Chapter 1

Introduction

This chapter provides the mechanics and characteristics of antitank (AT) mines and munitions, antipersonnel (AP) mines and munitions, and antihandling devices (AHDs). The information contained in this chapter also provides a foundation for the rest of the manual.

Land-based mines and munitions are hand-emplaced, remote-delivered, ground-delivered, or air-delivered:

- Hand-emplaced mines and munitions require manual arming and are labor-, resource-, and transport-intensive.
- Remote- and air-delivered mines and munitions require less time and labor; however, they are not as precisely placed as hand-emplaced mines and munitions.
- Ground-delivered mines are less resource-intensive than hand-emplaced mines. They are not precisely placed; however, the minefield boundaries are.

Soldiers can surface lay or bury mines and munitions and can place AHDs on hand-emplaced AT mines.

NOTE: Some countries employ AHDs on AP mines, but US forces are not authorized to employ AHDs on any type of AP mine.

MECHANICS OF MINES

CHARACTERISTICS AND FUNCTIONING

A land mine is an explosive device that is designed to destroy or damage equipment or personnel. Equipment targets include ground vehicles, boats, and aircraft. A mine is detonated by the action of its target, the passage of time, or controlled means. There are two types of land-based mines—AT and AP. Mines generally consist of the following parts (Figure 1-1, page 1-2):

- Firing mechanism or other device (sets off the detonator or igniter charge).
- Detonator or igniter (sets off the booster charge).
- Booster charge (may be attached to the fuse or the igniter or be part of the main charge).
- Main charge (in a container; usually forms the body of the mine).
- Casing (contains all the above parts).

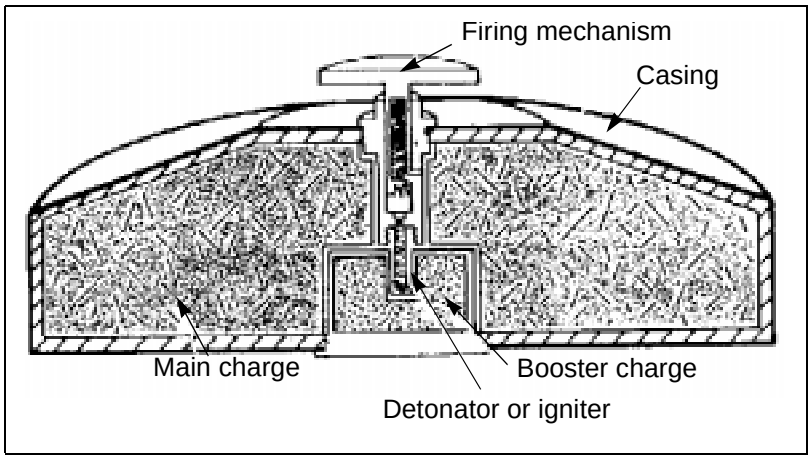


Figure 1-1. Mine components

COMPONENTS AND INITIATING ACTIONS

A firing mechanism prevents the mine from exploding until it makes contact with, or is influenced by, its target. Once a mine has been armed, the firing mechanism may be actuated by the following methods (Figure 1-2):

- Applying pressure (including tilt rod).
- Pulling a trip wire.
- Releasing tension or breaking a trip wire.
- Releasing pressure.
- Passage of time (time-delay mechanism).
- Impulses.
  - — Electrical.
  - — Vibration.
  - — Magnetic-influence.
  - — Electromagnetic-frequency.
  - — Infrared-sensored.
  - — Acoustic.

To arm some mines, you must position the igniter, set the mechanism properly, and disengage the safety device (usually by removing a safety pin). The fuse is the initial component in the firing chain; it has a low-explosive (LE) powder but is highly sensitive. The fuse is actuated by an initiating action. Although mines are issued with a standard fuse, alternate fuses are issued separately for some mines.

The four main fuse types are shown in Figure 1-3, page 1-4.

