Mechanical
c. Offset
d. Explosive

Item 49 The main components of the AN/PSS-12 are the electronic unit, search head, headsets, and

a. telescopic pole.
b. test piece.
c. plastic bolt.
d. batteries.

Continued on next page

Item 50 The transmitting coil in the search head is energized by

a. batteries.
b. sunlight.
c. electronics.
d. electrical pulses.

Item 51 What is the first step in unpacking the AN/PSS-12 mine detector?

a. Check for damage.
b. Open the pressure-relief valve.
c. Release latches to open metal case.
d. Unzip carry bag.

Item 52 During the initial adjustment of the SENSITIVITY knob, how high above ground should the search head be placed?

a. .5 meter
b. 1.5 meters
c. 2 meters
d. 3.5 meters

Item 53 How is the AN/PSS-12 mine detector cleaned after using it in salt water?

a. Wipe it down with a clean rag.
b. Clean it with fresh water.
c. Clean it with dry solvent water.
d. Clean it with a light coat of oil.

Continued on next page

Item 54 The five major components of the MK2 MOD 0 system are

a. launcher, rocket, line charge, storage box, and trailer chassis.
b. trailer chassis, hydraulic system, storage box rocket, and line charge.
c. launcher, hydraulic system, lifting sling, trailer, and line charge.
d. rocket motor, lifting sling, storage box, rocket, and trailer.

Item 55 Which hydraulic system component stores hydraulic pressure needed to raise the launcher rail when the hydraulic control valve handle is in the REMOTE RAISE position?

a. Control valve
b. Hand pump
c. Accumulator
d. Pump release valve

Item 56 What is step 1 in the *initial inspection* of the launcher operational check?

a. Make sure all components are present and undamaged.
b. Check the pump, accumulator, valve cylinder, and hose for leaks.
c. Be sure hydraulic system components are secured to the launcher.
d. Check the hydraulic fluid level in the hand pump.

Item 57 After installing the launcher on the M353 trailer, what is the next task?

a. Install the launcher on the trailer.
b. Install the charge container on the launcher.
c. Secure the container on the launcher.
d. Secure the launcher on the charge container.

Continued on next page

Item 58 When are limited clearing operations performed?

a. After the breach force has reduced the minefield and secured the area
b. Immediately following the assault force
c. After the lanes have been marked
d. After EOD arrives

Item 59 The definition of upgrading breach lanes is to

a. reduce lanes during clearing operation and to make sure all lanes were kept at minimum of 200 meters apart.
b. limited mine clearance conducted by follow-on engineers to improve existing lanes through minefields and reduce new lanes.
c. improve the marking system to reflect the new lane widths and increase the number of lanes.
d. clear a lane through a minefield less than 150 meters deep requires time and confirmation by the reconnaissance.

Item 60 What are the two types of sweep operations?

a. Hasty and deliberate
b. Day and night
c. Limited and full
d. Mounted and dismounted

Item 61 After a mine is detected, who decides what will be done with the mine?

a. NCOIC
b. Prober
c. Mine detector operator
d. OIC

Continued on next page

Item 62 During mine clearing operations, which two pieces of equipment are worn by all sweep team members?

a. Helmets and flak jackets
b. Eye protection and ear plugs
c. Utility uniforms and gloves
d. Ear plugs and mouth pieces

Item 63 What is the first item inserted in the container for the Grapeshot AP expedient mine?

a. FD
b. Explosive
c. Wadding
d. Shrapnel

Item 64 What FDs are used to activate the Grapeshot AP expedient mine?

a. M1 Pull FD, M1A1 Pressure FD, M3 Pull Tension Release, M142 Multipurpose FD
b. M1 Pull FD, M1A2 Multipurpose FD, M124 Multipurpose FD, M3 Pull Tension Release
c. M1 Pull FD, M1A1 Pressure FD, M142 Multipurpose FD, M3 Pull Tension Release
d. M1 Pull FD, M111 Pressure FD, M142 Multipurpose FD, M3 Pull Tension Release

Item 65 The explosive weight of the platter charge expedient mine is equal to

a. the weight of the platter.
b. the weight of the platter charge.
c. half the weight of the platter.
d. half the weight of the platter charge.

Continued on next page

Item 66 When making a barbwire AP fragmentation expedient mine, what is the block of wood used for?

a. To make the charge directional
b. To mount the explosive
c. As additional shrapnel
d. To wrap the wire around

Item 67 What is the preferred igniter of an improvised flame expedient mine?

a. Electrical spark
b. WP hand grenade
c. Matches
d. Lighter

Item 68 What are the three activation modes for the HE artillery shell AT expedient mine?

a. Pressure, pull, electrical
b. Pressure, pull tension, electrical
c. Pressure-release, pull tension, electrical tension
d. Pull, pull tension, electrical

Item 69 The description, *consists of objects that arouse someone's interest,* falls under which boobytrap category?

a. Decoy
b. Bait
c. Bluff
d. Double bluff

Continued on next page

Item 70 Which principle best describes *concealment is mandatory to success*?

