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TECHNICAL MANUAL

EXPLOSIVE ORDNANCE DISPOSAL PROCEDURES

GENERAL EOD SAFETY PRECAUTIONS

This complete revision supersedes Revision 6 dated 15 Jul 2003

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(Prepared by the Naval Explosive Ordnance Disposal Technology Division,
2008 Stump Neck Road, Indian Head, MD 20640-5070)

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PURPOSE STATEMENT (U)

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CHANGES (U)

(U) Errors in the EODB or recommendations for its improvement by Navy units shall be submitted in accordance with NAVEODFLTLAU Publication Note 1-99.

(U) Errors in this EODB or recommendations for its improvement by Marine units should be submitted to the Officer-In-Charge, Marine Corps Detachment, 2008 Stump Neck Road, Indian Head, MD 20640-5098, in accordance with MCO 3571.2.

(U) Reports of errors, omissions, and recommendations by Army units for improving this TM by the individual user are encouraged. Reports should be submitted on DA Form 2028, Recommended Changes to Publications, and forwarded directly to Commander, U.S. Army Technical Detachment, 2008 Stump Neck Road, Indian Head, MD 20640-5096.

(U) Recommended changes, additions, or deletions by Air Force units to this T.O. shall be submitted in accordance with T.O. 00-5-1 to Commander, Detachment 63, 2008 Stump Neck Road, Indian Head, MD 20640-5099.

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CHAPTER 1. INTRODUCTION.

1-1. PURPOSE.

a. Basic Safety Precautions. This manual provides, in a single document, those basic safety precautions applicable to all nonnuclear explosive ordnance: explosive main charges, fillers, and explosive initiating components.

b. General Safety Precautions. This manual also provides general safety precautions applicable to classes, (bombs, grenades, rockets, etc.), of nonnuclear explosive ordnance. Coverage in this manual eliminates the need for covering basic and general safety precautions in specific-item manuals.

1-2. SCOPE. Safety precautions contained herein are those applicable to operations on explosive ordnance of all nations, but are limited to those precautions that are basic or general in nature. For safety precautions applicable to underwater explosive ordnance, review the 60-series manual on underwater ordnance operations and procedures.

1-3. USE. This manual has been compiled for use by explosive ordnance disposal (EOD) personnel engaged in, or responsible for, EOD operations, and will not be used by non-EOD personnel.

1-4. BASIC SAFETY DOCUMENTS.

a. Regulations established by military services pertaining to the basic safety requirements for

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explosives and ammunition items are contained in the following publications:

- (1) Army. TM 9-1300-206, TM 9-1300-214, and AR 385-64.
- (2) Navy. OP-5, Volume 1.
- (3) Air Force. AFI 91-201.
- (4) Marine Corps. OP-5, Volume 1, and MCO 3571.2.

b. These documents should be consulted and complied with, as applicable. As there are minor differences between them, the documents pertaining to a particular service govern for that service. Where discrepancies exist between this manual and these documents, the requirements of the latter shall govern.

1-5. SAFETY CONCEPTS.

a. General.

(1) Disposal of unexploded ordnance (UXO) may be considered as two separate problems: disposal of the incident, and final disposition of the unexploded ordnance.

(2) Disposal of the incident is the action taken to render a hazardous situation safe, by removal of the cause of the hazard. This action might include such procedures as removal of an unexploded projectile, demolition of a bomb in place, or removal of fuzes from the UXO.

(3) Disposal of the UXO, in some incidents, may be accomplished along with the disposition of the incident. For example, the ordnance may be blown in place, thus solving both problems at the same time. In other incidents, the problem of final disposition still remains after the incident is closed.

(4) Final disposition may be affected in many ways. The disposition may be requested from higher authority where further use for service, research, or intelligence is desired. The methods most widely used, when definite requirements for recovered ordnance are not specified, are to remove the UXO to a demolition area and destroy it by demolition, or to demilitarize it for scrap.

(5) The preferred and safest method for disposal of unexploded ordnance is to destroy it in its original position, by demolition (blow in place). This method should be used whenever considerations and circumstances permit. When employing the blow in place method on small thin-cased munitions with sensitive fuzing, place the charge close to, but not touching the UXO. On larger items that will remain stable and have thick cases, place the charge directly on the ordnance. By this method, both the incident and the ordnance are disposed of by one simple demolition operation, and no render safe procedure (RSP) is necessary. This method, however, is not considered to be an RSP within the technical interpretation usually applied.

b. Procedures.

(1) The term "rendering safe" refers to that portion of an explosive ordnance disposal procedure which is designated to preclude the detonation or functioning of explosive ordnance, and which may involve the application of special EOD techniques and tools, to interrupt functions or separate essential components of the ordnance. Rendering safe permits disposal of the ordnance without detonation, or reduces the resultant explosion to a lesser magnitude.

(2) Care must be observed to avoid confusion between the terms "disposal" and "rendering safe." As a rule, the disposal of the ordnance creating the incident is a requirement. Use of render safe procedures in accomplishing disposal, may or may not, be required. The decision to use an RSP results from the estimate of the situation. RSP's and associated safety precautions are covered in the applicable

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60-series manuals on specific ordnance.

1-6. BASIC CONSIDERATIONS. The following safety considerations apply in general to all explosive ordnance, and should form a part of the planning preparatory to EOD operations involving possibly hazardous explosive ordnance munitions and components.

- a. EOD personnel must be alert at all times to be in observance of safety precautions. They also must advise personnel in the vicinity as to proper precautions for the protection of all persons within the damage radius of unexploded ordnance. By their nature, EOD operations are hazardous, and certain calculated risks must be taken; ingenuity, judgment, common sense, and above all, the mastery of EOD techniques and observance of EOD principles, will determine success or failure.
- b. There is no "safe" procedure for rendering safe and disposal, merely a procedure which is considered least dangerous. However, maximum safety in any EOD operation can be achieved through adherence to applicable safety precautions.
- c. When a situation is encountered in which the given procedure cannot be used, and it is mandatory that the operation be accomplished immediately, improvised procedures may be used.
- d. Until it can be absolutely determined that the object is not magnetically functioned, do not take magnetic tools or equipment near an unidentified object. Magnetically functioned explosive ordnance can be extremely sensitive to very small magnetic field changes.
- e. In dealing with an unknown type of explosive ordnance, past experience, conditions of delivery, and probable or obvious targets, will usually provide a clue as to probable type. However, considerations should include:
 - (1) The most hazardous type it could be.
 - (2) The most hazardous features it could contain.
 - (3) The most hazardous condition it could be in.
- f. EOD operations must not be conducted by one person alone, except in an extreme emergency where the compromising of safety is warranted by the seriousness of the incident. If only one EOD person is available, and there is insufficient time to secure the services of an additional EOD person, some other person should be designated as "safety backup" during the RSP and/or disposal operation. The person acting as "safety backup" will remain out of the danger area, but will be prepared to go to the aid of the EOD person if an accident should occur. For major EOD operations, medical personnel should be available.
- g. Care must be observed in probing for, moving, and handling explosive ordnance. Operations on the UXO should be conducted only after the establishment of a complete plan, for the operation involved, and careful preparation to ensure its implementation.
- h. Limit personnel exposure time at the ordnance site. To the extent possible, tool preparation, publications research, and other incident support activities should be performed at a safe distance from the ordnance.

CHAPTER 2.

BASIC SAFETY PRECAUTIONS FOR NONNUCLEAR EXPLOSIVE ORDNANCE.

2-1. INTRODUCTION. This section covers basic safety precautions applicable to all nonnuclear explosive ordnance in the broadest sense.

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2-2. ALL EXPLOSIVE ORDNANCE.

- a. Review electromagnetic radiation (EMR) hazards and precautions, and electrical grounding procedures, prior to conducting EOD operations on explosive ordnance, containing known or suspected electrically actuated explosive devices.
- b. Observe the following magnetic, acoustic/seismic, infrared, and laser precautions during the approach, and continue to observe these precautions until it is certain that the ordnance does not contain magnetic, acoustic/seismic, infrared, or laser fuzing.

(1) Magnetic:

- (a) Do not approach the ordnance with any tool or metallic object that is not approved for use on magnetically actuated ordnance.
- (b) Allow no movement of magnetic or ferrous material located near the ordnance.
- (c) Do not disturb or move the ordnance.
- (d) Screen personnel for a magnetic signature with a field magnetometer, if available, before approaching the ordnance.
- (e) Do not turn power lines, motors, or generators on or off in the area.
- (f) Do not permit compasses, magnetic telephones, or other sources of magnetic-field-producing equipment near ordnance.
- (g) Maintain maximum distance from magnetic sensors.
- (h) Eddy currents, caused by movement of metallic material, can be reduced by moving such material very slowly.

(2) Acoustic/Seismic:

- (a) Do not operate vehicles in the immediate vicinity of suspected acoustic/seismic ordnance.
- (b) Do not wear or carry loose equipment, which may rattle, flap, or otherwise cause noise.
- (c) Move with slow deliberate motions; avoid abrupt moves.
- (d) Permit no metal-to-metal contact, scraping, or scratching on the ordnance or in the immediate vicinity.
- (e) Use some form of cushioning, such as rubber or similar material, between tools or explosive charges and the ordnance.
- (f) Avoid imparting vibration into the ordnance or surrounding area.
- (g) Refrain from throat clearing, coughing, and vocal emissions.
- (h) Do not talk or create noise within 75 feet (23 meters) of the ordnance. Use full acoustic precautions within 30 feet (9 meters) of the ordnance, by restricting necessary noise or vibration to a period of 1-second duration, followed by a minimum period of 3 seconds of silence.
- (i) If the ordnance must be touched, hands should be discreetly placed on the area, then removed and

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carefully placed in the general area of the next point of interest. Do not rub the ordnance or slide hands from point to point.

