

## Chapter 1

# Individual Protective Equipment

A soldier's mission-oriented protection posture (MOPP) gear protects against NBC contamination. It consists of the overgarment, mask, hood, overboots, protective gloves, individual decon kits, detection equipment, and antidotes. Before soldiers can protect themselves against NBC hazards, they must first know what individual protective equipment is available and its capabilities.

## Protective Ensemble

Various armies of the world use different types of chemical protective clothing for individual protection. Several types are available in the US Army. The type depends on the protection required, but all fall within two major divisions: permeable and impermeable. Permeable clothing allows air and moisture to pass through the fabric. Impermeable clothing does not. An example of impermeable clothing is the special butyl rubber suits worn by some explosive ordnance disposal (EOD) soldiers and decon soldiers. Most troops use permeable suits. These are known as battledress overgarments (BDOs).

### Battledress Overgarment (BDO)

*Note: The information on the BDO represents a more flexible approach than was addressed in the 1985 version of this manual. More recent assessments of the BDO indicated that a more flexible approach was needed to optimize use of the BDOs excellent NBC protection capabilities.*

### Description

The BDO is a camouflage colored, woodland or desert, expendable two-piece overgarment consisting of one coat and one pair of trousers (figure 1-1). The jacket has a zipped front, and the trousers have a fly front and zipped legs. The overgarment material consists of an outer layer of nylon cotton and an inner layer of charcoal impregnated polyurethane foam. Due to heavy impregnation of charcoal, some charcoal may be deposited on skin and clothing under the BDO; however, this will not detract from the BDOs chemical protective characteristics nor harm the wearer. The BDO presently comes sealed in a vapor-barrier bag that protects against rain, moisture, and sunlight. The BDO is water resistant, but not water proof and is normally worn as an outer garment. The BDO is normally worn over the duty uniform; however, in high temperatures it may be worn over underwear. In extreme cold weather environments, the BDO should be worn between layer 2 (bib overall, cold weather shirt, and trouser liner) and layer 3 (coat liner and field trousers) of the Extended Cold Weather Clothing System (ECWCS). In extreme cold weather environments, the BDO is sized to wear over artic/extreme cold weedier environmental clothing; however, mission requirements may dictate that the BDO be worn under artic clothing. For example, soldiers may need to wear a white artic outergarment to help ensure needed cover and concealment.

### Protection Capabilities.

The BDO provides protection against chemical agent vapors, liquid droplets; biological agents; toxins; and

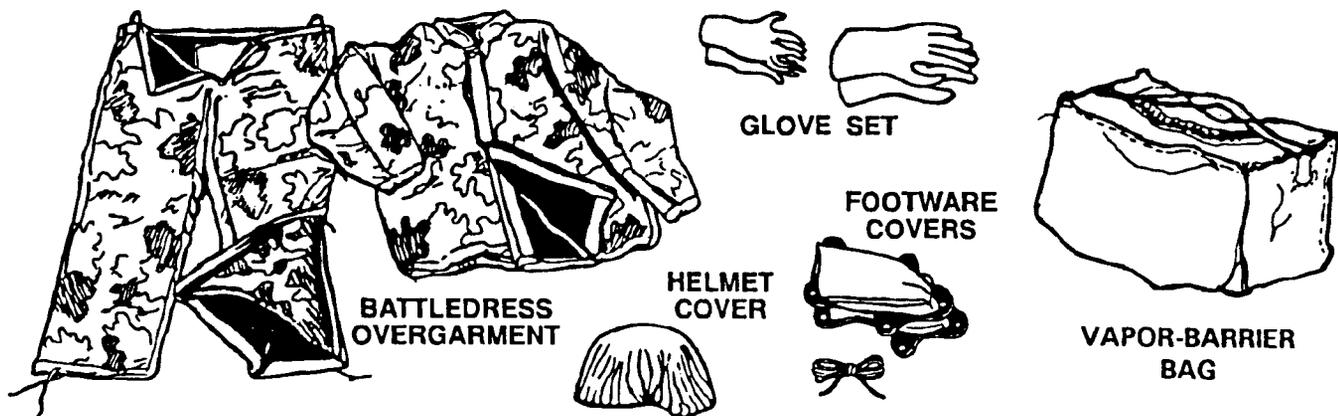


Figure 1-1. Protective ensemble.

radioactive alpha and beta particles. When the BDO is removed from its vapor-barrier bag and worn, its protective qualities last for a minimum of 30 days. It is recommended that the BDO be replaced after 30 days; however, the wear time may be extended by the commander when operationally necessary. BDOs worn longer than 30 days presents a slightly increased risk to the wearer; however, the key to BDO effectiveness at anytime during wear, is its serviceability. The slightly increased risk that is incurred by wearing the BDO past 30 days is discussed in chapter 3, Chemical Overgarment Risk Assessment.

Wear time for the BDO begins when it is removed from its sealed vapor-barrier bag, and stops when the BDO is sealed back in its vapor-barrier bag. If the original vapor-barrier bag is not available, return the BDO to a similar material bag and seal with common duct tape. Donning of the BDO regardless of the time, equates to a day of wear. Extending the wear time for the BDO affords additional flexibility operational and logistical support planning. The BDO provides a minimum of 24 hours of protection against exposure to liquid or vapor chemical agent. Exchange the BDO within 24 hours of exposure to a liquid chemical agent. The BDO is not designed to be decontaminated or reimpregnated for reuse.

### **Serviceability.**

The BDO becomes unserviceable if it is ripped, torn, fastener broken or missing, or petroleum, oils, or lubricants are spilled or splashed on the garment. For example, if a POL spill on a BDO sleeve or trouser leg soaks through the BDO material, replace the BDO. Further, the BDO remains serviceable if the vapor-barrier bag suffers damage (i.e., pinholes, rips, tears), provided the overgarment has not been physically damaged or exposed to water, POL spills, or chemical agents. When any packaging leaks are discovered, seal/repair them as soon as possible. Common duct tape provides an appropriate and expedient way to repair the vapor-barrier bag. Sealing the bag, protects the BDO from direct exposure to moisture, smoke, and fuel solvent vapors which can jeopardize the BDO protective qualities; however, if the original vapor-barrier bag is no longer available to the soldier for overgarment storage, use a replacement storage bag that, as a minimum, is water resistant or water repellent.

### **Nuclear, Biological, and Chemical Equipment Bag**

The NBC equipment bag is designed to consolidate and transport the CPOG, chemical protective gloves, and chemical protective boots. The bag is constructed of an abrasion-resistant nylon and incorporates a unique closure

system, using velcro, two compression straps, and quick release buckles for protection from the outside cargo tie-down straps for attachment to the current developmental load-carrying equipment (LCE).

### **Chemical Protective Overgarment (CPOG)**

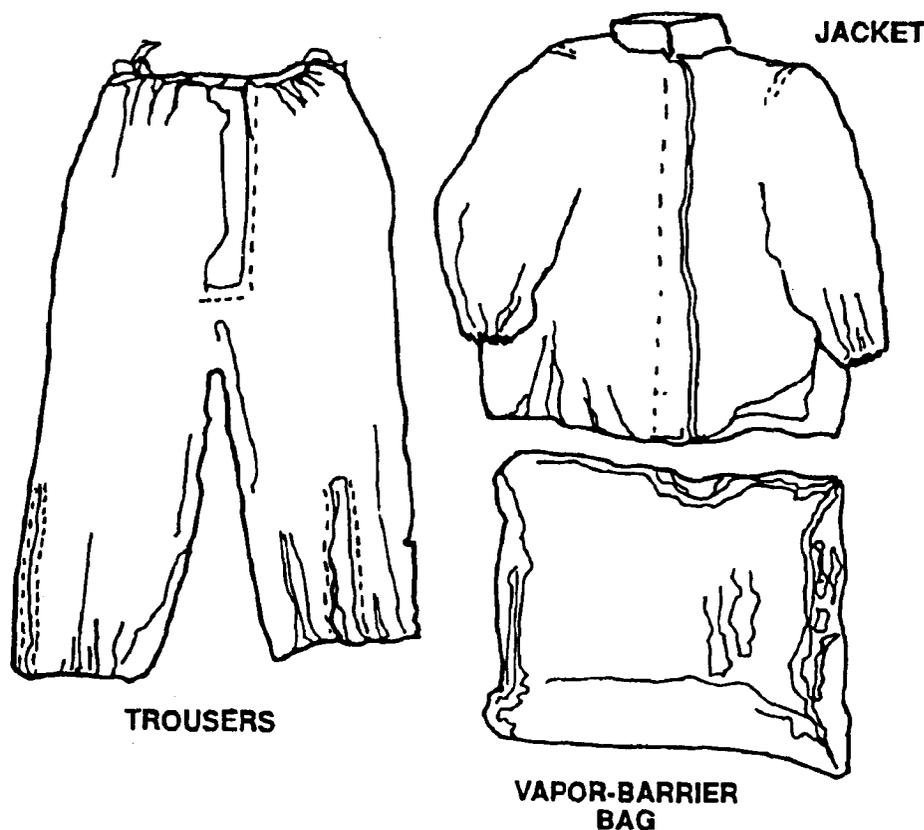
*NOTE: The information on the CPOG represents a more flexible approach than was addressed in the 1985 version of this manual. More recent assessments of the CPOG indicated that a more flexible approach was needed to better use the CPOGs protection capabilities.*