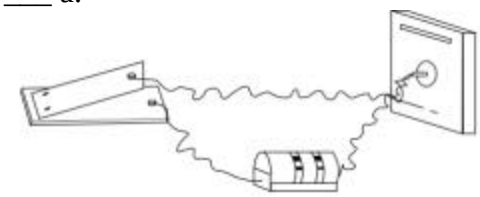
a. Firing
b. Likely areas
c. Appearances
d. Bait

Item 71 The two types of explosive boobytraps are

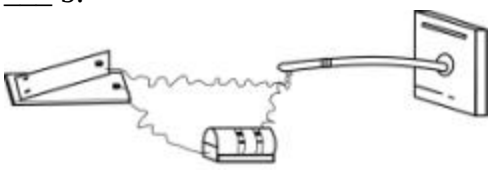
a. remote connection and direct connection.
b. electrical and nonelectrical.
c. natural and manmade.
d. decoy and bait.

Item 72 Which diagram illustrates an electrical remote connection?

___ a.



___ b.



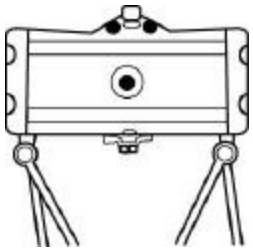
Item 73 When placing a boobytrap, the last step is

a. camouflage or conceal, if necessary.
b. leave the boobytrap area clean.
c. anchor the boobytrap securely with nails, wire, rope, or wedges, if necessary.
d. lay the charge.

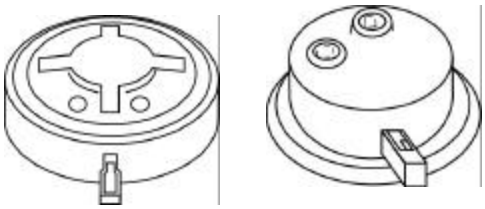
Continued on next page

Item 74 Which of the Soviet mines illustrated below has a blast type kill effect?

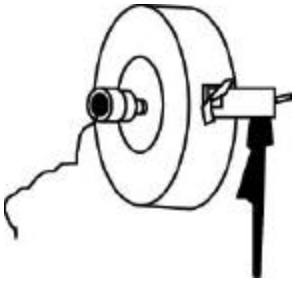
___ a.



___ b.



Item 75 Identify the Soviet mine in the illustration below.



a. MON-100 AP mine
b. MON-200 AP mine
c. PFM-1 scatterable AP mine
d. TM-57 AT mine

Continued on next page

Review Lesson Solutions

Solutions

The table below lists the answers to the review lesson examination items. If you have questions about these items, refer to the reference page.

Item Number	Answer	Reference
1	b	1-5
2	a	1-5
3	c	1-5
4	e	1-7
5	c	1-7
6	b	1-7
7	a	1-7
8	d	1-7
9	(1) Mechanical (2) Chemical (3) Friction (4) Electrical	1-9
10	(1) Pressure (2) Trip wire (3) Command-detonated	1-20
11	(1) Conduct inventory (2) Inspect mine (3) Test circuit (4) Place mine (5) Aim mine (6) Arm mine (7) Camouflage mine (8) Retest circuit (9) Detonate mine	1-23
12	(1) M15 (2) M19 (3) M21	1-39
13	Destroys the weapon system and the crew.	1-39
14	c	1-42
15	c	1-49
16	c	1-52
17	b	1-58

Continued on next page

Solutions, continued

Item Number	Answer	Reference
18	c	1-77
19	c	1-84
20	c	1-90
21	a	2-4
22	b	2-5
23	c	2-6
24	a	2-9
25	d	2-12-and 2-15
26	c	2-22
27	a	2-25
28	d	2-30 and 2-31
29	a	2-36
30	b	2-48
31	c	2-51
32	a	2-53
33	d	2-51 and 2-62
34	b	2-64
35	c	2-67
36	d	2-71 and 2-75
37	d	3-5
38	b	3-5
39	c	3-5
40	b	3-7
41	a	3-9
42	b	3-12
43	c	3-13
44	d	3-14
45	e	3-15
46	b	3-27
47	a	3-34
48	a	3-37
49	a	3-51
50	d	3-56

Continued on next page

Solutions, continued

Item Number	Answer	Reference
51	b	3-57
52	a	3-63
53	b	3-69
54	a	3-78
55	c	3-86
56	a	3-89
57	b	3-92
58	a	3-130
59	b	3-135
60	a	3-137
61	d	3-141
62	a	3-142
63	d	4-7
64	a	4-7
65	a	4-9
66	a	4-10
67	b	4-12
68	a	4-13
69	b	4-22
70	c	4-22
71	b	4-23
72	b	4-24
73	b	4-26
74	b	4-36
75	a	4-40

Bibliography

Source Materials

FMFM 13-7, *MAGTF Breaching Operations.*

FM 5-250, *Military Demolitions.*

FM 5-34, *Engineer Field Data.*

FM 20-32, *Landmine Warfare.*