(3) Infrared:

(a) Do not permit personnel, vehicles, or any heat-generating source in front of an infrared sensor.

(b) Do not permit personnel, vehicles, or any objects to pass between an infrared source and a receiver.

(c) Some seeker domes and seeker components are toxic. Use a mask and gloves when handling broken or burned components.

(4) Laser:

(a) Do not permit personnel, vehicles, or any objects to pass through a laser beam being emitted from a munition.

(b) Do not approach a laser-beam-emitting munition until the prescribed wait time for the battery has expired.

c. When RSP or disposal cannot be performed immediately on ordnance items, they should be appropriately marked. This will ensure that the item can be easily located, and will inform other personnel that an immediate hazard does exist.

d. Make every effort to identify the explosive ordnance before performing any RSP. Carefully examine the item for markings and other identifying features such as shape, size, and external fittings. However, do not move the item to inspect it, unless necessary. If ordnance of concern must be moved, do it remotely. Manual movement of the ordnance, or ordnance item component of concern, should only be considered when, beyond a reasonable doubt, doing so will not function the ordnance or ordnance item component.

e. Conduct any initial movement or jarring of a possibly hazardous munition or item by remote means.

f. Clear debris from obstructed explosive ordnance only enough to permit whatever action is necessary to perform the EOD mission. If movement of debris will disturb the ordnance, or create hazardous signals, perform the clearance remotely.

g. Make certain that the explosive ordnance will not move if it must be worked on directly.

h. Do not dismantle, strip, or subject any explosive ordnance to unnecessary movement except in response to a valid requirement.

i. Note any unusual markings, signs of tampering, or modifications to otherwise familiar ordnance. Such ordnance will be considered unknown ordnance.

j. Avoid inhalation of, and skin contact with, smoke, fumes, and vapors of explosives and related hazardous materials. Also avoid contact with hazardous liquids and solids that may result from damaged or actuated munition system components (i.e., mercury-thallium, cadmium dust, depleted uranium, thorium, lead, and battery electrolyte). Wear adequate respiratory equipment and protective clothing to preclude skin contact and ingestion.

k. Some electronic components in munitions use beryllium as a heat sink. For undamaged components, wear surgeon's gloves with overgloves. For damaged or burned components, wear full protective clothing with high-filtration mask.

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- I. Do not sharpen or grind beryllium-alloy tools. This produces beryllium dust, which is extremely toxic if ingested, inhaled, or exposed to broken skin. Obtain medical attention as soon as possible if beryllium is ingested, inhaled, or if there is a cut produced by a beryllium-alloy tool.
- m. Wait at least 30 minutes, if possible, and only after all evidence of burning and smoldering has ceased, before approaching any ammunition and/or explosives or other hazardous material(s) that were on fire, exposed to fire, or subjected to excessive heat, shock, or friction. Unconsumed explosives or hazardous materials may still be present and may unexpectedly reignite or detonate. Only an on-site authority will determine the number of essential personnel required to initially investigate any ammunition and/or explosive material incident or accident.
- n. Use caution working with ammunition and/or explosives that were on fire or exposed to fire. Chemical and physical changes may have occurred, resulting in a more sensitive state to the exposed item(s) of concern.
- o. Do not manually handle a possibly armed item of explosive ordnance unless specifically called for in the EOD procedures or, beyond a reasonable doubt, doing so will not function the item(s) of concern.
- p. Do not depress plungers, turn vanes, or rotate spindles, levers, setting rings, or other external fittings on the explosive ordnance, except as specifically directed in the EOD procedures for the item. Such action may arm, actuate, or function the ordnance.
- q. Do not remove high-pressure bottles or suspected pressurized hydraulic accumulators from a munition unless specifically required to do so by the EOD procedures.
- r. Do not allow non-essential personnel in the vicinity where EOD operations are pending or are in progress. An on-site authority will determine which personnel are essential or non-essential.
- s. Remove components from explosive ordnance by remote means unless established procedures direct otherwise. In the absence of information to the contrary, assume that antiwithdrawal devices are present under all components, which must be removed.
- t. No attempt will be made to remove bursters from dud-fired, damaged, or leaking toxic chemical munitions.
- u. The removal of bursters from explosive ordnance, in a condition other than mentioned above, is not required unless called for in the EOD procedures for the particular item involved.
- v. Do not perform an RSP if blowing in place is permissible. As a general rule, this method is the safest, fastest, simplest, and most economical, when it is suitable to the task. If authorized by service directive(s), and at the discretion of the Officer-In-Charge, RSP's may be performed in a training scenario. The RSP training will be limited to those tools and procedures that DO NOT require contact with the fuze or munition.
- w. Take precautions against boobytraps. Boobytraps can be incorporated into almost all types of ordnance.
- x. Do not rely on the color coding of explosive ordnance for positive identification of contents. Munitions having no, incomplete, or improper color coding have been encountered.
- y. As required, incorporate adequate protective measures and mitigation techniques to reduce explosion effects to personnel and material before performing EOD procedures on explosive ordnance of concern. Review the 60-series manual on protection of personnel and property for protective measures and techniques. Review AEODPS available programs such as the EOD Tactical Decision Aid (EOD-TDA), the Buried Explosion Module (BEM) program, and the Blast Effects Computer (BEC) as required.

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z. Review safety precautions on hazardous lithium batteries, as given in the 60-series manual on handling and disposal of lithium batteries, prior to conducting EOD operations on, or accepting, lithium batteries.

2-3. EXPLOSIVE-LOADED MUNITIONS.

a. Introduction. Explosive-loaded ordnance includes high and low explosives of all countries. For descriptive data on explosive materials, which may be encountered in ordnance, refer to applicable 60-series manuals. Due to the numerous references in specific 60-series manuals to shaped charge (including high-explosive antitank (HEAT)) ordnance precautions, these types of loadings are given special coverage (paragraph c).

b. Safety Precautions for Explosive-Loaded Ordnance.

(1) Do not subject any explosive-loaded ordnance to shock or rough handling. The item and/or its contents may be in an extremely hazardous condition.

(2) Protect explosive-loaded ordnance and explosive-loaded components from extreme heat, including the direct rays of the sun. High temperatures can greatly increase the sensitivity of explosives.

(3) Do not carry explosives or explosive components in pockets or elsewhere on the body, unless in special containers designed and approved for the purpose.

(4) Do not permit smoking, matches, or other sources of fire or flame, (except for approved items intended to be used for ignition), within 50 feet (15 meters) of an area in which explosives or explosive-loaded ordnance is being handled.

(5) Exercise extreme caution when dealing with old, damaged, and possibly deteriorated explosive-loaded ordnance. Certain explosives, notably picric acid, ammonium picrate, and explosive D may react with metals, other explosives, air, or chemicals in the earth, to produce extremely sensitive explosive compounds.

(6) Anticipate a detonation when burning any explosive. Safety measures for personnel and property must be based on this possibility. Certain low explosives, such as black powders, casting powders, and solid propellants having a high nitrogen content, can react under certain conditions, resulting in a high-order detonation.

(7) Smoke will penetrate ordinary clothing and may cause severe dermatitis, as well as eye and respiratory irritation. If the smoke cannot be avoided, wear appropriate protective clothing and respiratory protective equipment.

(8) Wear gloves and wash thoroughly with soap and water as soon as possible after handling explosives, including known toxic or unknown types of solid propellants. Severe dermatitis can result from skin contact.

(9) Do not inhale the gaseous products of high-explosive detonations. Some of the gases produced are toxic.

c. Safety Precautions for Shaped Charge and HEAT Ordnance.

(1) Introduction. These munitions have a special type of high-explosive (HE) loading, employing an explosive of high brisance formed in a manner which leaves a conical or hemispherical cavity, in the nose of the munition. Such a munition, when detonated from the rear (opposite the open end of the cavity), produces a concentrated explosive jet (Munroe effect) forward of the munition, along the central axis of the charge and cone. This jet has great penetrating power and is commonly used to penetrate armor. In

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this role, it is commonly designated as a HEAT munition. To be effective, the munition must be detonated at a point opposite the open end of the cone and there must be an adequate distance forward of the cone, at the instant of detonation, to permit the explosive jet to fully form before encountering the armor.

(2) **Uses.** This explosive loading is commonly used in an antiarmor role in artillery projectiles, cluster munitions, projected grenades, guided missiles, and rocket warheads. The principle is also used in demolition procedures for special effects.

(3) **Safety precautions.**

(a) Avoid the area forward of the nose of a munition item until it can be ensured that the item is not a shaped charge munition. The explosive jet can be fatal to great distances forward of the longitudinal axis of the item.

(b) Assume any shaped charge munition contains a piezoelectric fusing system, until the fusing is otherwise identified. Do not touch or move an armed munition except by remote means; it may be extremely sensitive and can fire at the slightest physical change.

(c) Observe adequate safe distances when manipulating the shaped charge munition remotely. These charges can project lateral fragments to considerable distances, and some types have been constructed to enhance the lateral fragment effect.

(d) In destroying shaped charges by detonation, initiate the munition to be destroyed in a manner which precludes the explosive jet from forming. This is best accomplished by initiating a charge on the side of the munition at a point 90 ° to the axis of the cone. The detonation point should be forward of the base, but not so far forward as to fire into the empty cone of the shaped charge. Where the inadvertent formation of the explosive jet may present a hazard, place the round to be destroyed in a pit, so that any jet formed will penetrate into the earth.

(e) Dispose of shaped charge munitions individually or in small quantities to reduce the possibility of inadvertent formation of a full jet effect.