### **Description.**

The CPOG is a plain OD green expendable two-piece overgarment consisting of one coat and a pair of trousers (figure 1-2). The jacket has a full length zipper opening covered by a protective flap. The trousers have a fly front, and zipper closure on the lower **outside section of each leg**. The CPOG is made of material having an outer layer of nylon cotton and an inner layer of charcoal impregnated polyurethane foam. Due to the heavy impregnation of charcoal, some charcoal will be deposited on the skin and clothing under the overgarment; however, this will not detract from the chemical protective characteristics of the suit nor harm the wearer. The CPOG comes sealed in a vapor-barrier bag that protects against rain, moisture, and sunlight. To protect the protective qualities of the CPOG against rain, wet weather gear should be worn over the overgarment. The CPOG is normally worn over the duty uniform; however, in high temperature it may be worn over underwear. In extreme cold weather, the CPOG is sized to wear over arctic extreme cold weather environmental clothing; however, mission requirements may dictate that the CPOG can be worn under arctic clothing. For example, soldiers may need to wear a white arctic outer garment to help ensure needed cover and concealment.

### **Protection Capabilities.**

The CPOG provides protection against chemical agent vapors, liquid droplets; biological agents; toxins; and radioactive alpha and beta particles. When the CPOG is removed from its vapor-barrier bag, its protective qualities last for a minimum of 14 days. It is recommended that the CPOG be replaced after 14 days; however, the wear times may be extended by the commander when operationally necessary. CPOG worn longer than 14 days present a slightly increased risk to the wearer; however, the key to CPOG effectiveness at anytime during its wear, is its serviceability. The slightly increased risk that is incurred by wearing the CPOG past 14 days is discussed in chapter 3, Chemical Overgarment Risk Assessment.



*Figure 1-2. Chemical protective overgarment.*

Weartime for the CPOG begins when it is removed from its sealed vapor-barrier bag, and stops when the CPOG is sealed back in its vapor-barrier bag. If the original vapor-barrier bag is not available, return the CPOG to a similar material (i.e. water proof) bag and seal with common duct tape (for example, double plastic trash bags are a possibility). Donning of the CPOG, regardless of time, equates to a day of wear. Extending the weartime for the CPOG affords additional flexibility in operational and logistical support planning. The CPOG provides a minimum of 6 hours of protection against exposure to liquid or vapor chemical agents. Exchange the CPOG within 6 hours of exposure to a liquid chemical agent. The CPOG is not designed to be decontaminated or reimpregnated for reuse.

### **Serviceability.**

The CPOG becomes unserviceable if it is ripped, torn, fasteners broken or missing, or petroleum, oils, or lubricants are spilled or splashed on the garment. For example, if a POL spill on a CPOG sleeve or trouser leg soaks through the CPOG material, replace the CPOG. Further, the overgarment remains serviceable if the CPOG vapor-barrier bag suffers damage (i.e., pinholes, rips, tears), provided the overgarment has not been physically damaged or exposed to water, POL spills, or chemical

agents. When any packaging leaks are discovered, seal/repair them as soon as possible. Common duct tape provides an appropriate and expedient way to repair the vapor-barrier bag. Sealing the bag protects the CPOG from direct exposure to moisture, smoke, and fuel solvent vapor which can jeopardize the CPOGs protective qualities; however, if the original vapor-barrier bag is no longer available to the soldier for overgarment storage, use a replacement bag that, as a minimum, is water resistant or water repellent. For example, the water proof bag can be used for storage.

### **Contamination Avoidance and Liquid Protective Suit**

The suit, contamination avoidance and liquid protective (SCALP)(Figure 1-3) is a four-piece suit consisting of jacket, trousers, and two footwear covers. The base cloth material is of high density polyethylene fibers, and the footwear covers have embossed polyethylene soles for durability and slip resistance. The jacket is a pullover design with an integral hood and covers the head, chest, and arms. An opening is provided for the facepiece of the individual protective mask. Two drawstrings, each with a barrelock, secure the hood to the facepiece, and latex bands secure sleeves around the wrists. The trousers contain a drawstring with a barrelock at the waist and latex bands on

soldier, increasing heat stress problems already associated with wearing the BDO. The SCALP weighs approximately 1.5 pounds.



**Figure 1-3. Contamination avoidance and liquid protective suit.**

the legs to secure them around the ankles. The footwear covers consist of polyethylene soles and latex bands in the upper portion to secure them to the legs. The SCALP jacket/trousers are issued separately from the SCALP footwear covers since the sizing systems are independent of one another. The SCALP, being a disposable, lightweight, impermeable suit, is worn over the BDO, CPOG or CPU/duty uniform to provide additional protection from gross liquid contamination for periods up to one hour. The primary users are armor and EOD personnel and personnel in collective protection who may, by necessity, be forced to leave that collective protection to perform some vital maintenance or reconnaissance function. In such situations, the SCALP will also reduce reentry time. A secondary use of the SCALP is to protect decontamination personnel from being soaked during decontamination operations. Commanders must be aware that wearing the SCALP over the BDO will place additional burden on the

### **Integrated Battlefield Aircrew Uniform**

The aircrew uniform integrated battlefield (AUIB) is a standard combat uniform for aircrews designed to replace both the CPOG, BDO, and Nomex flight suit. The AUIB provides NBC protection and protection against flames. It is a two-piece chemical protective uniform with a protective curtain and stand-up collar. The collar closes with a hook-and-pile tape. The suit has a slide fastener front closure with protective flap and a gusseted fastener leg closure for quick and easy donning and doffing. The wrists and ankles have hook-and-pile adjustments to ensure a tighter fit. Chest pockets are side openings for easy access when the safety harness is in use. Side thigh and calf pockets have bellows on one side for easy access. Insulated pockets for atropine injectors are provided on the upper sleeve. All pockets are lined with butyl rubber.

### **Toxicological Agent Protective Apron**

The toxicological agent protective (TAP) apron is intended for personnel whose duties may bring them into contact with liquid chemical agents: for example, those who work with toxic munitions, perform decontamination in a field environment, handle contaminated clothing and equipment at a decontamination site, and handle and treat chemical agent casualties. On the battlefield, the TAP apron provides chemical decontamination units added protection when conducting extended decontamination operations. See FM 3-5 for further information on the use of the TAP apron during decontamination operations.

### **Chemical Protective Glove Set**

#### **Description.**

A glove set (figure 1-1) consists of an outer glove for protection and an inner glove for perspiration absorption. The outer gloves are made of an impermeable, black, butyl rubber. The inner gloves are made of thin, white cotton. These inner gloves can be worn on either hand. If either outer glove is punctured or torn, replace the pair of gloves. When engaged in heavy work or during cold weather, soldiers should wear standard work gloves or black shells over the butyl rubber gloves to protect them from damage. The gloves come in three thickness; 7, 14, and 25 mil. The 7 mil glove set is used by soldiers such as medical, teletypist, and electronic repair personnel whose tasks require extreme tactility and/or sensitivity and will not expose the gloves to harsh treatment. The 14 mil glove set is used by soldiers such as aviators, vehicle mechanics and

weapon crews whose task require tactility and sensitivity and will not expose the gloves to harsh treatment. Use of more durable 25 mil glove set is for soldiers who perform close combat tasks and other types of heavy labor.

**Protection Capabilities.**

The glove protects against liquid chemical agents and vapor hazards as long as they remain serviceable. If the 14 and 25 mil glove set becomes contaminated with liquid chemical agent, decontaminate or replace them, within 24 hours after exposure. If the 7 mil glove set becomes contaminated, replace or decontaminate within 6 hours after exposure. The contaminated gloves may be decontaminated with a 5 % bleach and water solution or a 5 % HTH and water solution and reused indefinitely as long as they remain serviceable. The gloves also keep biting insect vectors and radioactive fallout away from the hands. See FM 3-5 for procedures on decontamination of gloves during the deliberate decontamination process.

**Serviceability.**

Exposure of the rubber to DS2, break-free, antiseize compound or any other petroleum-based products attacks the gloves rubber polymers and makes them very sticky. Avoid contact with these material if possible. However, replace the glove if the rubber is sticky. Use bleach and water to remove these compounds from the rubber gloves as soon as possible. See below for a means to determine glove serviceability.