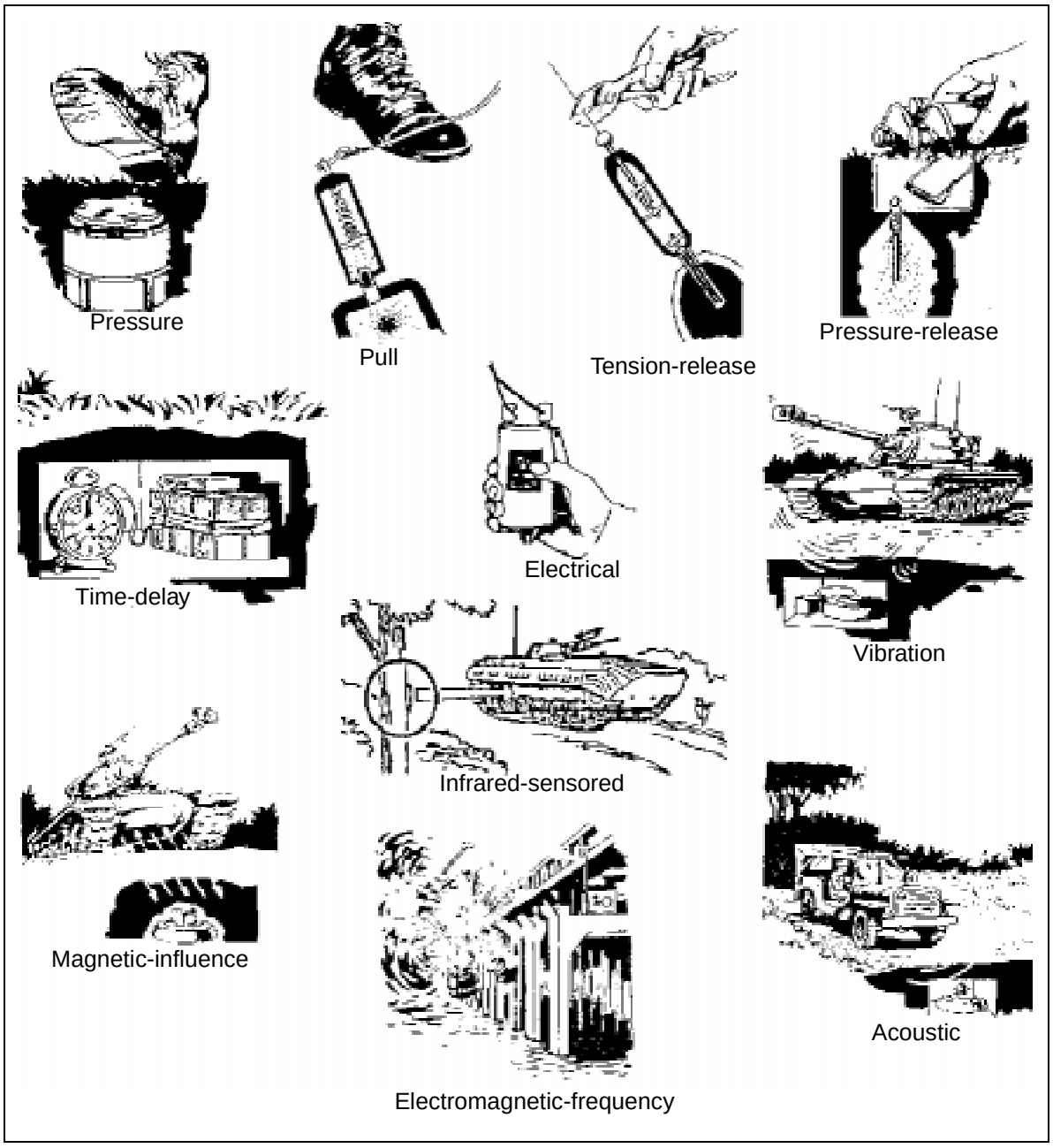


Figure 1-2. Methods of actuating mines

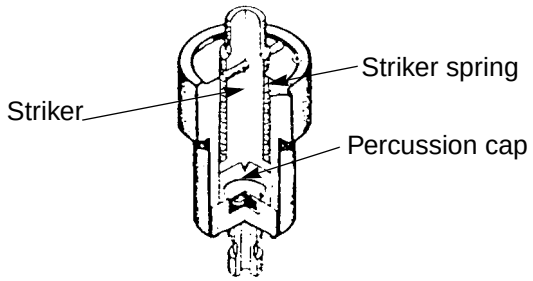
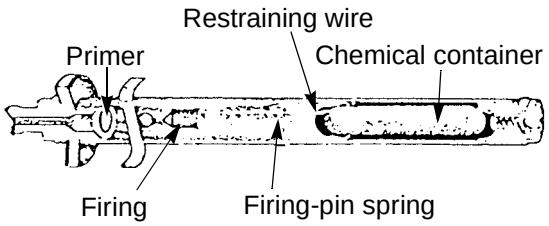
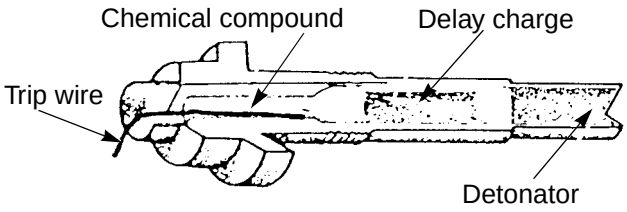
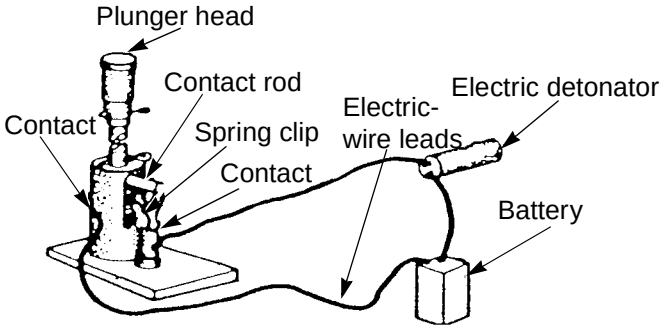
Mechanical. A spring drives a striker against a percussion cap, which fires the detonator.	
Chemical. A small container of a chemical compound is broken by the initiating action. The chemical compound reacts with another substance to generate heat, which ignites the detonator.	
Friction. The initiating action ignites substances inside the fuse by friction. The flame fires the detonator.	
Electrical. The initiating action closes an electrical circuit, which functions an electrical detonator.	

Figure 1-3. Types of fuses

ANTITANK MINES

AT mines are designed to immobilize or destroy vehicles and their occupants.

TYPES OF KILLS

An AT mine produces a mobility kill (M-Kill) or a catastrophic kill (K-Kill). An M-Kill destroys one or more of the vehicle's vital drive components (for

example, breaks a track on a tank) and immobilizes the target. An M-Kill does not always destroy the weapon system and the crew; they may continue to function. In a K-Kill, the weapon system and/or the crew is destroyed.

TYPES OF SENSING

AT fuses fall into three categories:

- Track-width. Usually pressure-actuated, requiring contact with the wheels or tracks of a vehicle.