2-4. CHEMICAL-LOADED MUNITIONS.

a. **Introduction.** Explosive ordnance may contain chemical material either as a main payload or as a significant component. Chemical materials include toxic chemical agents, riot-control agents, and smokes. Ordnance which may contain chemical agents include bombs, dispensers, clusters and launchers, projectiles, grenades, rockets, guided missiles, landmines, and miscellaneous explosive devices. For detailed information on the disposal and decontamination of chemical agents, refer to applicable 60-series manual.

b. **Safety Precautions.**

(1) Evacuate and isolate the downwind area for the distances specified in applicable instructions for toxic chemical agents, before beginning EOD operations on any munition containing chemical or riot-control agents.

(2) Approach an item of explosive ordnance suspected of containing toxic chemical agents from an upwind direction, while wearing protective clothing and equipment.

(3) Wear appropriate protective clothing and respiratory protective equipment while performing the EOD procedures.

(4) Check the area and the item for agent leakage, using a chemical-agent detector kit. If leakage is found, all unprotected personnel should be kept at a distance of 2,187 yards (2,000 meters) during the operation. This distance may be adjusted as described in the 60-series manual on chemical and

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biological (C/B) agents and related materials.

- (5) Avoid skin contact with caustic solutions. They will cause serious burns on contact.
- (6) Have first aid equipment available for toxic chemical agents.
- (7) Perform chemical disposal procedures only under the supervision of properly trained and equipped personnel.
- (8) When working on toxic or riot-control agents, have protective equipment available and in a serviceable condition in the area at all times.
- (9) Periodically check the area and the ordnance item with the proper detection equipment. The senior EOD person at the incident site should evaluate the situation and determine whether to perform the RSP, or to decontaminate first. Regardless of the sequence of events, decontamination must include the surrounding area as well as the item itself.
- (10) When dealing with chemical munitions other than smokes, EOD personnel should render the explosive components safe; EOD personnel may be required to dispose of the chemical agent.
- (11) Consider as toxic, the fumes and smoke resulting from burning and/or venting of chemical agents. The area must be properly evacuated downwind, and signs visible from all directions must be posted.
- (12) To disperse the chemical agent and prevent the formation of hazardous concentrations, dispose of chemical-loaded munitions when the weather is producing lapse conditions.
- (13) Carefully remove contaminated clothing without allowing the contaminated portions to touch the skin, and place the clothing in a decontamination solution after completing the operation and withdrawing from the affected area.
- (14) Do not use sodium hydroxide (caustic soda) as a decontaminant on aluminum munitions. Sodium hydroxide reacts violently with aluminum, generating heat and hydrogen gas, deteriorating the aluminum. This may result in warhead leakage.
- (15) Observe chemical precautions as given in the 60-series manual on chemical and biological (C/B) agents and related materials.

2-5. PYROTECHNIC- AND INCENDIARY-LOADED MUNITIONS.

a. Introduction. Pyrotechnic mixtures, used to produce light and/or colored displays for signaling purposes, are usually physical mixtures or blends of powdered chemicals which include fuels and oxidizers, so that the mixture burns when ignited. Pyrotechnic loadings may be encountered in bombs, clusters and cluster adapters, projectiles, rockets, grenades, landmines, hand-signaling devices, and all types of training munitions. Incendiary mixtures are usually of the hot metal (thermite) types, or of an oil base, such as napalm. Incendiary loadings may be encountered in any class of ordnance. Ordnance filled with incendiary or pyrotechnic mixtures are subject to deterioration, with resultant increase in ignition sensitivity, if exposed to high temperatures. Some mixtures may ignite spontaneously if exposed to moisture. Ordnance containing these mixtures are fire hazards, burn with intense heat, and are difficult to extinguish. Most types furnish their own oxygen upon combustion. Photoflash charges detonate with great violence, rather than burn. In general, water should not be used to combat incendiary or pyrotechnic fires.

b. Safety Precautions.

- (1) Do not inhale the smoke or fumes of burning pyrotechnic or incendiary materials. The fumes and dust from many of these materials are irritating and/or toxic if inhaled. Wear a protective mask where

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extensive fumes may be encountered.

(2) Protect the eyes by No. 6 shade welders goggles, or equivalent, if visual exposure to burning pyrotechnic materials is probable. Such burning materials can cause serious eye injury unless the eyes are properly protected.

(3) Use sand to smother incendiary fires. Water may induce a violent reaction or be completely ineffective, depending on the mixture.

(4) Bury incendiary-loaded munitions in sand when transporting them. This will smother any fire which could start until other corrective action can be taken.

(5) Anticipate a high-order detonation when burning pyrotechnic- or incendiary-loaded ordnance. Safety measures for personnel and property must be based on this possibility.

(6) Dispose of pyrotechnic- and/or incendiary-loaded munitions by burning or detonation. The exact method to be used will vary, depending on the particular item to be destroyed.

(7) Do not approach a pyrotechnic or incendiary ordnance burn area for at least 30 minutes after the cessation of burning. Unconsumed explosive components may still be present after burning ceases.

c. Photoflash Munitions.

(1) Do not attempt to dispose of photoflash munitions by burning.

(2) Do not look directly at photoflash munitions during disposal operations.

(3) Photoflash powder should be desensitized by spraying or soaking with oil, diesel fuel, hydraulic fluid, or other nonvolatile lubricants.

(4) Do not manually remove fuzes from munitions containing photoflash powder.

(5) Do not remain in the vicinity of a damaged photoflash munition longer than necessary, after it has been exposed to excessive moisture. Photoflash powder will react with moisture and generate hydrogen gas, and this reaction may generate sufficient heat or pressure to detonate the munition.

d. Red Phosphorus-Loaded Munitions.

(1) Do not permit red phosphorus to come in contact with oxidizing agents (chlorates, perchlorates, etc.). Such mixtures can form very sensitive explosive compounds.

(2) Check expended pyrotechnic devices carefully for red phosphorus residue, and decontaminate if necessary. Due to incomplete combustion, red and white phosphorus may be present and reignite spontaneously.

(3)

Do not crush or break crusted phosphorus residue which may be present after red phosphorus has been burned. This residue is sensitive and may ignite if subjected to friction or if the crust is broken.

(4) Decontaminate confined spaces in which red phosphorus devices have been burned. Incomplete combustion may produce deposits of red and white phosphorus which may reignite spontaneously at any time, emitting fire and smoke.

(5) Isolate and decontaminate, as necessary, items or equipment which have been associated with burning red phosphorus under water. Such items may be contaminated with phosphorus residue, which may reignite spontaneously as they dry out.

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(6) Submerge a damaged, partially consumed, or functioned pyrotechnic device containing unconsumed red phosphorus residue in water, or cover it with mud, wet sand or earth, or foam, as quickly as possible, if necessary to handle or transport.

- e. Fireworks.

NOTES

Consult service directives prior to or disposing of fireworks.

If available, review National Fire Protection Association Standard Publication (NFPA) 1123, prior to working with fireworks.

- (1) Fireworks are extremely sensitive and may be chemically similar to photoflash powder.
- (2) Fireworks should be destroyed as soon as practical after recovery.
- (3) Fireworks should be desensitized by spraying or soaking them with oil, diesel fuel, hydraulic fluid, or other nonvolatile lubricants.
- (4) Transport desensitized items in plastic bags, preferably 6 mils thick.
- (5) If large quantities are to be transported, the bags of desensitized fireworks should be placed in sturdy cardboard boxes or suitable substitutes. This will prevent the items from bearing the weight of others and reduce the hazard of friction caused by load shifting.

WARNING

Do not approach fireworks that fail to function as designed for at least 30 minutes .

(6) Utilize manufacturer's disposal procedures, if available. Disposal of fireworks may be accomplished by detonation or burning. To prevent kick-outs from mortar-type fireworks, burning of limited quantities should be done in a trench.

2-6. SMOKE-LOADED MUNITIONS.

- a. Bursting Smoke.

(1) Introduction. The properties of plasticized white phosphorus (PWP) are similar to those of white phosphorus (WP). Both are solid chemicals which burn when exposed to air. Vapors which may be present in high concentrations of the smoke, are irritating and poisonous. Burns are deep, painful, and continuing, unless treated. PWP and WP are found in a wide variety of munitions and are used as screening smokes and/or incendiary agents. They are also used as igniters in certain types of incendiary munitions.

- (2) Safety precautions.

(a) Assume that WP munitions with explosive bursters are present until investigation proves otherwise. Use protective equipment and have first aid items available and ready for use.

(b) Identify and treat a known or suspected WP munition in accordance with the requirements of its fuzing and the item's overall condition. The fuzing may be armed, of an especially hazardous type, or be in an otherwise hazardous condition.

(c) Do not approach a smoking WP munition unless absolutely necessary. Burning WP may detonate

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the burster or disperse the explosive charge at any time.

(d) Submerge a smoking (leaking) WP munition in water or cover it with mud, wet sand or earth, or foam, as quickly and gently as possible, if necessary to handle or transport.

(3) First aid. Refer to applicable service publications.

(4) Protective equipment. Personnel should have gloves (cotton, leather, or asbestos), a face shield, and flame-retardant clothing available, when working with suspected leaking WP munitions. The protective mask should be worn when personnel are exposed to WP smoke.

b. Screening Smoke.

(1) Wear a protective mask in areas where strong concentrations of screening smokes can develop. Strong concentrations of screening smokes generally irritate the eyes and respiratory tract.

(2) Replace filters in protective masks if troops are exposed to moderate or high concentrations of red phosphorus (RP) screening smoke for an extended period or for repeated exposures.

2-7. FUZES AND FUZING SYSTEMS - GENERAL.

a. Introduction. Fuzes contain, in a single unit, an explosive initiating charge and the means for initiating this charge. Fuzing systems divide these elements and functions among several units. Certain elements of fuzing systems closely resemble fuzes and should be treated similarly to fuzes. Safety and arming (S&A) devices containing explosives, electrical circuits, and arming systems are typical of these. Pistols are normally inert items which, when associated with an initiating explosive (detonator), become a fuzing system. Fuzes and fuzing systems are used in a wide variety of surface ordnance, including bombs, dispensers, clusters, launchers, projectiles, grenades, rockets, landmines, guided missiles, pyrotechnic devices, and in some types of underwater ordnance. Fuzes and fuzing systems may be mechanical, pyrotechnic, chemical, electrical, electronic, or combinations of these. They function in a variety of designed modes such as impact, long delay, time after launch, and antidisturbance.

