

## APPENDIX



## EXPLOSIVES AND MUNITIONS SAFETY

*The purpose of this appendix is to provide safety considerations for explosives and munitions commonly encountered on the battlefield. This appendix will not replace the skills or training that qualified EOD or engineer personnel can provide to deploying SFODs. It will, however, provide information that will help personnel employed in remote areas where this external support is not available.*

### GENERAL SAFETY CONCEPTS

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Certain safety concepts must apply to all ordnance. The SFOD must apply the concepts described in the following paragraphs when encountering ordnance in the field.

If required to approach a piece of ordnance, expect the most hazardous conditions. Limit exposure time to the hazard. Only one person should approach the munition.

Do not expose munitions or bulk explosives to heat, shock, static electricity, or radio waves.

If a hazard is encountered, but there are no plans to do anything about it at that time, mark the hazard to alert other friendly personnel. Report major hazards to the next higher headquarters using a 10-digit grid.

Do not dismantle ordnance items. If movement is required, move all hazardous munitions remotely.

Record and report any signs of tampering, modifications, or unusual markings on discovered ordnance.

Avoid liquids, smoke, fumes, or vapors coming out of items of ordnance. Liquid propellants are extremely caustic. Contact will result in blister-agent type chemical burn. If inhaled, extreme damage to the lungs and other internal organs, or death will occur.

All ordnance and explosives exposed to fire are extremely hazardous. Chemical changes take place within the explosive that may result in crystallized by-products. These crystals, or "salts," are extremely sensitive to friction, heat, and shock. Often, if these salts are walked on, they will explode.

Do not depress, turn, remove, or disturb any arming vanes, plungers, levers, or other control fittings on any item of ordnance. This action may arm or set off the item.

Do not remove an item of ordnance if the site will permit disposal by detonation in place.

Take booby trap precautions on all ordnance encountered. Probe and examine the area around the item for wires, lines, and secondary devices. Never uncover more than one third of a land mine at a time. Never completely uncover any item of ordnance. This action may activate a pressure-release booby trap.

Do not rely on markings or color codes on ordnance encountered in the field or captured from enemy forces. All munitions may have been modified or booby-trapped. Grenade fuzes are easy to modify. The fuzes may have a zero time delay.

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## SPECIFIC SAFETY PRECAUTIONS

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Beyond general safety precautions, certain items require specific precautions. These specific precautions are due to type of employment or design of function. The following paragraph addresses specific safety precautions for major categories of ordnance.

### **High Explosive Anti-Tank (HEAT) Munitions**

Common HEAT munitions include tank rounds, the M-72 LAW, the VIPER, the TOW/TOW-2, and most of the Soviet-made rocket propelled grenades (RPGs). These munitions have a cone in the front of the item. The explosive is cast or impacted around the cone that forms a shape charge. When the round explodes, most of the energy is focused forward in the form of a jet. This jet can cover great distances. All HEAT munitions require special safety precautions described below

- Avoid the area in front of a HEAT round.
- Assume the HEAT round has a piezoelectric firing system.
- Do not touch or move any munition that may have a fired or armed piezoelectric fuze.
- Place the disposal charge next to the item, never on top of or in contact with the round.
- Avoid changing the temperature of the item. Casting a shadow over the munition may cause the item to function.
- If possible, dispose of HEAT munitions in small quantities in a pit or hole or place one or two sandbags in front of the item to reduce the possibility of damage to personnel or equipment by the shape charge jet.
- Carefully fire RPG weapons during heavy rain or snowfall. These weapons have been known to function upon contact with the rain during flight.

### **Land Mines**

Mine warfare has made distinct changes in the last few years. Technological advances have been applied to common mines encountered on today's battlefield. Simple pressure-activated fuzes are still in inventories of all armies. However, fuzes that are magnetically-influenced or seismic-fuzed mines controlled by central sensors are being manufactured and exported to all nations that can afford to purchase them. These developments have made countermine operations even

more hazardous. Even with these advances, the hazards associated with mines can be lessened by taking the safety precautions described in the following paragraphs.