- Full-width. Activated by several methods—acoustics, magnetic-influence, tilt-rod, radio-frequency, infrared-sensored, command, or vibration. Tilt-rod or magnetic-influence fuses are the most common. Full-width fuses are designed to be effective over the entire target width and can cause a K-Kill from penetration and spalling metal or from secondary explosions. When a full-width fuse is activated solely by contact with the wheels or tracks of the target vehicle, it usually causes an M-Kill because most of the energy is absorbed by the wheels or tracks.
- Off-route. Designed to produce an M-Kill or a K-Kill, top or side attack, when a target vehicle activates the fuse with acoustic or seismic signals. When activated, an infrared-sensored, explosive-formed penetrating (EFP) or a shaped-charge rocket warhead sublet is launched; and the warhead acquires the target.

TYPES OF WARHEADS

AT mines can be identified by their warheads:

- Blast AT mines derive their effectiveness from the force generated by high-explosive (HE) detonation. They usually produce an M-Kill when the blast damages the track or the vehicle, but a K-Kill is also possible.
- Self-forging fragmentation (SFF) mines use a directed-energy (Miznay-Schardin [M-S] effect) warhead that is designed to penetrate the armor on a vehicle's underside or side (for horizontal-effect mines). SFF mines are shaped-charge or EFP—shaped-charge mines concentrate an explosive *jet* in a desired direction; EFP mines turn the mines' solid metal end plate into a projectile. SFF mines usually produce a K-Kill because spalling metal from the blast of the mines or from secondary explosions kills the crew.