(1) Fuze identification. When identification of a fuze is impossible, the type of arming device and type of firing device in the fuze must be determined. When a fuze can be identified only as one of several types, treat the fuze as the most hazardous type.

(2) Fuze condition. Before attempting to render safe any fuze, its condition must be determined. The condition of a fuze usually can be determined through careful inspection of the visible components of the fuze. However, if the condition is questionable, consider the fuze armed and perform the procedure prescribed for an armed fuze. When more than one fuze is installed, render safe the most hazardous fuze first. If this is impracticable, reduce the danger of the most hazardous fuze to an acceptable level and render safe the second fuze; then render safe the first fuze.

b. Safety Precautions.

(1) Approach, handle, and render safe a fuze following acceptable EOD practices. The fuze is considered the most hazardous component of explosive ordnance, regardless of type or condition.

(2) Observe magnetic, seismic, infrared, and acoustic precautions when approaching an unidentified fuze.

(3) Do not allow movement of equipment in the impact area until it is determined to be safe to do so. Some fuzes are designed to function on passage of a predetermined number of targets.

(4) Refer to the specific fuze publication prior to attempting an RSP. Some fuzes contain boobytraps that function on fuze removal.

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(5) Perform any initial movement of an armed fuze remotely. Do not drop, strike, or jar an armed fuze. It may be in a very sensitive condition and may be fired by such action.

(6) Avoid any unnecessary movement of an armed fuze.

(7) Do not attempt to reset an adjustable clockwork fuze to an indicated safe position or reinsert any fuze safety device. Clockwork fuzes are susceptible to jamming or damage upon impact. These fuzes may fire if an attempt is made to return them to a safe condition.

(8) Assume that an electric fuze is sensitive to shock, heat, discharges of static electricity, and stray electric current. Many of these fuzes have a nonelectric impact-firing device, in addition to an electric firing device, often one which is graze-sensitive.

(9) Observe the minimum waiting period specified for an identified electric fuze before proceeding with the EOD procedure. Electrical energy remains in fuzes for varying periods of time, after impact. When a fuze cannot be identified, wait a minimum of 1 hour.

(10) Positively identify any munition or component before performing any procedures. Several munitions contain piezoelectric crystals that cannot be identified by the shape of the munition. Armed piezoelectric crystal fusing systems may remain hazardous for an indefinite period of time. Do not disturb any armed ordnance with a piezoelectric crystal firing system. Armed piezoelectric crystal firing systems may be sensitive to a shock or force that may stress the crystal.

(11) Turn off any source of radio-frequency energy in the vicinity of a known or suspected proximity (VT) fuze. A proximity fuze may be capable of being fired by radio-frequency energy transmitted to the fuze by an outside transmitter.

(12) If the munition is known to contain a VT fuze, do not approach it until the prescribed waiting time has expired.

(13) Do not drop, jar, or strike a fuze, or subject it to heat or any other force likely to fire a possibly armed fuze. Many fuzes are fired by spring-loaded firing pins. In addition, the firing pin or other metal fuze part may be embedded in an explosive component.

(14) Keep a fuze which has been removed from ordnance, separated from other explosive ordnance. A fuze located near another explosive charge may induce its detonation, should the fuze accidentally explode.

(15) When transporting a possibly armed fuze, position the fuze in the most neutral orientation possible, considering its design and all forces which may act on it, or its components.

(16) Do not subject a mechanical time fuze to any unnecessary movement. These fuzes contain a clock mechanism which may be temporarily stopped by a mechanical malfunction, and the firing pin or detonator, which is under spring tension, may be partially released.

(17) Observe the minimum waiting period specified for an identified powder train time fuze. When a fuze is tentatively identified as powder train time, but further identification of type or nomenclature cannot be made, wait a minimum of 30 minutes. If 30 minutes has obviously elapsed since the ordnance was dropped or fired, an additional wait time is not required.

(18) Approach with caution ordnance items that can be affected by strong or gusting winds, (i.e., cocked striker, piezoelectric, antistrike, or tripline, ribbon, parachute, air-inflated decelerator/RAM air-inflated decelerator (AID/RAD)-equipped ordnance, and other items as applicable). Movement of these items by such environmental conditions could cause them to function.

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c. Transportation of Explosive Munitions Containing an Armed Fuzing System.

(1) When prescribed in Joint Service approved 60-series information sets/manuals, hand-carry and vehicle transportation procedures for explosive munitions, containing an armed fuzing system, are based on the maximum acceleration g-load that a munition will experience, during the procedure. Current methodology has been established from extensive data, derived from controlled testing, that established the acceleration limits as 3-g for hand-carry, and 10-g for motorized vehicle transport.

(2) For vehicle transportation, acceleration imparted to an armed munition is primary function of road conditions and vehicle speed. Of less significance is the type of vehicle, location of the munition on the vehicle (front vs rear), vehicle load, type or weight of the munition, and padding material. The use of vehicle-pulled trailers for the transportation of armed munition(s) has not been evaluated and therefore should be avoided.

(3) Do not allow an armed munition to come into contact with any portion of the transport vehicle bed/body during transportation. Sand or sandbags offer good padding and propping material over materials such as plastic air-bubble packing, rubberized mohair, and foam padding. Munition(s) experience greater acceleration forces when in contact with the transport vehicle bed/body.

(4) Additional payload weight from the use of sand/sandbags tends to reduce acceleration forces to a munition(s), during transport over various road surfaces. Sand and/or sandbags provide dual-purpose as a barricade/mitigation against primary case fragments, and at the same time increasing the transport vehicle weight, facilitating a smoother ride.

(5) Avoid placing an armed munition(s) near the rear bed/body and away from the rear cross frame of the transport vehicle. Acceleration forces tend to be greater at these locations.

(6) The following road surface conditions/descriptions and vehicle speed limitations are intended to facilitate risk and decision analysis for motorized vehicle transportation of armed munition(s). Acceleration forces of less than 10 g have been observed under test conditions for the following road surfaces descriptions and speeds. Be aware that these road descriptions and speeds do not consider road anomalies such as pot-holes, expansion joints between pavement sections and at bridge road junctions, railroad crossings etc. that may be encountered along any road surface. When possible, the transport route should be analyzed and anomalies noted, prior to actual transportation of the munition(s) of concern.

(a) Belgian Block (cobble stone) - individual cobble stones average five inches in width: An irregular and bumpy surface with crests of about three inches. The crests are such that a vehicle traveling over them is subject to both pitching and rolling motion. Recommended speed limit is up to 18 miles-per-hour (MPH) (28.97 kilometers-per-hour (KPH)).

(b) Spaced Bump concrete pavement with spaced speed bumps: The spacing between the speed bumps is such that the front and rear wheels of a vehicle impact the bumps at random intervals. Some bumps are at an angle to the wheel axis so that the left wheel and the right wheel impact at different instances of time. Recommended speed limit is up to 6 MPH (9.66 KPH).

(c) Radial Washboard concrete pavement with a right and left turn: The road surface is a series of bumps (resembling a washboard) at various angles to the vehicle wheel axis. The bumps may vary from two to four inches in height and from one to six feet from crest to crest. The bumps angles, road turns, and the vehicle wheel base causes the wheels being impacted in a random pattern. Recommended speed limit is up to 4 MPH (6.44 KPH).

(d) Gravel well maintained compacted dirt and gravel surface whose surface condition is not always the same, dependant on the time since last graded maintenance. Recommended speed limit is up to 30 MPH (48.28 KPH).

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(e) Paved well maintained typical paved asphalt over concrete, and/or aggregate base, seamless surface. The paved straightaway is essentially a level road. Recommended speed limit is up to 30 MPH (38.28 KPH).

CHAPTER 3.

GENERAL SAFETY PRECAUTIONS FOR NONNUCLEAR EXPLOSIVE ORDNANCE.

3-1. INTRODUCTION. This section provides general safety precautions applicable to specific classes of nonnuclear explosive ordnance.

3-2. BOMBS.

a. Introduction. This paragraph covers all explosive ordnance classified for EOD purposes such as bombs, regardless of size, type, loading, or fuzing. Safety precautions include those of a general nature which apply specifically to bombs, and which have not been covered in Chapters 1 and 2.

b. General Safety Precautions. In addition to the applicable basic precautions covered in Chapters 1 and 2, observe the following:

(1) Positively identify the bomb. Some HE-filled bombs have rocket motors for stand-off delivery or increased penetration; others contain fillers such as chemical agents, photoflash composition, or incendiary material.

(2) Do not move or jar a bomb initially, except by remote means, unless permitted in a specific RSP. Some fuzes may contain a hung cocked striker, antidisturbance device, etc.

(3) Do not move or jar a bomb, or attempt any portion of an EOD procedure until the type and condition of its fuzing has been determined.

(4) Do not drop a fuze or subject a fuzed bomb to impact or shock. Such action may cause a time fuze to start or resume functioning, or may release a hung cocked striker.

(5) Do not turn arming vanes, insert safety pins or pop-out pins, pull or cut arming lanyards, or attempt fuze removal, except as called for in specific fuze RSP's.

(6) Observe all safety precautions for the applicable fuze, or fuses, during fin assembly removal procedures.

(7) Observe magnetic, seismic, and acoustic precautions during the approach to any bombs. Continue to observe these precautions until it is certain that the bomb does not contain magnetic-, seismic-, and/or acoustic-influence fuzing.

(8) Assume that the most dangerous fuze or fuses are installed in the bomb if visual recognition of fuses cannot be made, due to closure plugs or fin condition.