**Serviceability Test**

To determine if a glove set is damaged or serviceable, either fill the gloves with air and submerge in water or fill the glove with water and look for water leaks. The preferred method for determining serviceability is to fill the glove with air and submerge it in water. Prior to submerging the glove in water, hold the base of the glove with both hands (using thumb and index fingers). With the glove fingers hanging downward, rotate the glove several times ensuring an air pocket is formed below the palm. Holding the inflated glove in one hand, squeeze the glove and examine for escaping air and then submerge in water. If bubbles escape, the glove is unserviceable.

**Green/Black Vinyl Overboot  
(GVO)/(BVO)**

**Description.**

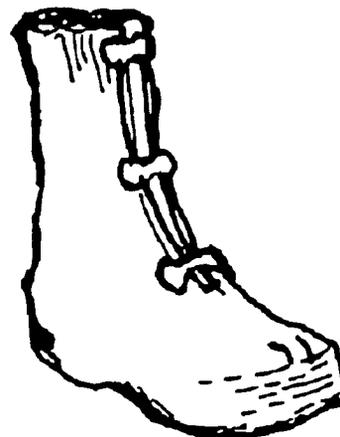
The GVO is a plain Olive Drab (OD) Vinyl green overshoe with elastic fasteners. The GVO can be used to

protect the wearer against NBC agents or rain, mud, or snow (environmental effects). The black vinyl overshoe (BVO) has been recently typed classified, and can also be used for NBC protection. The BVO is very similar to the GVO, except for the change in color and black enlarged tabs on each elastic fastener.

**Protection Capability.**

Soldiers wear the green or black vinyl overshoe (GVO/BVO) over their combat boots (figure 1-4) to protect feet from contamination by all known agents, vectors, and radiological particles for a minimum of 14 days. Protection continues past 14 days provided the GVO/BVO remains serviceable. Wearing the GVO/BVO with combat boots provides 24 hours of protection against all known agents, following contamination. Decontaminate the GVO/BVO with a 5 % bleach and water solution or a 5 % HTH and water solution. If the GVO/BVO shows signs of deterioration

following decontamination (e. g., cracks, tears, punctures, rubber becomes sticky), replace the boots. See FM 3-5 for information on decontamination of the GVO during the deliberate decontamination process.



**Serviceability.**

Inspect GVOs regularly to ensure their integrity is maintained, and replace if cracks, tears, or punctures are found. Continuous contact with DS2 will, over time, degrade the GVO/BVO. If DS2 gets on the GVO/BVO, rinse it with bleach and water at the earliest possible time.

**Chemical Protective Footwear Cover  
(CPFC)**

**Description.**

The CPFCs are impermeable and have unsupported butyl rubber soles and butyl uppers. Two variations are in the field. One has a single heel flap, and the other has the newer fishtail double heel flap. Donning

instructions vary for each type. Check instructions before donning.

Soldiers wear the chemical protective footwear cover (overboots) (figure 1-1) over their combat boots. The CPFC are being replaced by the GVO/BVOs as stocks become available.

### Protection Capabilities.

The overboots protect feet from contamination by all known chemical agents, vectors, and radiological dust particles for a minimum of 24 hours as long as they remain serviceable. The overboot can be decontaminated using a 5% bleach and water solution or a 5% HTH and water solution. If the CPFC shows signs of deterioration following decontamination (e.g., rips, tears, torn laces, rubber becomes sticky), replace the footwear covers. See FM 3-5 for information on decontamination of the footwear cover during the deliberate decontamination process.

### Serviceability.

When wearing the overboot, avoid tearing or puncturing them. Tears and punctures can happen when soldiers traverse rough terrain. The laces may catch on protrusions, such as are found on tanks, causing the boots to rip. Replace the overboot if it is punctured or torn.

### Chemical Protective Helmet Cover

This cover (Figure 1-1) protects the personnel armor-system ground troop (PASGT) helmet from chemical and biological contamination. The cover is a piece of butyl-coated nylon cloth gathered at the edge by an elastic web enclosed in the hem. It is an olive green, one size fits all cover. It is designed to keep

chemical and biological agents from penetrating the kevlar helmet and the helmet cover.

### NBC Protective Covers

The NBC protective cover (NBC-PC) is designed to be a lightweight, low-cost, versatile cover to be used in the field to prevent liquid contamination of supplies and equipment. The cover will be used to provide a barrier between covered supplies and equipment and liquid agents, biological agents, and radioactive dust. Protection time against liquid-agents is 48 hours. The cover can provide protection for up to six weeks without agent exposure before it begins to break down due to environmental conditions.

### Protective Masks

Protective masks keep wearers from breathing air contaminated with chemical and/or biological agents. Masks are available in these categories: the field protective masks, M17-series currently issued to every soldier, and the M40-series, its replacement; the tank and aircraft protective masks, M24/M25-series, and their eventual replacement; the M42 for combat vehicle crewmen; the M43 for aviators and crewmen; and finally the special purpose mask.

### M17A1/M 17A2 Field Protective Mask

An M17-series chemical-biological mask (Figure 1-5), when properly fitted and worn with the hood, protects against field concentrations of all known chemical and biological agents in vapor or aerosol form. Filter elements, in the cheeks of the facepiece, remove the agents from air entering the mask. When the air has a low-oxygen content, such as in tunnels or caves, or

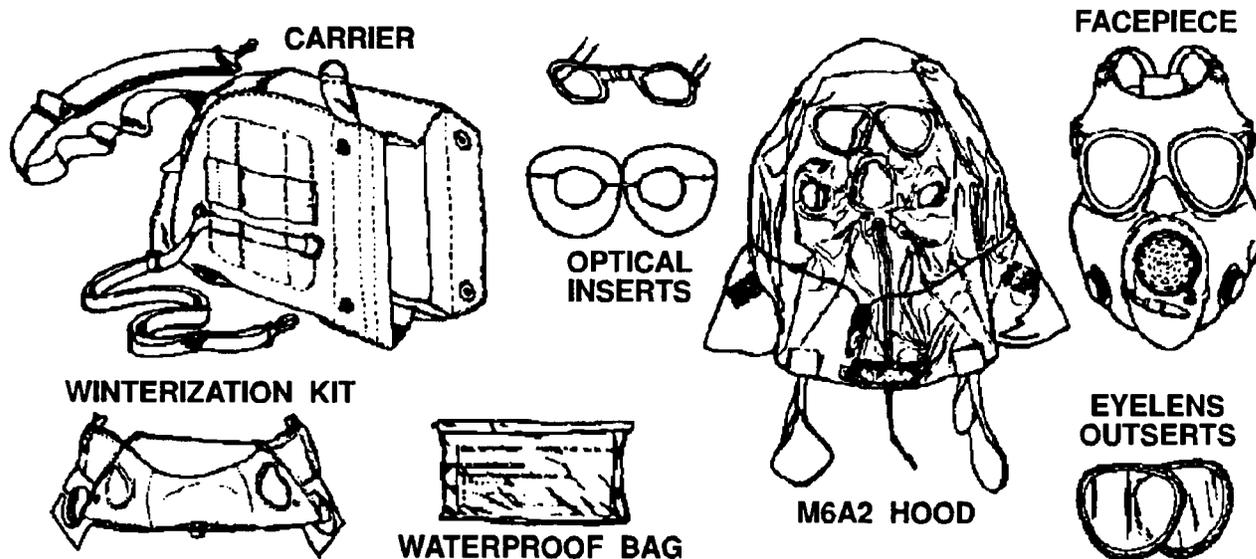


Figure 1-5. M17A2 mask and additional authorized items.

when the air has a high level of smoke mixtures, the mask will not protect the wearer. Do not use it for firefighting. It does not protect against ammonia vapors or carbon monoxide. It also is not designed for radiological protection. However, worn properly, it provides added alpha and beta dust inhalation protection, and soldiers should wear it in all known situations until the contamination is identified.

The M17A2 is the standard-A field mask. It is a modification of the M17A1 mask and has no resuscitation tube. Both masks have the following items:

- A voicemitter to facilitate communication.
- A lube for drinking water from the canteen while masked.
- Two outserts to protect the eye lenses and to prevent fogging in low temperatures.

A carrier for storing and carrying the mask and additional authorized items. Pockets inside the carrier store such items as the nerve agent antidote kit (NAAK), Mark I, and the convulsant antidote for nerve agents (CANA). The exterior pocket of the carrier stores such items as the M1/M1A1 waterproof bag and M8 paper. The M1/M1A1 waterproof bag is used to enclose the mask to protect the filter elements from water damage. An example of use is during river-crossing operations.