If passing through a suspect area, take time to do a visual check of the area and route of march. Look for mines lying on the ground, discolored soil, unexplained wires, dead vegetation, or anything that looks out of place. Look not only on the ground but also on the sides of trees or at tree branches.

Assume all mines to be booby-trapped and armed. Check and probe the area around a mine for secondary devices or other mines. Probe only with nonmetallic items. Branches, plastic MRE spoons, or other like items are acceptable. Never probe with a knife or bayonet. If the tactical situation permits, detonate all mines in place.

Do not approach suspected or known mines while wearing or carrying metal objects. Weapons, helmets, LBE, radios, and like items should be left at a secure location no closer than 50 meters to the item.

All initial movement of mines must be done remotely. (See Figure I-1.) If possible, neutralize external fuzes before lifting a mine. Most external fuzes have more than one safety pin position. If possible, re-pin both the positive safety (hole closest to the mine) and the secondary safety position (hole farthest away from the mine). The safety pins found in a standard issue triangular bandage, paper clips, or thin nails make ideal items to neutralize fuzes. **Never force anything into a fuze.** If the first hole does not accept the safety pin freely, look for another hole.

After remotely removing a mine from the ground, wait 60 seconds in a secure area. Modern mines often use delayed fuzing. After pulling a mine out of the ground, check the hole for secondary devices. Antilift devices have a history of malfunctioning when left underground for extended periods of time. If encountered, they must be blown in place due to their extreme sensitivity.

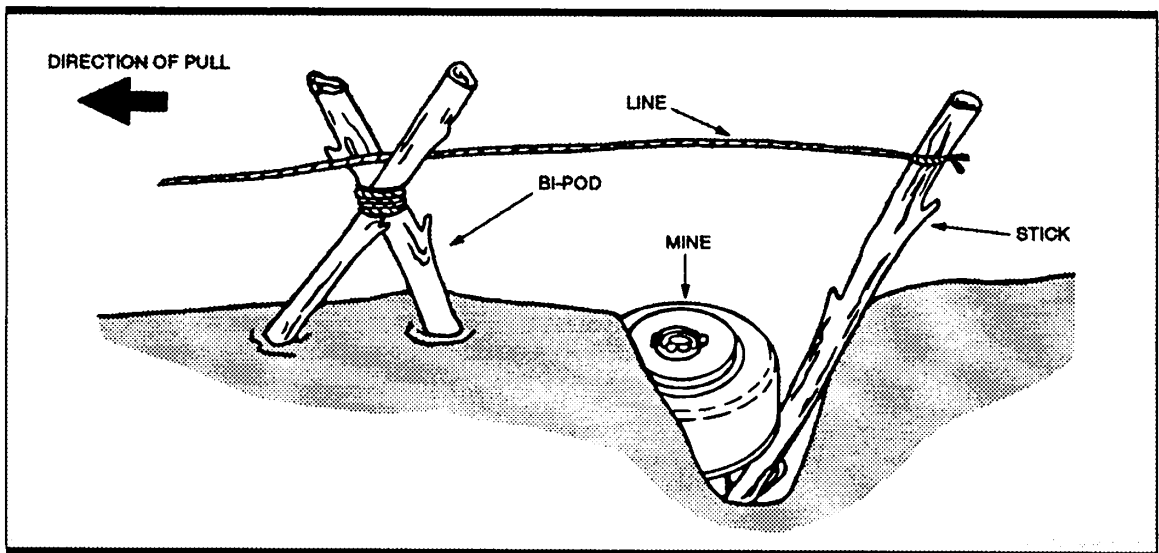


Figure I-1. Remote removal techniques.