ANTIPERSONNEL MINES

TYPES OF KILLS

AP mines can kill or incapacitate their victims. The mines commit medical resources, degrade unit morale, and damage nonarmored vehicles. Some types of AP mines may break or damage the track on armored vehicles.

TYPES OF SENSING

AP mines can be fused by pressure, seismic, wire, or command detonation:

- Pressure fuses usually activate an AP mine when a load is placed on the fuse.
- Seismic fuses activate an AP mine when the sensor detects vibrations or movement within the search range.
- Trip wires or break wires activate an AP mine when something disturbs barely visible wires.
- Command-detonated mines are activated by a soldier when he detects the enemy in the mines' blast area.

TYPES OF WARHEADS

AP mines contain five types of warheads:

- Blast. Cripples the foot or leg of a soldier who steps on it; can also burst the tires of a wheeled vehicle that passes over it.
- Bounding-fragmentation. Throws a canister into the air; the canister bursts and scatters shrapnel throughout the immediate area.
- Direct-fragmentation. Propels fragments in the general direction of enemy soldiers.
- Stake-fragmentation. Bursts and scatters shrapnel in all general directions.
- Chemical/flame. Disperses a chemical agent or a flame mixture to cripple or kill the soldier who activates it; can also cause casualties in the proximity of the detonated mine.

ANTIHANDLING DEVICES

AHDs perform the function of a mine fuse if someone attempts to tamper with the mine. They are intended to prevent moving or removing the mine, not to prevent reduction of the minefield by enemy dismounts. An AHD usually consists of an explosive charge that is connected to, placed next to, or manufactured in the mine. The device can be attached to the mine body and activated by a wire that is attached to a firing mechanism. US forces can employ AHDs on conventional AT mines only. Other countries employ AHDs on AT and AP mines.

Some mines have extra fuse wells that make it easier to install AHDs (Figure 1-4). An AHD does not have to be attached to the mine; it can be placed underneath the mine (Figure 1-5). Mines with AHDs are sometimes incorrectly called *booby-trapped* mines.