Additional authorized items for use with the M17-series mask include the following:

- The ABC-M6A2 field protective mask hood. The hood attaches to the M17-series mask. It protects the head and neck from chemical agent vapors or liquid droplets, biting insects, and radioactive dust particles.
- The M4 mask winterization kit. Use it during cold weather conditions—lower than -20°F (-29°C)—to prevent frost accumulation on the inlet-valve caps.

(See cold weather operations in Appendix B).

- Optical inserts. These are provided for soldiers who require vision correction according to AR 40-63. TMs 3-4240-279-10 and 3-4240-279-20&P give instructions on the care and maintenance of these masks.

### M40 Field Protective Mask

The M40-series chemical-biological mask (Figure 1-6) as it becomes available replaces the M17-series protective mask as the standard Army field mask. The mask consists of a silicone rubber

facepiece with in-turned periphery, binocular eye lens system and elastic head harness. Other features include front and side voicemitters, allowing better communication particularly when operating FM communications, drink tube, clear and tinted inserts, and a filter canister with NATO standard threads. The M40 mask provides respiratory, eye, and face protection against CB agents, toxins, radioactive fallout particles, and battlefield contaminants. The canister filter cannot be changed in a contaminated environment. The mask was not designed for that contingency. TMs 3-4240-300-10-1 and 3-4240-300-20&P give instructions on the care and maintenance of the mask.

### M25/M25A1 Tank Protective Masks

The M25/M25A1 chemical-biological masks are special masks for crews of armored vehicles. These masks, like the M17-series masks, protect against chemical and biological agent in the vapor or aerosol form.

The M25 and M25A1 masks (Figure 1-7) are essentially the same. The only difference is the higher forehead tab on the M25A1. When used in a tank or other armored vehicle, the masks couple to a filter unit, such as the M13A1 gas-particulate filter unit (GPFU). The GPFU forces filtered temperature-controlled air to the facepiece. This increases protection. It also reduces heat stress in hot weather. When wearing the mask outside the tank or armored vehicle, the wearer inhales air through the M10A1 canister.

A microphone assembly in the mask allows communication with other crew members.

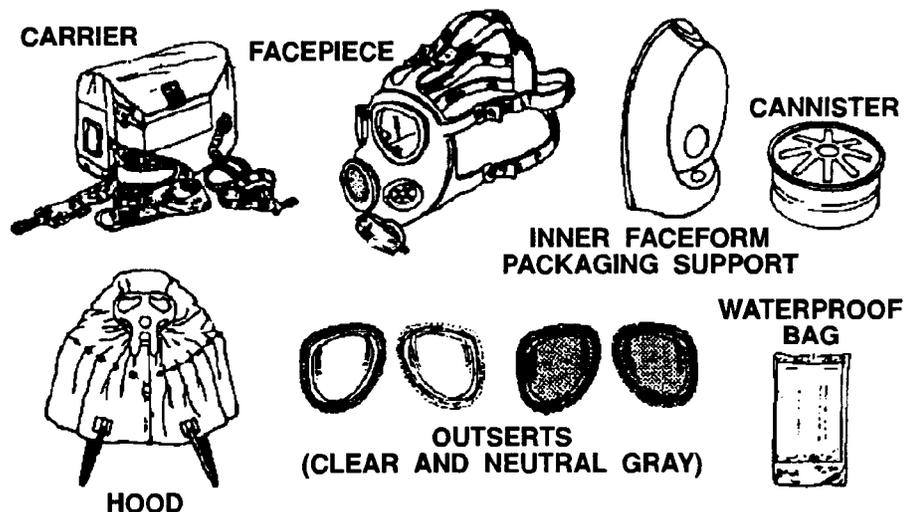


Figure 1-6. M40 mask and additional authorized items.

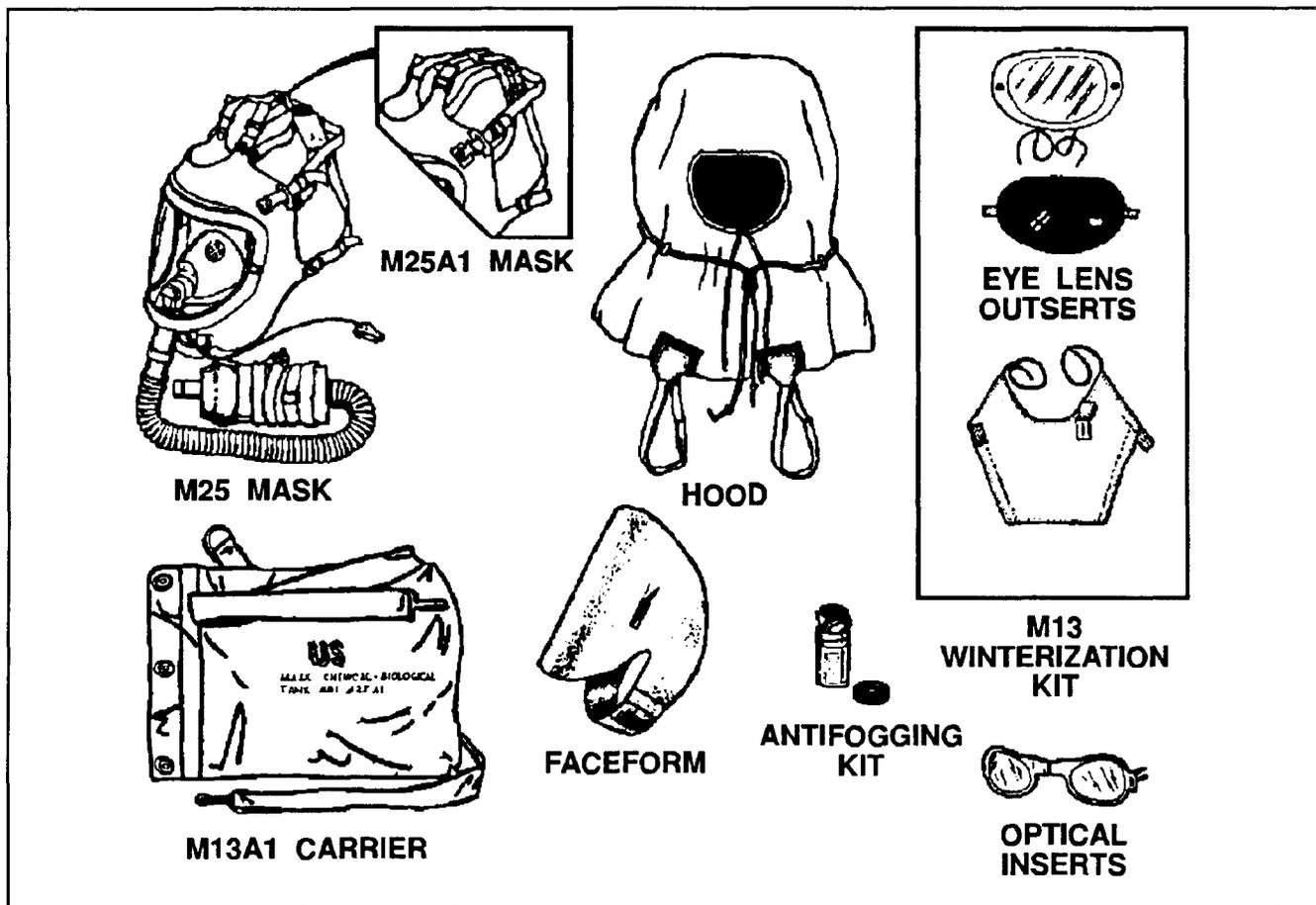


Figure 1-7. M25 and M25A1 chemical-biological masks and accessories.

Communication is through the vehicle communications system. In addition, crew members can communicate with other vehicles having FM receivers.

TMs 3-4240-280-10 and 3-4240-280-23&P give instructions on the care and maintenance of these masks.

### M42 Combat Vehicle Crewman Mask

The M42 chemical-biological mask has the same components (Figure 1-8) as the M40. In addition, though, the M42 combat vehicle crewman mask has a built-in microphone for wire communication. The canister on the M42 mask is attached to the end of a hose and has an adapter for connection to a GPFU. Just as the M40 mask, the filter canister is designed with NATO standard threads.