(9) Do not remove fuzes by hand if the bomb could possibly contain an explosive charge of picric acid. If explosive salts have formed, removal of the fuze could detonate the bomb.

(10) Do not pack a fuze well with plastic explosive if the well contains a detonator. Detonators are sensitive to heat, shock, and friction.

(11) Do not attempt to separate the detonator from the pistol, if attached, after pistol is removed from bomb. The firing pin may be embedded in the detonator, or explosive salts may have formed between the detonator and the pistol.

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(12) Do not remove a United Kingdom tail pistol by hand if it has been in the bomb in excess of 14 days. Movement of the pistol may function the detonator if explosive salts have formed between the detonator and the pistol.

(13) Photoflash bombs must be handled with the same care as black powder, and with even greater care than conventional explosive-loaded bombs. When loose photoflash powder is observed, stop all work until the loose powder has been desensitized and the leaking bomb has been removed from the operating area.

(14) Do not manually remove a fuze from a photoflash bomb. The bomb burster charge or photoflash powder may be in the fuze threads, and may detonate the bomb if pinched in the threads.

(15) Do not continue manual removal of any steel closure plug(s)/retaining ring(s), adapter booster(s), or FMU-type fuzing, with 3-inch diameter threads from tritonal-filled bombs, if excessive binding occurs. Proceed immediately to remote removal procedures or disposal procedures. There is a possibility that explosive-contaminated exudate may be in the fuze wells of tritonal-filled bombs.

3-3. CLUSTERS, DISPENSERS, AND LAUNCHERS.

a. Introduction. Precautions in this paragraph are applicable to all explosive ordnance classed as dispensers, clusters, and launchers, and to the explosive ordnance they contain. The precautions are general in nature, but sufficiently specific, to be limited to this class of munitions, and therefore are not included in Chapters 1 and 2.

b. General Safety Precautions. In addition to the applicable basic precautions covered in Chapters 1 and 2, observe the following:

(1) Observe all safety precautions applicable to the fuze.

(2) Observe all safety precautions applicable to the payload.

(3) Positively identify the dispenser and payload before attempting an EOD procedure. It may contain random delay fuzing and a payload of HE, incendiary, chemical, or smoke munitions.

(4) Approach a cluster or generator from an upwind direction until certain that no chemical or other toxic agent is present.

(5) Approach and work from the side of a dispenser only. Should an actuation occur, payload items may be ejected with dangerous force.

(6) Consider a dispenser loaded. The presence or absence of a payload may not be obvious from an external examination.

(7) Exercise caution around a dispenser or cluster adapter that contains no payload. The dispenser may contain explosive detents, ejection cartridges, or other explosive devices.

(8) Do not remove munitions from a dispenser unless absolutely necessary. Many of the contained munitions are designed to arm as soon as they leave the dispenser.

(9) Do not jar or unnecessarily move the fuze or dispenser. Such action may initiate the dispenser and eject its contents.

(10) Render safe any bombs which are separated from a ruptured cluster adapter before performing the procedures on the cluster adapter. Individual bombs may be scattered over a wide area. Bombs outside the adapter, or dislodged within it, may be armed.

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(11) When more than one fuze is present, evaluate their conditions and render safe the most dangerous fuze first.

(12) Handle practice bombs carefully during, and after, their removal from a dispenser. They contain spotting charges which are hazardous if functioned.

(13) Remain clear of retracted dispenser fins; actuation may cause injury.

3-4. PROJECTILES.

a. Introduction. Projectiles include missiles which are projected by guns, mortars, howitzers, and rifles, other than small arms. They may be rocket-assisted in some cases. Projectiles may carry almost any type of payload, including high explosive, chemical, incendiary, pyrotechnic, biological, nuclear, inert, training, spotting, and test payloads. Projectiles range in size from less than 20 millimeters to over 16.00 inches in diameter. They use a wide variety of fusing, both as to functioning and in operating principles. Fuzing may be multiple in a single projectile.

b. General Safety Precautions. In addition to the applicable basic precautions covered in Chapters 1 and 2, observe the following:

(1) Identification.

(a) Examine the projectile to determine if it has been fired. Consider it armed if it has been fired.

(b) Positively identify the type of projectile and its fusing, and determine the condition of the fuze or fuzes, before performing the RSP. Ascertain the type and amount of projectile main charge or filler, and the number and types of any other explosive or pyrotechnic components, which may be present. Projectiles may be identified by markings and color codes stenciled/painted on the projectile. However, the most reliable identification is by the physical characteristics and engraved or stamped markings, on the exterior of the projectile body. In addition, the designation of projectile components, such as fuzes or fin assemblies, may be marked on the exterior surface of the component.

(c) Determine the country of origin of the projectile and compare its color marking against known national markings and color codes, if possible. A thorough knowledge of the various national color codings, marking systems, and external configurations and details, is required for proper identification.

(d) Do not move a projectile to inspect for markings unless absolutely necessary. If required, move the projectile remotely.

(e) Examine a projectile for the presence or absence of an unfired tracer. This knowledge may have a bearing on the procedure to be used.

(2) Projectiles.

(a) Do not drop, jar, strike, or otherwise mishandle a projectile at any time during the EOD operation. A projectile is a sensitive explosive assembly, especially if it has been fired, or otherwise subjected to unusual stress.

(b) Stay clear of the front and rear of the projectile when performing the render safe procedure on an ejection projectile. Initiation may result in explosive ejection of the payload.

(c) Perform initial movement of an embedded projectile remotely, using a line. First movement of an embedded projectile may cause fuze functioning, under certain conditions.

(d) Do not pick up a fired projectile unless called for in the EOD procedure.

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- (e) Observe rocket motor precautions when dealing with a rocket-assisted projectile.
 - (f) Do not, under any circumstances, dismantle, disassemble, or otherwise strip, unexploded projectiles or projectile components, except in response to a valid requirement.
 - (g) Have appropriate protective clothing and respiratory protective equipment available when handling smoke and/or riot-control agent projectiles.
 - (h) Do not approach a smoking WP or PWP projectile unless absolutely necessary. It may cook off an associated burster charge at any time.
 - (i) Assume a practice projectile contains a live charge until it can be determined otherwise. A practice projectile should not be regarded as harmless simply because it does not have a live filler. Target practice projectiles may contain small pyrotechnic and explosive charges. Furthermore, personnel should not assume that a projectile does not have hazardous components because it is color-coded or marked as a dummy. Protect flash cartridges used in practice projectiles from moisture. Some cartridges contain powdered metals, which may react violently, and liberate explosive or toxic fumes, when exposed to moisture.
 - (j) Transport fired, separated, cracked, or unfired projectiles, containing depleted uranium in a closed, padded metal container. The depleted uranium is an alpha/low-level-beta-emitting pyrophoric radioactive material.
 - (k) Do not dispose of projectiles containing depleted uranium by burning or detonation. The depleted uranium expels a toxic (alpha/low-level-beta-emitting) heavy metal smoke, while burning, or when detonated.
 - (l) Wear adequate respiratory equipment and protective clothing during EOD procedures on munitions containing depleted uranium that have been involved in fires or detonations. This will preclude skin contact, ingestion, and inhalation of toxic/heavy metal smoke.
- (3) Projectile fuzes.
- (a) Exercise extreme care in handling graze-sensitive, electric, switch-actuated, piezoelectric, spring-loaded, and cocked-striker fuzes. Very little external force is required to function armed fuzes of these categories.
 - (b) Wait 1 hour after arming before approaching a possible VT fuze. This should permit the electrical charge to bleed off condensers and safe the fuze.
 - (c) Do not attempt to remove base fuzes from projectiles unless remote stripping facilities are available. The fuze may be in direct contact with the explosive, and a chemical reaction may have occurred.
 - (d) Use extreme care in handling air column fuzes. Many fuzes of this type are always armed.
 - (e) Do not disturb or remove any foreign matter that may be embedded in the nose of an armed fuze. Doing so may function the fuze.
 - (f) Do not attempt to replace safety pins or wires in fuzes, or to reset them to safe, unless called for in specific EOD procedures. Such action may function the fuze.
 - (g) Seal the open end of the flash tube with tape or other suitable material when a sheared fuze with an exposed flash tube is encountered.

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(4) Projectile components. Exercise extreme caution when handling explosive-loaded components which have been separated from the projectile. Some projectile components are held in place by the fuze; removal of the fuze leaves the components unsecured and exposed. In some instances a sensitive lead is exposed. Normally, projectile components, other than the fuze, are not removed or withdrawn from the projectile, during the RSP. Always protect the primer of an unfired cartridge when handling or transporting a fixed round of ammunition or a propellant case. It may contain a percussion primer.

3-5. GRENADES.

a. Introduction. Grenades may be designed for hand or rifle projection. They may contain an HE main charge or a variety of fillers which include riot-control agents, smokes, and incendiary and pyrotechnic materials. A variety of fusing is available. Hand grenades are usually time-delay fuzed; projected grenades may be time-delay or impact fuzed. Grenades are not limited to military application, but are widely used by police and other civil authorities. Grenades are easily and frequently boobytrapped.

b. General Safety Precautions. In addition to the applicable basic precautions covered in Chapters 1 and 2, observe the following:

- (1) Do not drop or jar a grenade. This may arm and function the fuze.
- (2) Do not disturb a grenade, except remotely, until the condition of the fuze can be determined. The grenade may be extremely sensitive to movement.
- (3) Wait at least 30 minutes before approaching a suspected dud-fired grenade; deterioration or dampness may prolong the burning time of the pyrotechnic delay.
- (4) Do not attempt to remove the fuze from a dud-fired grenade. This may function the fuze.
- (5) Do not attempt to replace the safety pin in a dud-fired grenade. This may function the fuze.
- (6) Manually handle an armed grenade only as a last resort and after considering all methods of remote disposal. An armed grenade may be extremely sensitive to movement.
- (7) Wear proper protective equipment when dealing with known or suspected chemical grenades.
- (8) Do not approach a smoking WP grenade unless absolutely necessary. It may cook off an associated burster charge at any time.
- (9) Move an embedded grenade by remote means only. Grenades may contain a piezoelectric fusing system.
- (10) Do not attempt to dispose of grenades by functioning them in a normal manner. Many types are easily boobytrapped for instantaneous firing.
- (11) Take proper cover and observe a safe distance before detonating a grenade. Fragments may be projected over a radius of 650 feet (198 meters).
- (12) Ensure that the fuze body and base of practice hand grenades are pointed away from the body. Fuze functioning could cause serious injury.