If a trip wire is encountered, trace it to both ends and check for secondary devices or other mines before cutting or removing the wire. If thin hair-like wires are encountered, search the area for enemy soldiers. Brake wire systems or clasp circuits are being used as both a command detonation device and booby traps.

### **Chemical Munitions**

Chemical munitions will present a very hazardous situation if encountered by SFODs in the field. Most of the armies of the world can hand place, air drop, or fire these munitions. The best course of action for SFODs encountering chemical munitions is to mark the item or area, report what was found, and by-pass the hazard. Specific safety precautions for chemical munitions are as follows:

- Bypass the suspect item by taking an upwind route.
- Maintain an exclusionary zone of 2,000 meters downwind from all known chemical munitions.
- Avoid all unknown liquids, smoke, or fumes in areas where chemical munitions have been or maybe used.
- Assume ammunition supply points (ASPs) contain chemical munitions.
- Assume all modified ordnance contain booby traps, toxic chemicals, or both.

### **Pyrotechnic Munitions and Incendiaries**

Smoke grenades, artillery simulators, trip flares, star clusters and parachute flares, and other like items present special problems for SFODs. Described below are specific safety precautions for these items.

Do not inhale the smoke from any pyrotechnic or incendiary munition or source. Damage to the respiratory system will result. Some smoke compounds and incendiaries are toxic.

Never use water to smother a burning pyrotechnic or incendiary device. This action may result in a violent reaction or detonation of the munition. Sand or dirt may be used to fight fires or smother the munition. Wait for 30 minutes after all burning has stopped before approaching any pyrotechnic or incendiary munition.

Dispose of incendiary or pyrotechnic munitions by detonation only. Never try to bum these items as a detonation may result.

WP or plasticized white phosphorus (PWP) munitions bum on contact with air. If damaged, these items bum until a crust is formed over the crack or hole in the case of the munition. Removal of an impacted round from the ground may remove this crust and reignite the leaking phosphorus. This action may, in turn, activate the burster charge and result in damage to personnel or equipment. Remove all white phosphorus (WP), red phosphorus, or PWP rounds from the ground by remote means only. If possible, detonate the item in place. If WP comes into contact with skin, place a wet field dressing over the wound and seek medical help.

Wear a protective mask when working around or passing through smoke screens. WP, red phosphorus, white smoke, and other agents are harmful to the respiratory system.

### **Grenades**

Broken down into two main groups, rifle or hand, grenades are normally described by their means of delivery. These grenades can be charged with numerous fillers,

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such as high explosives (HEs), riot control agents, smoke, or other compounds. The following are specific safety precautions applicable to grenades:

- Do not drop or jar a misfired grenade. This action may cause the fuze to function as designed.
- Wait 30 minutes before approaching a misfired grenade. These grenades may function longer than normal due to damage, moisture, or modifications.
- Do not attempt to remove the fuze from a misfired grenade. This action may cause its detonation.
- Do not replace the safety pin into a misfired grenade. This action may result in a detonation.
- Never approach a smoking WP grenade. The grenade may function as designed as the heat builds up around the burster charge.
- Do not dispose of grenades by causing them to function as they were designed. Grenades are often booby-trapped for instantaneous firing.
- Take cover at a distance of more than 650 meters when disposing of unwanted grenades.

### **Rockets**

Rockets may be subsurface, surface, or air launched. Rockets may have a warhead with HEs as the main filler or a variety of other fillers. Rocket motors are normally solid-fuel type. Hazards are associated with both the warhead and the propulsion system. The following are safety precautions that are applicable to rockets:

- Approach all rockets from the side. Accidental activation of the reactor may happen at any time.
- Do not strike or jar an armed rocket.
- Wait for 1 hour before approaching an impacted rocket.
- Never remove a fired rocket from, or reinsert it into, a launcher.
- Wear a protective mask when working on any rocket motor. Wash your hands with soap and water after handling rocket motor propellant.
- Avoid long-time exposure to the toxic propellant, which may be caustic to the skin, eyes, and lungs if inhaled.
- Approach all rockets from upwind. They may contain NBC agents.
- Do not operate a radio close to rockets, which may be electrically fired. If the rocket is damaged, operating a radio may cause it to fire the motor.
- Avoid all liquids around a missile. Liquid fuels and oxidizers or NBC agents may be present. Liquid rocket fuels and oxidizers are extremely caustic.
- Avoid excessive movement around areas containing spilled liquid fuels and oxidizers. Contaminated footwear can cause agents to mix, which will result in a fire or explosion.