TMs 3-4240-300-10-2 and

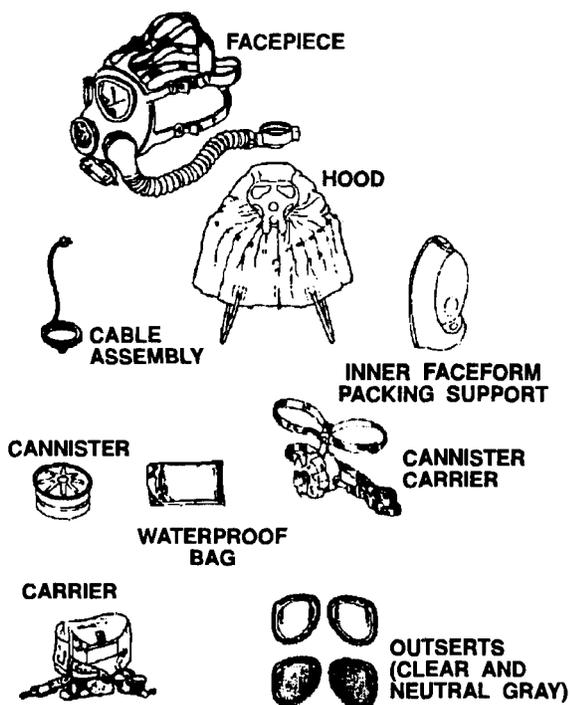


Figure 1-8. M42 chemical-biological mask and accessories.

3-4240-300-20&P give instructions on the care and maintenance of the mask.

**ABC-M24 Aircraft Protective Mask**

The ABC-M24 aircraft chemical-biological mask (Figure 1-9) protects, both in the aircraft and on the ground, against all known chemical and biological aerosols and vapors. The wearer can attach it to the aircraft oxygen supply system by using an M8 adapter kit. The facepiece is not force-ventilated. A microphone element and bracket assembly are in the nose cup for communication.

TMs 3-4240-280-10 and 3-4240-280-23&P give instructions on the care and maintenance of this mask.

**M43 Aircraft Protective Mask**

The M43 mask is a form-fitting butyl rubber facepiece with lenses that mount close to the eyes; an integrated hood with a skull-type suspension system; a portable blower/filter system that operates on battery or aircraft power to maintain positive pressure in the facepiece; and an inhalation air distribution assembly for regulating the flow of air (Figure 1-10). The M43 Type I has a notched eye lens to allow interface with the integrated helmet and display sighting system (IHADSS) equipment. The mask was specifically

designed for compatibility with subsystems of the AH-64. The M43 Type II has unnotched lenses for use by non-AH-64 aviators. Both types of masks provide face, eye, and respiratory protection from concentrations of CB agents, toxins, and radioactive fallout particles; however, they do not have the capability of mounting eye lens inserts. Additionally, the mask provides for external voice or wire communications and a drink tube assembly.

TM 3-4240-334-10 gives instructions on the care and maintenance of the mask.

**Special Purpose Masks**

Several masks are special purpose masks. The present M9A1 field protective mask is in the field and is designed to be used with the M3 toxicological agent protective hood. The M40 special purpose mask will replace the M9A1. The M40 special purpose mask consists of an M40 with an additional canister and a special purpose hood of heavy weight, butyl-coated fabric with a double skirt, M3A1. These masks are primarily used with the toxicological agent protective outfit. It protects specially trained personnel performing duties when liquid agent exposure is expected.

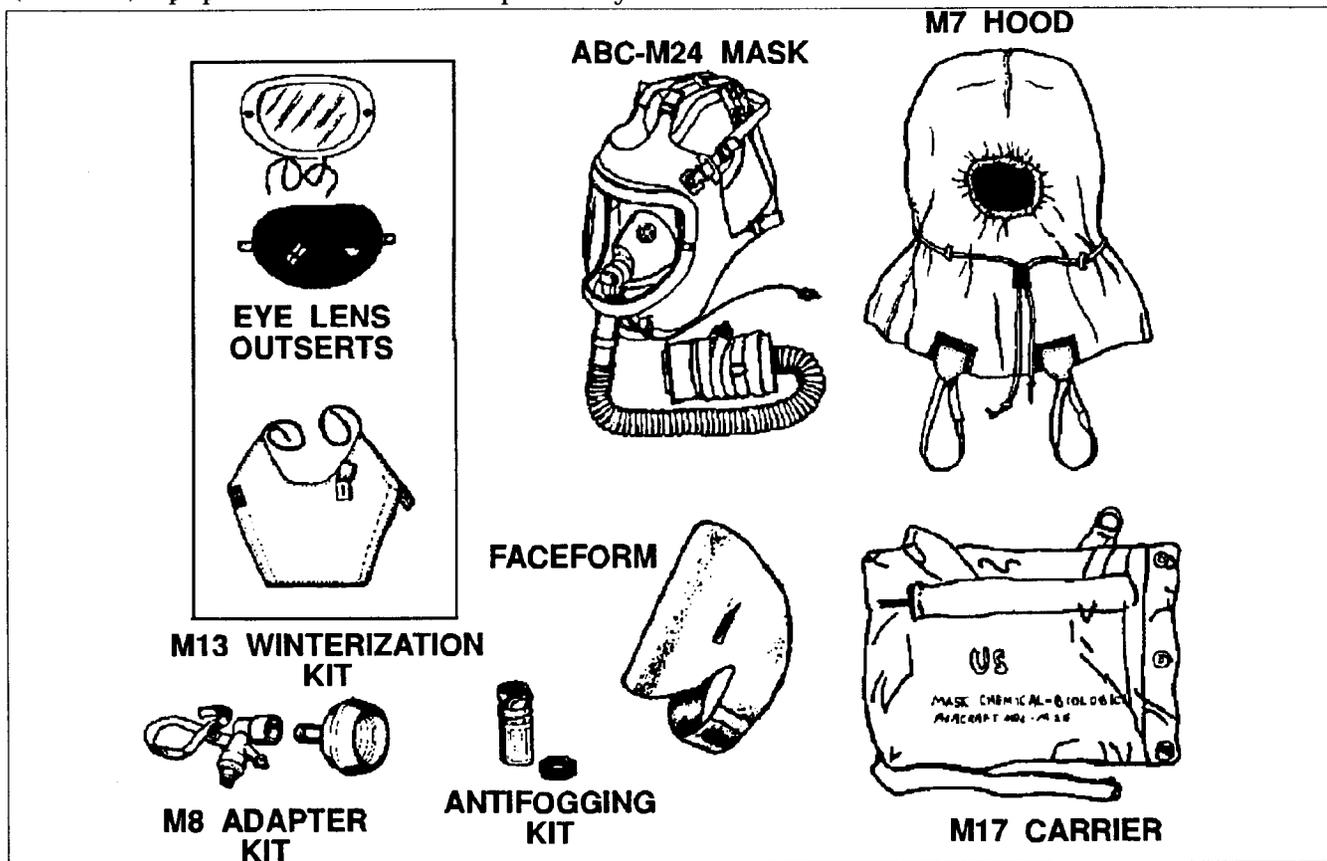


Figure 1-9. ABC-M24 aircraft chemical-biological mask and accessories.

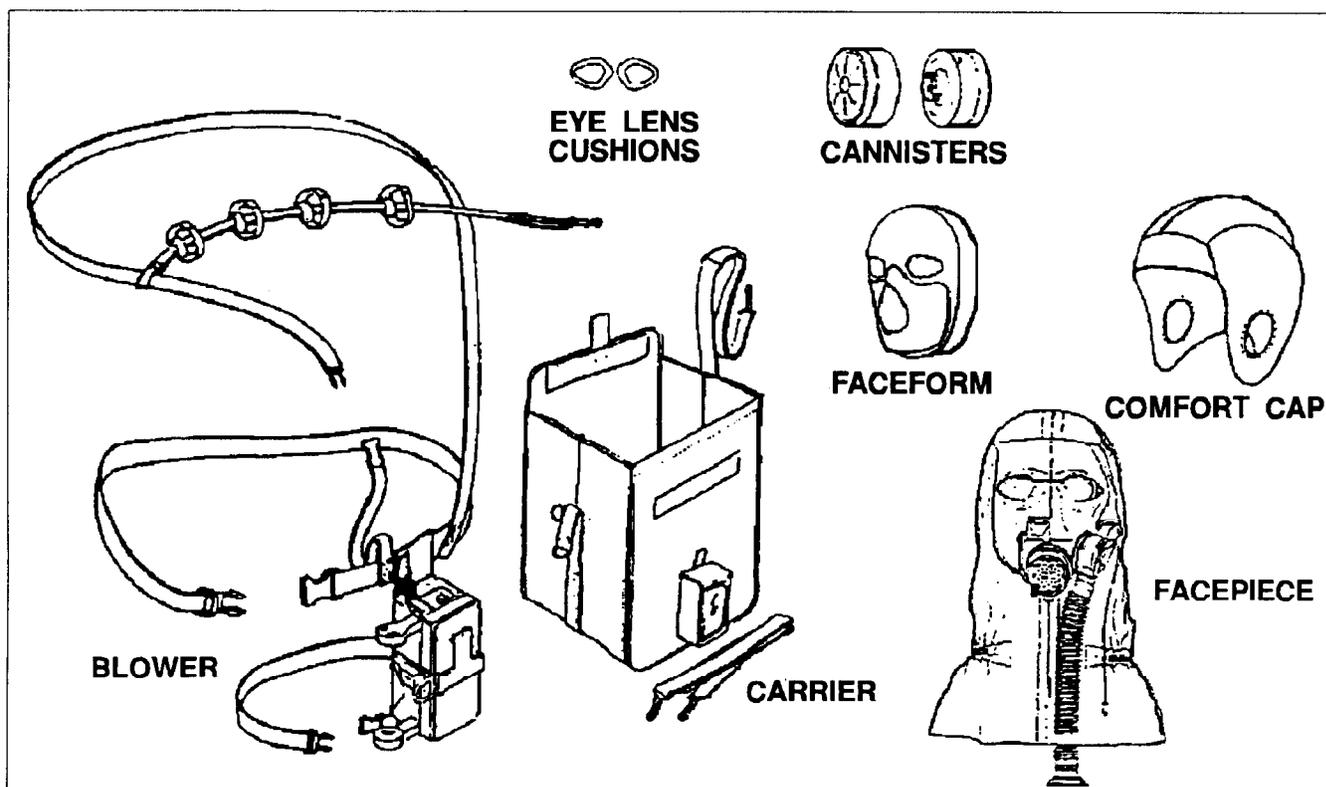


Figure 1-10. M43 chemical-biological mask and accessories.