3-6. ROCKETS.

a. Introduction. Rockets may be launched from aircraft, ships, vehicles, fixed positions, and by individuals. The rocket warhead section may contain an HE main charge or a variety of fillers, which include chemicals, pyrotechnics, incendiaries, or combinations of these agents. The solid-propellant rocket motor is used for propulsion in weapons other than rockets. These include guided missiles,

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bombs, projectiles, underwater weapons, and target missiles. The hazards of a rocket include those related to the warhead section and those related to the propulsion system.

b. General Safety Precautions. In addition to the applicable basic precautions covered in Chapters 1 and 2, observe the following:

- (1) Approach and work on an unfired rocket motor from the side. Ignition will create a missile hazard and hot exhaust.
- (2) Do not jar or otherwise disturb an armed warhead. If it is necessary to move it, do so remotely.
- (3) Perform initial movement of an embedded rocket from a safe distance.
- (4) Positively identify the fuze, if possible. If it cannot be identified, assume it to be the most hazardous type which can be used in the item.
- (5) Where more than one fuze is present, deal with the most hazardous fuze first.
- (6) Where the possibility of charged capacitors exists, wait a sufficient time, (at least 1 hour), for them to discharge, before beginning any operation on the rocket.
- (7) Do not remove weapons from launchers in an EMR field. There is a risk of functioning the motor igniter in so doing.
- (8) Do not, under any circumstances, dismantle, disassemble, or otherwise strip unexploded rockets or rocket components, except in response to a valid requirement.
- (9) Approach from upwind, and wear a protective mask, if the rocket is suspected of containing smoke or riot-control agents. (For toxic chemical agents, see Chapter 2.)
- (10) Do not approach a smoking WP warhead unless absolutely necessary. It may cook off an associated burster charge at any time.
- (11) Wash thoroughly with soap and water after handling rocket motor propellant. Certain solid propellants are toxic and present a skin, eye, and respiratory hazard.
- (12) Do not expose electrically fired rocket motors to any electronic transmitting equipment or antenna leads within 25.0 feet (7.6 meters).
- (13) Do not transport an unfired rocket unless the motor igniter is shielded from EMR. It may contain electric squibs or other sensitive electroexplosive devices (EED's).

3-7. GUIDED MISSILES.

a. Introduction. Guided missiles may be launched from aircraft, ships, vehicles, fixed installations, and by individuals. They vary in size from a weapon capable of being carried and fired by one man, to intercontinental types fired from large, complex, fixed or mobile installations. The warhead section may contain a nuclear or HE main charge, or a variety of fillers which include chemical or biological agents. Propulsion systems may be solid propellant (rocket motors), liquid fuels and oxidizers, or combinations of these energetic materials. Fuzing systems are usually complex and may be compound.

b. General Safety Precautions. In addition to the applicable basic precautions covered in Chapters 1 and 2, observe the following:

- (1) Approach.

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- (a) When a guided missile has been located, restrict all vehicle movement as much as possible, in the vicinity of the missile.
- (b) Avoid entanglement with the wires of a wire-guided missile; pulling the wires may jar the missile.
- (c) Terminate mobile and other radio equipment transmissions within the critical area, as per appropriate safe distance recommendations of service directives.
- (d) Approach an unidentified guided missile from the side. Many missiles have proximity fuzes, and some produce microwave radiation.
- (e) Do not approach a guided missile that has been in a fire until sufficient time has elapsed for it to cool. If the missile has a specified waiting period, the period should commence after the missile has cooled.
- (f) When approaching an unidentified guided missile, observe nuclear, chemical, liquid fuel, and liquid oxidizer precautions, until monitoring has verified that the missile does not contain a nuclear/chemical warhead or a leaking liquid-propellant rocket motor.
- (g) Approach and work on an unfired rocket motor from the side. Ignition will create a missile hazard and hot exhaust.
- (h) Do not approach an armed guided missile that has proximity fuzing while using a fluorescent light. Fluorescent light has been known to function armed proximity fuzes.

(2) Identification.

- (a) Identify the type of guided missile, if possible, prior to commencing the EOD procedure.
- (b) Remotely perform initial movement necessary for missile identification.
- (c) Consider the following when attempting to identify a missile:
 - 1. An air-to-air or surface-to-air missile generally contains an HE-fragmentation warhead. A surface-to-surface or air-to-surface missile may contain any type of warhead.
 - 2. A rocket motor of single-piece construction probably contains solid propellant, while a rocket motor of two- or three-piece construction may be an engine, containing liquid propellant. Some liquid-propellant engines may have a solid-propellant grain, (gas generator), for combining the fuel and oxidizer.
- (d) Wait a minimum of 3 hours, after impact, before approaching an unknown missile. This period may allow the missile to self-destruct or allow the fuze firing system power supply to bleed-down to a no-fire level.

(3) Fuzing systems.

- (a) Consider the warhead fuzing system armed if the missile's propulsion system has been fired. Some fuzing systems arm by pressure from the propulsion system alone, and do not require acceleration.
- (b) Do not strike or jar any missile components. The warhead may contain more than one fuze and may incorporate a self-destruct system. Most proximity fuzes have some type of impact backup. These fuzes may be anywhere throughout the missile system. An impact fuze may incorporate either a sensitive contact switch or a piezoelectric crystal. Some systems also contain an antibreakup device along the

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length of the warhead.

(c) Do not disconnect or cut any electrical cable unless it is specifically prescribed in the EOD procedure, or unless the explosive train has been broken. A fuzing and firing circuit can fire because of a loss of, or drop in voltage.

(d) Take precautions against anticompromise devices or boobytraps when performing procedures on a foreign guided missile.

(4) Propulsion systems.

(a) Wear appropriate protective clothing and respiratory protective equipment when performing procedures on a missile which contains a liquid-propellant rocket engine. Liquid-fuel propulsion systems contain highly caustic and toxic fuels and oxidizers that can cause serious burns or respiratory damage. Observe precautions and review procedures outlined in applicable 60-series manual.

(b) Observe maximum fire-prevention precautions for the rocket motor.

(c) Remain upwind when working on a missile suspected of containing leaking fuels and oxidizers.

(d) Do not allow liquid fuels to mix with oxidizers. Mixture of the two liquids will result in a violent hypergolic reaction.

(e) Thoroughly wash the outer surface of protective clothing after working in the presence of fuels and/or oxidizers.

(f) Do not attempt to remove an igniter from a missile motor section unless specifically called for in an RSP.

(5) Guidance and control systems.

(a) Take precautions against burns when performing procedures on a missile which contains a thermal battery. These batteries develop extremely high temperatures when activated. They may also be coated with cadmium, which produces toxic dust and/or gases.

(b) Avoid body contact with the electrolyte used in wet-cell batteries. This electrolyte can be highly corrosive and can cause serious burns, eye injury, and if ingested, poisoning. Immediately remove any contaminated clothing, wash the affected area with large quantities of water, and seek medical assistance.

(c) Do not move, bend, cut, or disconnect any high-pressure lines, until certain that the system is void of pressure. Remotely cut or separate any line suspected of being under pressure. Almost all guidance and control systems contain high-pressure air, hydraulic liquid under pressure, or both.

3-8. LANDMINES AND ASSOCIATED BOOBYTRAPS.

a. Introduction. Landmines are emplaced area-denial weapons, which vary from small antipersonnel (apers) types, to larger antitank (AT) or special-purpose types. Many landmines are designed to be boobytrapped. They are frequently used as part of boobytrap systems and can use demolition firing devices similar to boobytraps. Landmines may be loaded with high explosives, chemicals, or pyrotechnic materials. They may be fused in a variety of ways, including mechanical, electrical, chemical, acoustic/seismic, infrared, magnetic-influence, or controlled firing systems. They may be fired by pressure, tripwire, tension release, explosive pressure pulse, pressure release, magnetic field changes, or direct electrical circuit closure.

b. General Safety Precautions. In addition to the applicable basic precautions in Chapters 1 and 2,

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observe the following:

- (1) Landmines in general.
 - (a) Observe magnetic precautions when approaching or working on landmines with a known or suspected magnetic influence fuze.
 - (b) If it is absolutely necessary to walk into a mined area, move slowly, looking at the ground carefully to note disturbances in the soil and the presence of any tripwires.
 - (c) Handle all mines and fuzes with care at all times.
 - (d) Permit only one person at a time to work on one mine.
 - (e) Probe and examine carefully, the ground around a mine, before starting to work on it.
 - (f) Be constantly on the lookout for boobytraps.
 - (g) Before lifting a mine, neutralize all external fuzes.
 - (h) Perform all initial movement of the mine remotely.
 - (i) Assume the presence of other mines nearby, whenever a landmine is located; also assume that:
 - 1. AT mines may be protected by apers mines.
 - 2. All mines may be protected by boobytraps.
 - 3. Any mine can be emplaced with antilift devices.
 - (j) Do not manually disturb, drop, or strike an armed mine or mine fuze. It may contain a cocked-striker firing system.
 - (k) Consider an emplaced landmine armed, until proven otherwise. It may not be possible to tell, or it may be intentionally rigged to deceive.
 - (l) For greatest safety, the preferred disposal procedure for antipersonnel and antitank landmines is to detonate using explosives, or burn, using incendiary grenades, the mine in place. Explosive charges/incendiary grenades may be placed on or near the mine and initiated from a safe distance.
 - (m) Before disarming any mine, first determine the number and types of fuzes incorporated within the mine. Once a determination has been made, the safety precautions set forth herein, should be followed as appropriate to the fuzes and mine encountered.
 - (n) Do not cut or pull a taut wire; never pull a slack one. Look at both ends of a wire before you touch it.
 - (o) Take cover before pulling a mine, and do not come out for at least 60 seconds after you have pulled it. There may be a delay fuze.
 - (p) Do not touch an AT mine that has been pulled from its emplacement until after closely examining the mine case, to ensure that the case was not deliberately altered, to permit separation at its base. Separation of the mine case from its base and main charge will function an internal pressure/pressure-release fuze.