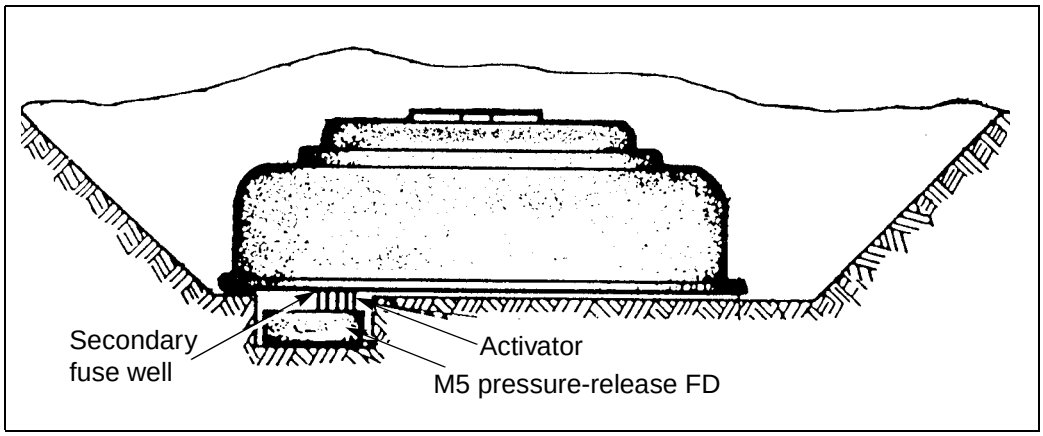


Figure 1-4. AHD incorporating a release mechanism

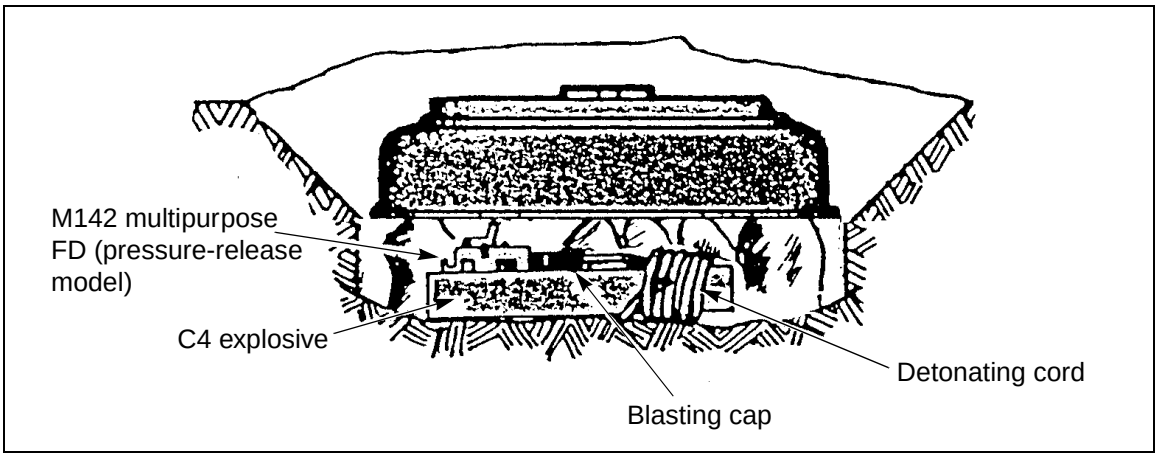


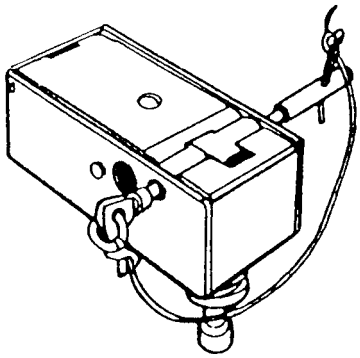
Figure 1-5. AHD not attached to the mine

The following hand-emplaced AHDs are used by US forces (Figure 1-6, page 1-8):

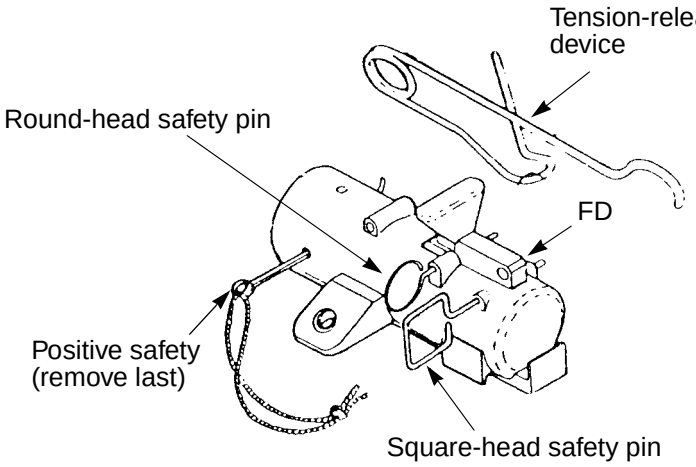
- M5 pressure-release firing device (FD).
- M142 multipurpose FD.

These devices use a spring-loaded striker with a standard base, and they function in one or more modes—pressure, pressure-release, tension, and/or tension-release. When an FD is employed as an AHD on certain AT mines, it requires the use of an M1 or M2 activator. FDs and activators are described in Appendix A.

The *family of superquick fuses* is commonly used by other countries as AHDs. There are seven known fuses that are initiated by vibration, acoustic, inertia, time, lighting, trip wire, and thermal. These devices, when employed with explosives materials, can also be used for booby-trap and sabotage actions. Superquick fuses consist of two separate component boxes—one contains the detonator and the fuse; the other contains the electronics module that activates the system.



M5 Pressure-Release FD



M142 Multipurpose FD

Figure 1-6. Hand-emplaced US AHDs