## Decontamination Equipment

When skin becomes contaminated, decontaminate it immediately, that is, neutralize or remove contamination from all exposed skin. Do this by using the M258A1 skin decon kit (Figure 1-11) or M291 skin decon kit (Figure 1-12), which are issued to each soldier. If a soldier is incapacitated, a buddy must perform the decon, using the kit issued to the victim.

### M258A1 Skin Decontamination Kit

The M258A1 skin decon kit is designed for chemical decon. It comes in a hard plastic case containing three sets of foil-packaged decontaminating wipes. These wipes contain solutions that neutralize most nerve and blister agents. Attach the kit to the protective mask carrier or LCE. Protect it from temperatures above 110F(43°C) and below 32F (0°C). Cold weather operations in Appendix B gives further details.

The substance in the packets leave a residue on the mask that when checked with M8 paper causes a color change similar to GB. The Soldiers Manual of Common Tasks provides step-by-step procedures on the use of the kit. For details on the maintenance and care of the kit, See TM 3-4240-216-10.

### M291 Skin Decontamination Kit

The M291 skin decon kit as it becomes available replaces the M258A1 for skin decontamination. It consists of a flexible outer pouch containing six individual skin decontaminating packets. Each packet consists of a foil-packaged, laminated fiber material containing a reactive resin. Its use is very similar to that of the M258A1. It decontaminates the soldier's hands, face, ears, and neck. The M291 kit should be stored in the large cargo pockets of the BDO trouser for easy access. The M291 is capable of operation in temperatures ranging from -50°F to 120°F.

## Detection Equipment

On the battlefield, soldiers need to help measure radiation and detect chemical agents. They may use radiacmeters (dosimeters) to record cumulative gamma and neutron radiation dosages received and detector papers to detect and identify liquid chemical agents.

### Individual Dosimeter

The new DT236/PD individual dosimeter looks like a wristwatch without a face. Wear it on the wrist to measure the cumulative dose of gamma and neutron radiation received. It is designed to augment the IM93 dosimeter. Selected trained personnel use the CP696/UD radiac computer-indicator to read this dosimeter (Figure 1-13). Data obtained from the basis

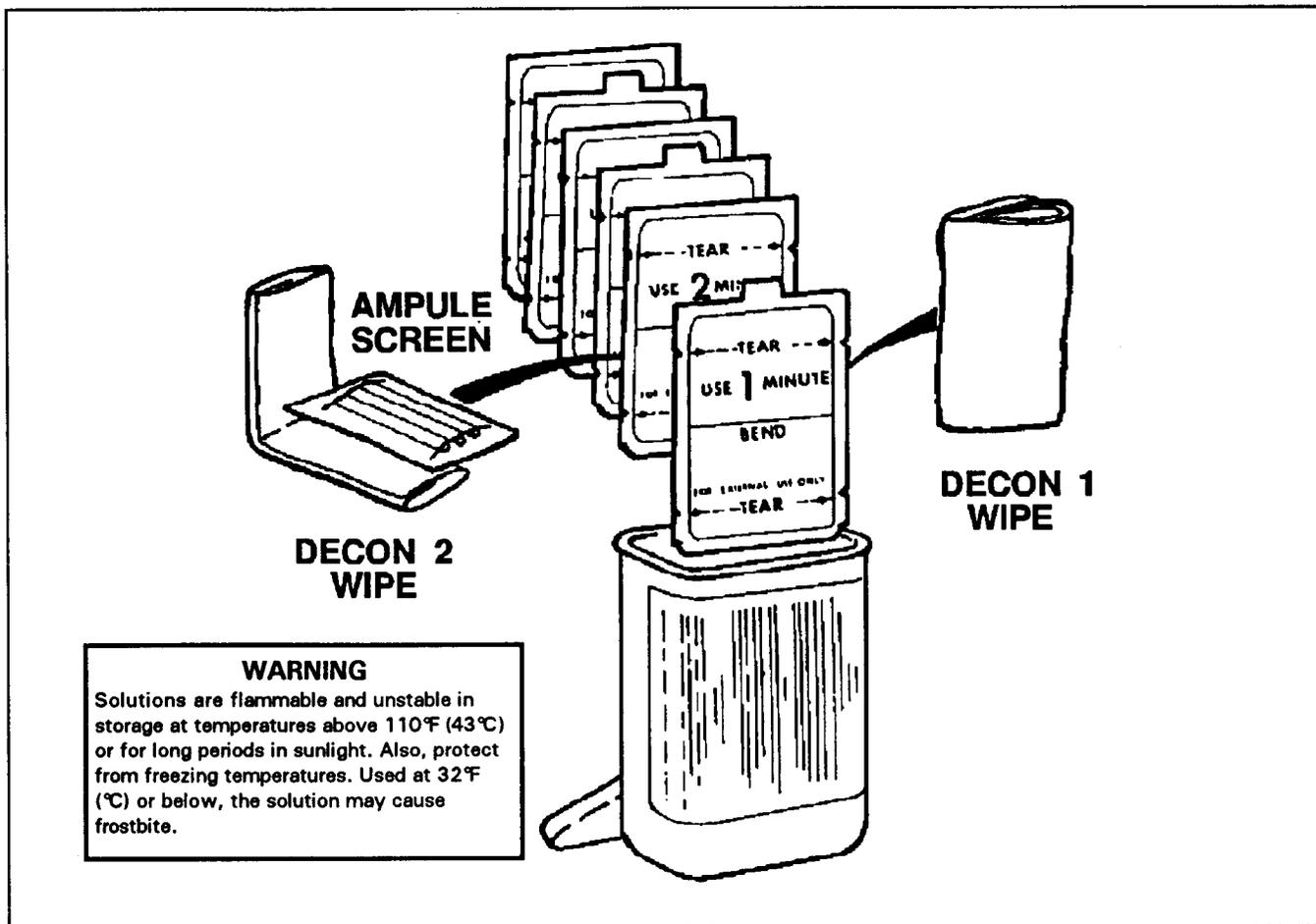


Figure 1-11. M258A1 skin decontamination kit.