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- (q) Do not use force on a mine or boobytrap. If a part cannot be removed without applying an undue amount of force, cease removal procedures and destroy the mine in place.
- (r) If a mine or boobytrap must be left unlifted, mark the location prominently and notify the proper authorities.
- (s) Improvised grapnels may be used to clear tripwire-actuated mines.
- (t) When cutting the wires of an electric detonator, cut and tape them one at a time, to avoid closing the circuit with the wire cutters. A mine is harmless if the firing train is broken, but there may be more than one firing train.
- (u) Do not stack fuzed mines. Many types contain pressure-actuated fusing which may be fired by such action.
- (v) Handle training mines with care; many contain firing indicator charges capable of inflicting serious injury.
- (w) If possible, destroy in place all mines loaded with picric acid explosive. Extremely sensitive explosive salts may have formed wherever the explosive contacts the metal, particularly in the threaded areas of the fuze and fuze wells.
- (x) Observe acoustic/seismic precautions when approaching or working on landmines with a known or suspected acoustic/seismic fuze.
- (y) Remotely remove emplaced landmines.
- (z) Do not remove a mine from its emplacement if the pressure plate is compressed or deformed. The fuze may contain a hung cocked firing pin.

(2) Antitank mines.

- (a) Do not uncover an AT mine until the ground has been thoroughly checked for antilift devices. Probe cautiously, for even the disturbance of the earth by the probe may release the fuze striker. A nonmagnetic probe is safer to use, as the mine may have a magnetic fuze.
- (b) Do not remove the pressure plate from a metallic AT mine unless the mine can be positively identified as one that is not fitted with a pressure/pressure-release fuze.
- (c) Exercise care when disarming wooden AT mines by hand. Frequently, holes are drilled through the bottom of the case and pullwires connected to auxiliary fuzes are threaded and anchored to a stake underneath. If the stake is driven deep enough, it is not easy to locate the wire by probing. A pressure-release fuze, or pull fuze with pullwire, may be actuated by raising or removing the pressure plate or lid. Some wooden mines have a special mousetrap device that is actuated in this way.
- (d) Exercise care with wooden AT mines that have been buried for a long time. Because of soil conditions, the wood deteriorates, and the slightest inadvertent pressure on the top, may initiate the fuze.
- (e) Observe infrared precautions when approaching or working on a known or suspected off-route AT landmine.

(3) Antipersonnel mines.

- (a) Neutralize apers mines by replacing all safety pins, if possible, before lifting the mines.
- (b) Exercise care when hand-disarming apers mines with tripwire actuation. Before cutting tripwires,

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trace them from mine to anchor, (often the anchor may be another mine). Be alert for small apers mines laid along the side of, or underneath the tripwire, to hinder disarming. Always trace the tripwire from the friendly side - do not straddle it - as a safeguard against accidental tripping, or stepping on a small apers mine, laid underneath the tripwire. If possible, insert a safety pin in the fuze before cutting the tripwire.

(4) Landmine fuzes.

(a) Be extremely cautious disarming tilt fuzes by hand, especially if they have been partially initiated. There must be no movement of the tiltrod when the fuze is removed from the mine. Some may not have a safety feature, or a safety device may not be available or cannot be applied.

(b) Use extreme caution disarming belleville-spring-type fuzes by hand, as they may be partially initiated by contact or blast, and a slight jar or movement will set off the mine. Some may not have a safety feature, or a safety device may not be available or cannot be applied.

(c) Infrared safety precautions. Observe the following infrared precautions when approaching and working on a possibly armed item, suspected of being actuated by an infrared sensor or receiver.

1. Do not permit personnel, vehicles, or any heat-generating source, in front of an infrared sensor.
2. Do not permit personnel, vehicles, or any objects, to pass between an infrared source and receiver, in front of the ordnance.

3-9. AIRCRAFT HAZARDS.

a. Introduction. The aircraft itself, irrespective of any munitions it may carry, presents a number of serious hazards. As the majority of these hazards are unique to aircraft, those of a general nature are given here in some detail. Emergency EOD procedures applicable to aircraft consist of actions to be taken if an aircraft or munitions are involved in an accident/incident or fire. EOD personnel should be thoroughly familiar with these instructions. Refer to NAVAIR 00-80R-14 or TO-00-105E-9 (Aircraft Firefighting and Rescue Manual) for typical firefighting information. EOD personnel will not usually be concerned with an aircraft accident until completion of the firefighting phase. Do not depend on the reported cook-off times for various types of ordnance; wide variations in these can be expected because conditions of fire, fuel, and ordnance vary. If possible, wait until the fire has been extinguished and the ordnance has cooled sufficiently to be handled. The interior of larger ordnance may not reach maximum temperature for some time after exposure to fire, due to size and low thermal conductivity. If possible, record the exact time that a fire completely envelops a munition. This action provides the only basis upon which to form an estimate of the amount of time left to evacuate the area, before munition functioning. Some firefighting, time factors, evacuation distances, and withdrawal time criteria, are contained in NAVAIR 11-5A-17 for conventional weapons, and SWOP 20-11 for nuclear weapons. Air Force EOD personnel should be thoroughly familiar with instructions contained in TO 11A-1-46.

b. Approach Precautions. If engines are running, caution should be exercised when approaching the aircraft. In situations where emergency procedures are required of EOD personnel, the following safety precautions shall be observed:

(1) Avoid the exhaust-jet-wake danger area. Engine exhaust heat and blast are severe enough to cause injury to personnel up to 300 feet (91 meters) behind the aircraft. Danger from blast-impelled dirt and rocks exists.

(2) Remain in excess of 25.00 feet (7.62 meters) from the aircraft, in the vicinity of the engine intakes. Engine intake suction is hazardous in an arc of 120 ° from the nose. Use extreme caution when entering engine inlet danger area. Personnel ingestion into engine inlet will cause death.

(3) Avoid the turbine blade danger area, if at all possible. Turbine blade disintegration/failure danger exists in a conical area 300 feet (91 meters) out from either side of the aircraft, in line with the leading

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edge of the aileron. This area should be observed with caution, particularly if the aircraft has suffered crash damage.

(4) Always approach an aircraft involved in an accident at a 45 ° angle from the rear. All weapons contained within, or carried on an aircraft are launched toward the front or rear. In addition, should an overheated tire burst, the danger zone is to the front, rear, and side.

(5) Stay clear of rotating propellers and the prop wash area of propeller-driven aircraft. In addition, where turboprop engines are involved, a jet exhaust hazard also exists.

(6) Exercise caution in the vicinity of an operating auxiliary power unit (APU) of the turbine type. They create a suction and hot exhaust hazard and emit high-intensity sound which can cause hearing damage.

(7) Avoid the intake suction and engine exhaust areas of helicopters whose engines are running.

(8) Exercise extreme care in the vicinity of a helicopter whose rotor blade is turning. Certain types rotate sufficiently close to the earth to present a hazard within their blade sweep area. In addition, rotor blade failure can cause missile hazards over a wide area in any direction.

(9) Wear earplugs or earphones if the engines are running. High-intensity sound from the engines can cause hearing damage, when approaching the aircraft.

(10) Approach with caution if the aircraft has been subjected to fire damage.

(11) Always ensure that the seat ejection system is safe, (safety pins installed or hoses cut), before attempting removal of an aircrewman from the seat.

(12) Do not turn, twist, or pull any switches in the cockpit of a crashed aircraft, as the condition of the electrical circuitry is unknown.

(13) Use caution upon cockpit entry. Any equipment in the cockpit, which requires movement for ejection, is probably initiated by explosive means.

(14) Avoid inhalation of, and skin contact with, smoke, fumes, and vapors of explosive and related hazardous aircraft materials. Also avoid contact with hazardous liquids and solids that may result from damaged or actuated munition system components, (i.e., mercury-thallium, cadmium dust, depleted uranium, battery electrolyte). Wear adequate respiratory equipment and protective clothing to preclude skin contact and ingestion.

c. Electromagnetic Radiation (EMR) Hazards. Radar/radio energy can cause radiation damage or burns to personnel. The following safety precautions shall be observed:

(1) If it is known or suspected that the radar or electronic countermeasure (ECM) equipment is operating, approach the aircraft from the side, avoiding the nose area.

(2) Do not introduce electroexplosive devices (EED's) into a radiation hazard (RADHAZ) environment. Radar energy can induce arcing between the aircraft surface and other metal objects within the radar's energy field.

(3) Do not look directly at the radar antenna in the nose of the aircraft.

NOTE

If the engines are not running, it can be assumed that no RADHAZ threat exists around the aircraft.

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d. Hot Wheels and Brakes.

(1) If hot wheels or brakes are suspected, approach the aircraft at a 45 ° angle from the rear, to avoid the tire/brake explosion danger area. This area extends out to 300 feet (91 meters) from each of the main landing gear wheels.

(2) Do not use water or carbon dioxide to extinguish a fire and/or cool the brakes. Wheel castings have high percentages of magnesium and may explode if subjected to water or carbon dioxide.

e. Oxygen Systems.