### **Guided Missiles**

Like rockets, guided missiles may be delivered by many different means. All of the safety precautions that apply to rockets apply to missiles. These precautions are described below.

Avoid entanglement with wires. Many missiles have a wire guidance system. Pulling on these wires may cause a misfired missile to explode.

Avoid the front of a missile. Many missiles are fuzed with a proximity fuze. This fuze may function if anything is passed in front of the nose.

### **Submunitions**

These items may be delivered by missiles, rockets, bombs, artillery rounds, ground or airmounted dispensers, or by hand. Submunitions are delivered by a single round and cover a large area. They resemble a small bomb, or they may be in the form of a small metal or plastic disk or ball. If passing through an area where submunitions were used, determine the type of ordnance used, and expect special features such as self-destruction or antihandling devices. These self-destruct features can be incorporated in even the smallest submunition. The following are safety precautions associated with submunition:

- Do not disturb any metallic or plastic object encountered on the battlefield where submunitions may have been used.
- Do not transport submunitions. The command detonation feature may function at any time.
- Take shape charge precautions for all submunitions.
- Watch for **very** thin trip wires around submunitions.
- If submunitions are still in the dispenser, do not get in front of the submunitions or fuze of the dispenser. They may be forced out under high pressure.

### **Poststrike Reconnaissance Safety Precautions**

When movement is required in an area where ordnance was recently used, special precautions are required for unexploded munitions. The following paragraphs describe some of the hazards and safety precaution associated with a poststrike reconnaissance.

**Dud Ordnance.** When munitions do not function as designed, they are considered "duds." These items have been subjected to shock, heat, spin, and the most damaging of all, impact. These forces make the ordnance much more hazardous. The safety precautions described in the following paragraphs must be observed when dealing with dud ordnance.

In all but the most extreme conditions, dud rounds must not be disturbed. Do not remove, reinsert, turn, bend, or move anything around the nose, midsection, or tail of the item. This action may release a jammed spring or stress an internal component, resulting in a detonation.

Take NBC precautions for all ordnance encountered in the field. Approach the ordnance from upwind. Avoid all unknown liquids.

If transportation of a dud round is mandatory, remove the item in the same attitude as it was found. This action will aid in reducing the movements of internal components.

**Active Ordnance.** If an item of ordnance has a fuze, then expect the item to have a delay feature. These delays can range from milliseconds today or longer. Some items, particularly land mines, have magnetic, seismic, acoustic, and infrared-influence detonation capabilities with a command-detonation back-up. These munitions can sit in the ground undisturbed, counting or waiting for the target to get within range.

If an area or item is suspected to contain active ordnance, avoid suspected areas or items. Other than possibly an NBC item, these munitions are the most dangerous. If operating around these items, remove metallic items from the body to reduce the magnetic signature.

**NOTE:** Expect detonations. Seek as much cover as possible.

These items are often susceptible to small arms fire. If trapped in an area such as a minefield where these mines are being used, an emergency path may be cleared by firing.

Most of these items have a self-destruct feature incorporated. If these items are suspected in a future area of operation, learn what was dropped, and what the self-destruct timer was set for. Then wait for the self-destruct feature to function before conducting operations in the area.