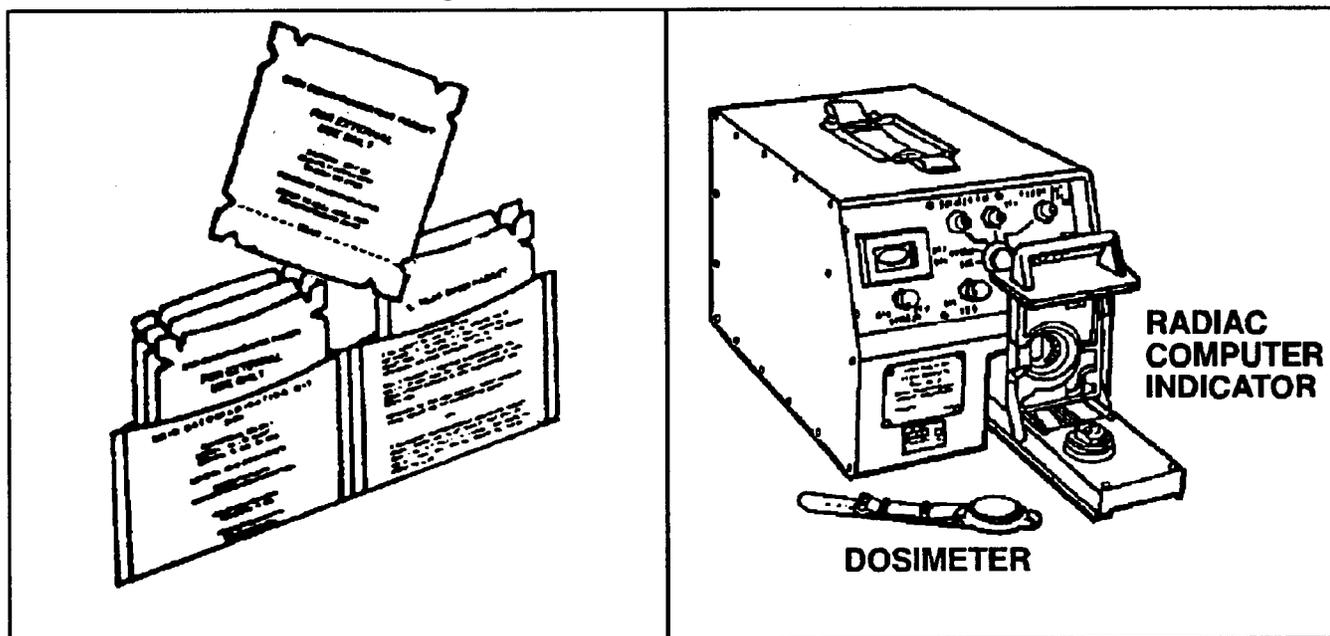


Figure 1-12. M291 skin/equipment decontamination kit.

Figure 1-13. DT236/PD individual dosimeter and CP696/UD radiac computer-indicator.

of radiation dose exposure records. Units will maintain one DT236 per individual assigned plus 10 percent for loss or damage. During periods of heightened tension when other contingency items are issued to soldiers, the DT236/PD will be issued to each individual. Once issued, each soldier will wear the DT236/PD on his wrist at all times except when being read and cleaned. The readings obtained from DT236/PD dosimeters in a unit will be averaged and used to determine the radiation exposure status (RES). The RES determined from existing dosimetry equipment and the RES based on the DT236/PD will be compared and the higher of the category (worst case) will be used. When the unit assumes MOPP, the DT236/PD will be worn underneath the MOPP suit. A DT236 may be decontaminated with the M258A1 and the M291 skin decon kits. However, if a chemical agent soaks into the wristband, it must be replaced. The DT236 is not designed to replace existing dosimetry equipment and specifically is not designed to replace the film badge worn by medical personnel. The DT236 is designed to be worn by tactical personnel only. TM 11-6665-236-12 gives instructions on the care and maintenance of the DT236/PD.

### Chemical Agent Detector Paper

Soldiers receive two types of chemical agent detector paper. The ABC-M8 VGH chemical agent detector paper is called M8. It detects and identifies liquid agents. The M9 chemical agent detector paper detects the presence of liquid agent. The M9 does not identify

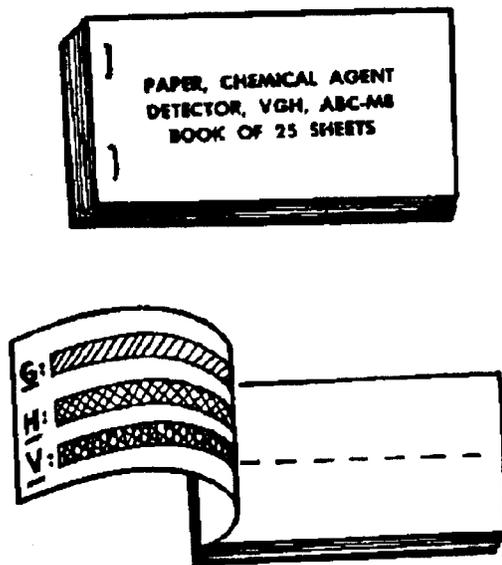


Figure 1-14. ABC-M8 chemical agent detector paper.

agents.

M8 detector paper (Figure 1-14) comes in booklets of 25 sheets. Use the M8 paper to detect and identify liquid V- or G-type nerve agents or H-type blister agents. The sheets are impregnated with chemical compounds that turn dark green, yellow, or red upon contact with a liquid chemical agent. A color chart in the booklet helps determine the type of agent contacted. The paper must touch liquid agent; it does not detect vapor. It is best suited for use on nonporous materials. Because some solvents also cause it to change color, the paper is unreliable for determining the completeness of decon: for example, DS2 mimics a positive V agent reaction, a black/green color change (see FM 3-5). M8 paper is also in the M256/M256A1 chemical agent detector kit.

Use M9 chemical agent detector paper (Figure 1-15) to detect the presence of liquid chemical agents. It does not detect chemical agent vapor. The paper indicates the presence of a nerve agent (G and V) or a blister agent (H and L) by turning a red or reddish color. Because of this, read M9 paper with only a white-light source.

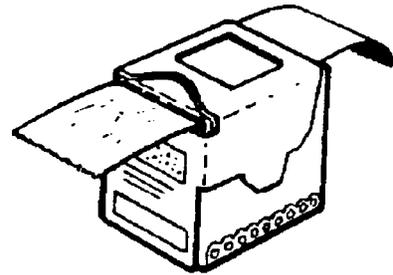


Figure 1-15. M9 chemical agent detector paper.

The self-adhesive M9 paper attaches to most surfaces. When attaching it to clothing, place it on the upper portion of your right arm, left wrist, and either your left or right ankle to allow adequate representation of contamination encountered. When placing it on a piece of equipment, ensure the location is free of dirt, oil, and grease, and place the paper where it will not be stepped on. It is advised that M9 paper that has been placed on equipment be removed before DS2 is sprayed over it; if that is not done, it becomes almost impossible to remove the paper. The M9 paper is usable in any weather, in temperatures above 32°F (0°C). However, exposure to extremely high temperatures may produce false readings. Scuffs, certain types of organic liquids, and DS2 also cause false readings. DS2 turns M9 paper blue. If the paper shows spots or streaks of pink, red-brown, red-purple, or any shade of red, assume it

has been exposed to a chemical agent. See TM 3-6665-311-10 for further information.

### M256-Series Chemical Agent Detector Kit

The M256-series chemical agent detector kit (Figure 1-16) is issued at squad, crew, or section level. It provides a squad-level ability to detect and identify field concentrations of nerve blister, or blood agent vapors. It differentiates between classes of agents and helps determine when unmasking may be safe after a chemical attack. The kit consists of 12 individually packaged samplers/detectors, a set of instruction cards, and a packet of ABC-M8 VGH chemical agent detector paper. These components come packed in a small, compact, plastic case. Each sampler/detector detects harmful vapor concentrations of nerve, blister, and blood agents. It changes color upon contact with chemical agents at concentrations hazardous to an unmasked person. See TM 3-6665-307-10 for further information.

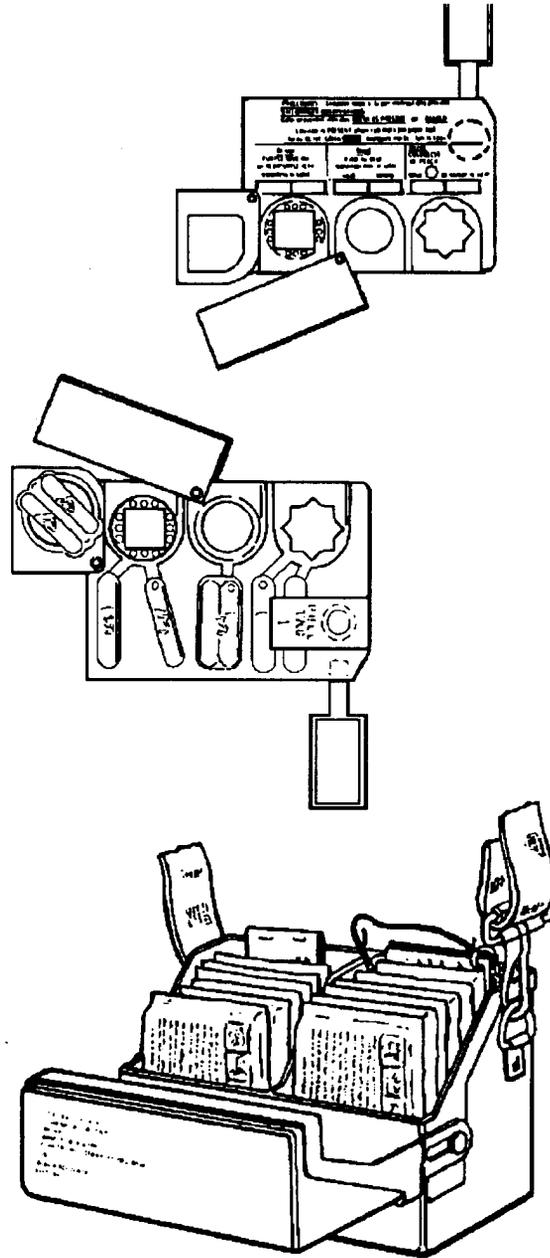


Figure 1-16. M256/M256A1 chemical agent detector kit.