(1) Do not permit oils, greases, or solvents to come into contact with oxygen. A spontaneous fire or explosion may result.

(2) Do not allow liquid oxygen to contact the skin. Severe frostbite can result.

f. Fuel Systems. Exercise extreme care to avoid ignition of fuel vapors which can pose an explosive hazard. Examine the fuel areas for leakage.

g. Hydraulic Systems.

(1) Exercise extreme caution when working on, or in the vicinity of any portion of the hydraulic system.

(2) The contained fluid in these hydraulic systems is under high pressure and will form an explosive/flammable mixture if released into the air.

h. Pneumatic Systems. Exercise extreme caution when working on, or in the vicinity of any portion of the pneumatic system. These systems contain various gases which may be at extreme high pressures. Wearing of ear protectors may be required.

i. Fire Extinguishers. Take precautions to avoid breathing the fumes of a fire extinguisher agent. Certain extinguishing agents are toxic.

j. Electrical Systems.

(1) Ensure that the aircraft is properly grounded as soon as possible, by first attaching the ground cable to the ground, and then to the aircraft.

(2) Exercise extreme care and caution when working in the vicinity of electrical circuits.

k. Batteries.

(1) Potassium hydroxide or sulfuric acid used in the electrolyte of many aircraft batteries is very corrosive and can cause severe burns. Treat body contact by flooding the affected area with water, then consult medical personnel.

(2) Keep open flames and sparks away from the battery; battery fumes are highly explosive.

l. Ordnance Stores.

(1) A preliminary check for armed ordnance should be made if any immediate or potentially dangerous condition exists.

(2) Personnel will ground themselves before handling EED's, impulse cartridges, and electrically primed munitions.

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(3) If any forward-firing ordnance, (to include gun systems), is present on the aircraft, stay clear of the area directly forward of the aircraft and, if required, the area immediately behind the ordnance. These areas should be avoided until completion of safing/removal procedures.

(4) Exercise caution with bomb rack safing until impulse cartridges are removed.

(5) Check all munitions involved in an accident for unsafe conditions before downloading them from the aircraft.

(6) Utilize armament personnel whenever possible, to assist in downloading munitions from a crashed aircraft.

(7) Never attempt to remove weapons from a crashed aircraft by using pilot controls.

(8) Do not work underneath a damaged aircraft unless the gear locks are in place or the aircraft is properly supported.

(9) When working around the tail of the aircraft, ensure that the arresting hook, if present, is properly secured.

(10) Ensure that pressure hoses or electrical connectors are disconnected from guns and gun pods, prior to downloading.

(11) Turn off aircraft power prior to performing any other steps of the EOD procedure when weapons, launchers, dispensers, etc., are attached to an aircraft.

m. Cartridge Actuated Devices (CAD's). CAD's are explosive devices used in aircraft to perform mechanical work such as seat ejection, hose cutting, canopy removal, etc. The majority of these devices are electrically actuated and, as such, are also EED's. When dealing with these items, the following safety precautions apply:

(1) Positively identify the CAD and determine its condition (when applicable).

(2) Do not twist, turn, or pull any wires, switches, or cables, unless their operations are definitely known.

(3) Using the applicable aircraft hazards manual, determine the operating procedures and the location of explosive ordnance that may be present.

(4) Personnel will ground themselves before handling EED's, starter cartridges, bomb ejector cartridges, and electrically primed ammunition.

(5) Electrical cartridges and CAD's, by design, may be hazards of electromagnetic radiation to ordnance (HERO)-susceptible, during handling and unloading operations, even if they are classified as HERO-safe when installed. Do not allow the electrical contact, electrode (primer), or contact pins to touch any object capable of transmitting or storing radio frequency (RF) energy, during handling and unloading operations. Objects capable of transmitting or storing RF energy include aircraft structures, bomb rack breeches, tools, and other cartridges and CAD's.

(6) Never attempt to disassemble any cartridge or CAD unless it is requested by a crash investigating committee and authorized by appropriate authority.

(7) Firmly secure high-pressure hoses in place on both sides of the point of cut, before cutting to avoid possible violent whipping.

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- (8) Stand clear of the breech assembly and ejector foot, when removing ejection rack cartridges.
 - (9) Always assume that a breech assembly contains a cartridge, until proven otherwise.
 - (10) Do not subject a CAD to shock, heat, or rough handling. CADs contain explosive charges and constitute a hazard.
 - (11) Do not place any more of the body than necessary, over any portion of a CAD.
 - (12) When a CAD is in the armed condition, fully insert the ground safety pin, when applicable. Always use the original ground safety pins or a suitable substitute such as a steel cotter key or nail. Never use brass or copper wire, etc.
 - (13) When working with gas-fired CADs, ensure that high-pressure hoses are pointed in a safe direction and tied down, before they are cut or disconnected.
 - (14) When carrying a CAD to a disposal area, keep it in a horizontal attitude and pointed away from personnel and equipment.
 - (15) When removing ejector cartridges, do not stand in front of breeches or exhaust ports.
 - (16) Whenever rocket catapults are involved in an incident/accident, whether the seat has ejected or not, assume the catapult contains propellant, until proven otherwise. The booster charge may have burned, and a live sustainer may still be present.
- n. Carbon-Boron-Graphite-Composite Fibrous Material Mishap. Large quantities of carbon boron fibers are contained in new composite material used in aircraft structures. Carbon-boron-fibers can be released if the composite material burns or explodes, as a result of an aircraft accident. When this occurs, these fibers, because of their small size (0.006 to 0.020 millimeters in diameter) and light weight, can remain suspended in the air like dust. They can also penetrate electrical equipment where, due to their conductivity, they create shorts, rendering the equipment inoperative. Carbon-boron-fibers in heavy concentrations can also be a health hazard, irritating the eyes and respiratory system, and possibly penetrating exposed skin. The following precautions apply:

- (1) Approach upwind of the incident site.
 - (2) Do not take electronic equipment in, or near the incident site.
 - (3) Wear gloves when working in the incident site. In heavy concentrations, goggles and respiratory protection should be worn.
 - (4) Decontaminate tools, equipment, and ordnance items, in accordance with local policies before departing the incident site.
- o. Movable Surfaces. Exercise extreme caution when working in the vicinity of aircraft movable surfaces such as slats, flaps, ailerons, stabilizers, rudders, speed brake doors etc. These surfaces can move rapidly and have sharp trailing edges which can cause injury to personnel.

3-10. PYROTECHNIC MUNITIONS AND DEVICES.

- a. Introduction. These are munitions which contain pyrotechnic material and which perform their designed function by burning. They include flares, markers, signals, and smoke generators.
- b. General Safety Precautions. In addition to the applicable basic precautions in Chapters 1 and 2, observe the following:

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- (1) Do not drop or roughly handle pyrotechnic munitions. They are easily ignited and present a serious fire hazard.
- (2) Do not expose pyrotechnic munitions to excessively high temperatures. High temperatures will increase their sensitivity, induce chemical reactions, and may cause ignition.
- (3) Remain upwind of a functioning pyrotechnic munition. Some pyrotechnic material residues are toxic.
- (4) Approach and work on a flare only from the side. A functioning flare may eject its candle with sufficient force to cause serious injury.
- (5) Do not pull any lanyards or cables, or touch electric primers on pyrotechnic flares or signals. Such action may function the item.
- (6) Do not look directly at a burning flare, candle, or flash signal. Serious eye injury can result, unless the eyes are protected by No. 6 shade welders' goggles or equivalent shaded glasses.
- (7) Maintain thermite-filled munitions at temperatures above freezing. Thermite-filled munitions, if frozen, may detonate upon functioning.

3-11. IMPROVISED AND SPECIAL DEVICES.

a. Introduction. These devices include improvised explosive devices (IED's), improvised incendiary devices, improvised boobytraps, and special devices. As their designation implies, improvised devices are made up from available material and equipment. Special devices, on the other hand, are standardized military actuating/explosive devices, used for specific purposes. They may, or may not include requirements for boobytrap features. Improvised devices may take almost any form, and are used for a variety of purposes such as assassination, sabotage, and various military and paramilitary functions. They may vary from the simple, to complex, and be simple or sophisticated in design and effectiveness. In considering these devices, remember that boobytraps may be improvised and improvised devices may be boobytrapped.

b. General Safety Precautions. In addition to the applicable basic precautions in Chapters 1 and 2, observe the following:

- (1) Detonate the device in place, if at all possible. The hazards of IED's include all those related to standard munitions, plus the additional hazards of diversity and unpredictability of design, compounded by the ingenuity or incompetence of the designer. This unpredictability of the IED demands more caution on the part of the EOD technician than that used for conventional munitions.
- (2) Check carefully for other methods of initiation than those that appear obvious.
- (3) In addition to these precautions, also observe landmine precautions when improvised devices are used in this manner.
- (4) Use remote procedures to gain access to the device in all situations, where time permits. Opening of hoods, doors, lids, or the removal of covers, etc., can be used as firing actions.
- (5) Minimize personnel exposure. Be on the alert for all types of entrapment situations. Incidents are on record where EOD personnel were lured to a false incident site and then attacked with rifle fire and grenades.
- (6) Do not allow variations in light sources, (natural or artificial), when approaching or working on a device. A photoconductive cell or device may be installed as the primary or secondary firing device.

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3-12. MISCELLANEOUS EXPLOSIVE DEVICES.

a. Introduction. This title does not denote a class of ordnance. Rather, it is the title given to a variety of unrelated ordnance which does not readily fall within any of the classes of ordnance described under surface ordnance.

b. General Safety Precautions. In view of the diverse and limited number of items included under miscellaneous explosive devices, there are no general safety precautions which apply to these items. Chapters 1 and 2 should be reviewed for broad general coverage, which may be applicable to these types of devices.