**Expendable Ordnance.** NBC contamination is not the only hazard associated with expended ordnance. The blast can damage structural integrity of buildings and loosen soil. Ordnance designed to function below the surface of the ground has a tendency to produce cavities known as camouflets. The formation of a camouflet is caused by the absorption of the explosive pressure into the soil as shown in Figure I-2. The round may travel so deep that the force of the explosive cannot rupture the soil covering it. This failure to rupture the surface may not seem very important; however, these camouflets contain concentrated carbon monoxide gas capped by an unstable layer of dirt. A soldier walking over a camouflet can fall through the crust and die from inhaling the toxic gases. Identification of a possible camouflet is the best safety. Look for—

- Unexplained mounds.
- Cracks in the soil.
- Discolored soil or vegetation.

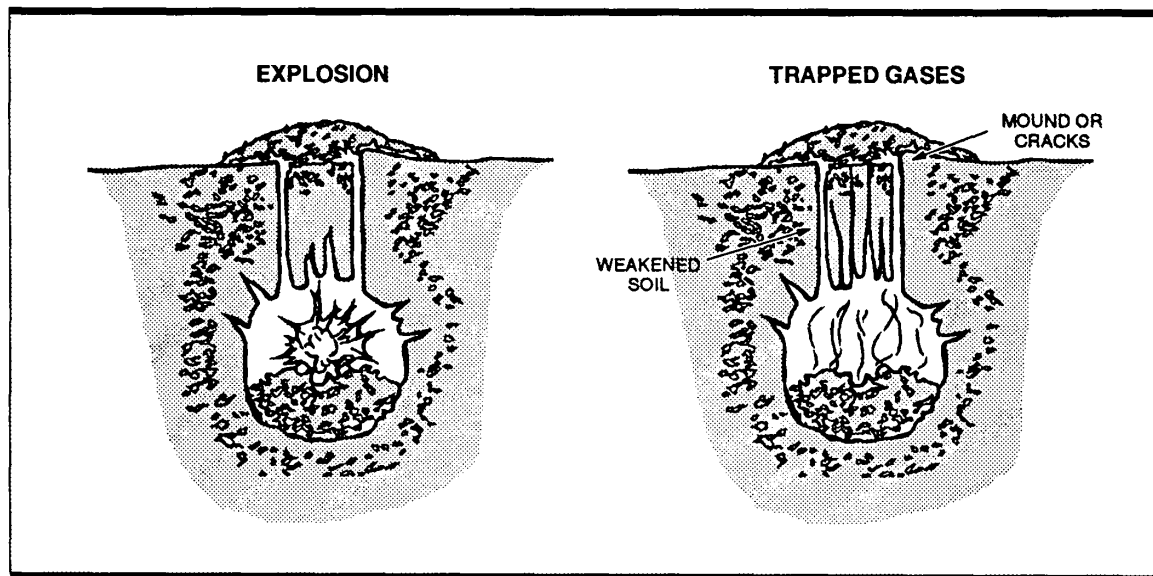


Figure I-2. Typical camouflet.

### Crash Sites

Aircraft have numerous hazards. The safety precautions described below are associated with crashed aircraft. Approach the craft from a 45-degree angle from the upwind side. Approach all crash sites in the highest MOPP level available. Modern aircraft have numerous toxic items on board. Battery fluids are very caustic, and their fumes may be encountered in concentrated, toxic levels.

Never stand directly in front of or behind the aircraft. Gun systems, radars, and engines may still be functional.

Never stand in the path of a bomb rack. Ordnance stations under the wings of fast moving aircraft don't simply drop the bombs; they are expelled under pressure. At the crash site, these pressure cartridges can still throw a 250-pound bomb about the length of a football field. Because these cartridges are electrically primed, exercise electro-magnetic radiation (EMR) precautions. These precautions include ensuring no radio messages are transmitted from the site and that static-electricity-causing clothing is removed.

Be careful when moving around the pilot's and copilot's seats. Do not touch yellow, red, or boldly striped levers, handles, or control knobs. This action will result in the expulsion of a functional ejection seat or canopy.