### First-Aid Equipment

Nerve agent poisoning requires immediate first-aid treatment. Soldiers receive three NAAKs, Mark I (Figure 1-17), for this purpose.

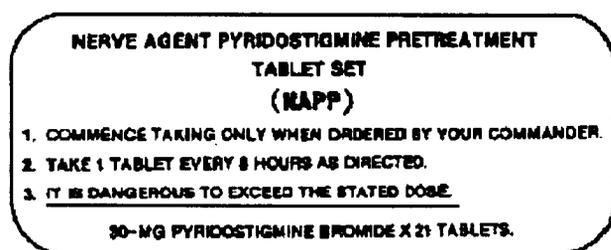
Soldiers may become subjected to nerve agent poisoning on the battlefield. Immediate treatment with the NAAK is required if they are to survive. The NAAK consists of one small autoinjector containing atropine and a second autoinjector containing pralidoxime chloride. A plastic clip holds the two injectors together. Store the NAAK in the accessory storage pocket inside your mask carrier. Protect the NAAK from freezing. Cold weather operations in Appendix B gives details.

### Nerve Agent Pretreatment Pyridostigmine

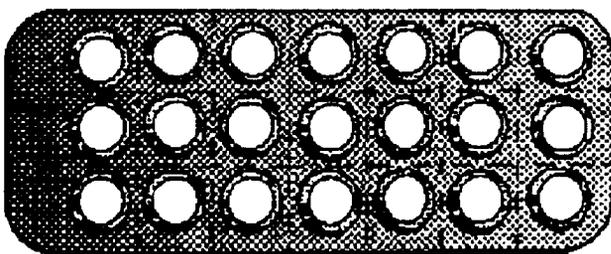
The nerve agent pretreatment pyridostigmine (NAPP) (Figure 1-18) is an adjunct to the NAAK. When used in conjunction with the NAAK this



Figure 1-17. Nerve agent antidote kit, Mark I.



### OUTER WRAPPER



### PYRIDOSTIGMINE BROMIDE TABLETS

Figure 1-18. Nerve agent pyridostigmine pretreatment tablet set.

pretreatment enhances the survivability of the soldier in a nerve agent chemical environment. Each soldier is initially issued one NAAK, which he is responsible for carrying and safe-guarding against loss. He will secure the NAPP in the sleeve or breast pocket of the BDO. Soldiers will begin taking their NAPP tablets when ordered by their commander based on his assessment of possible agent exposure within the next few hours or days. One tablet is to be taken on a continuous basis once every eight hours until all 21 tablets have been taken or the soldier has been directed to discontinue taking the tablets. NAPPs should be stored/refrigerated in temperatures ranging from 35°F to 46°F. If the medication is removed from the refrigerator for a total of six months, it should be assumed that it has lost its potency and should not be used.

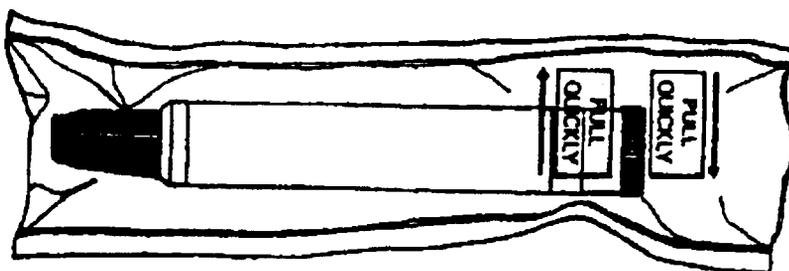


Figure 1-19. Convulsant antidote for nerve agents.

### Convulsant Antidote for Nerve Agents

The CANA (Figure 1-19) is similar to existing autoinjectors but modified to hold a 2-milliliter volume of diazepam. The exterior of the autoinjector will be distinguishable from the NAAK kit by two flanges on the length of the barrel. The autoinjector is packaged in a chemically hardened material. The CANA is a disposable device for intramuscular delivery of diazepam to a buddy who is incapacitated by nerve agent poisoning. It is administered by buddy aid only and is an adjunct to the NAAK kit. The CANA is an individually issued item. See TM 8-288 for further information.

### RELATED EQUIPMENT

Commanders must ensure that the appropriate section, squad, or platoon has personnel trained to operate and maintain the assigned NBC defense equipment. Operation and maintenance of individual and unit NBC equipment are both a leadership and individual responsibility. Not everyone in the unit will be provided these items of NBC equipment, but any soldier may become responsible for them or need to use them. The items include the M256/M256A1 chemical agent detector kit, IM93/UD dosimeter, M11 decontaminating apparatus, and M13 decontaminating apparatus. Skills applicable to these items can be found in STP 21-24.

### Chemical Agent Monitor

The chemical agent monitor (CAM) (Figure 1-20) is designed to be used to detect chemical agent vapor and provide a readout of the relative concentration of vapor present. It can be employed to monitor—

- Personnel or vehicles prior to decontamination and after.
- The inside of collective protection shelters.
- Relative concentrations of agents to assist in the selection of the appropriate level of protective posture.
- The completeness of decontamination.

The CAM draws in air and samples it for contamination. It indicates the level of contamination on a bar graph indicator. When very light concentrations are present, the CAM samples for a longer period of time to reduce the possibility of false indications. When an agent vapor is detected, the CAM will provide a bar graph indication of the relative concentration of the sample (Figure 1-21). Although very close to what is actually there, the indication is only an approximation of the concentration. If

vapor is not present, the instrument will not provide an indication. If vapors are transient, the CAM would provide intermittent indications. This is primarily a function of weather, time of exposure, and the challenge presented. See TM 3-6665-327-13&P for instructions on care and maintenance.

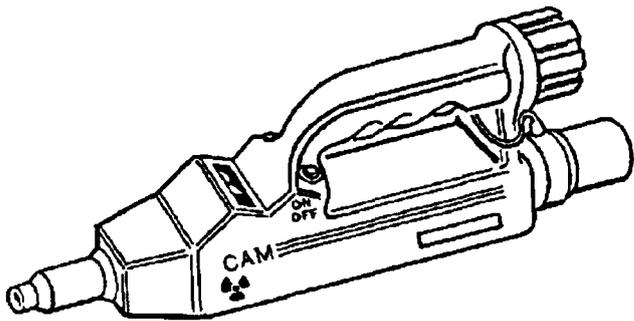


Figure 1-20. Chemical agent monitor.

### M34 Soil Sampling Kit

The M34 sampling kit (Figure 1-22) is intended for use by authorized NBC personnel to perform sampling of soil, surface matter, and even water. The primary use though is to gather soil samples for processing at laboratories in the rear.

The sampling kit consists of a carrier, a plastic scoop, 2 extraction fluid bottles, 2 soil extraction bags, 16 individually wrapped ampules, 6 soil collection bags, 10 plastic-covered wire ties, M8 paper, 3 radiation

hazard tags, and 8 shipping tags with envelopes.

The components are used in the field to collect soil and water samples, samples from contaminated surfaces, munition fragments, material fragments, small objects, and dead animals. The carrier is used as a shipping container for transmitting samples to the laboratories. See TM 3-6665-260-10 for further information.

### IM93/UD Dosimeter

The Army standard tactical instrument for reading total radiation dose is the IM93/UD (Figure 1-23). It is a tubular device, about the size of a fountain pen. It allows the user to read the accumulated gamma total dose simply by looking through the lens while pointing the instrument toward the sun or another bright light source. One end has a dust cap to keep dirt from the charging contacts.

This dosimeter requires a charging unit—the PP1578A/PD radiac-detector charger. This charger is a small, electrostatic-charge generator. It is designed to serve all US and certain NATO combat dosimeters. The charger has its own NATO adapter stored within the case. The major operating features of the charger are the charging knob, charging pedestal, and window. Reading the unit requires direct sunlight or another bright light source, such as vehicle headlights or a flashlight. See TM 11-6665-214-10 for instructions on care and maintenance.

### M272 Water Testing Kit

The M272 (Figure 1-24) kit will detect and identify dangerous levels of common chemical warfare (CW) agents in water sources. It can be used by non-chemical corps personnel who are required to collect and check any water source such as wells, lakes, rivers, and city water systems. The M272 is a lightweight kit that will detect and identify harmful amounts of CW agents when those are present in raw or treated water. See TM 3-6665-319-10 for further information.

### AN/VDR2 Radiac Set

The AN/VDR2 is used to locate and measure radioactivity in the form of gamma rays and beta particles (Figure 1-25). It displays dose rates and total accumulated dose resulting from fallout.

The AN/VDR2 has the following

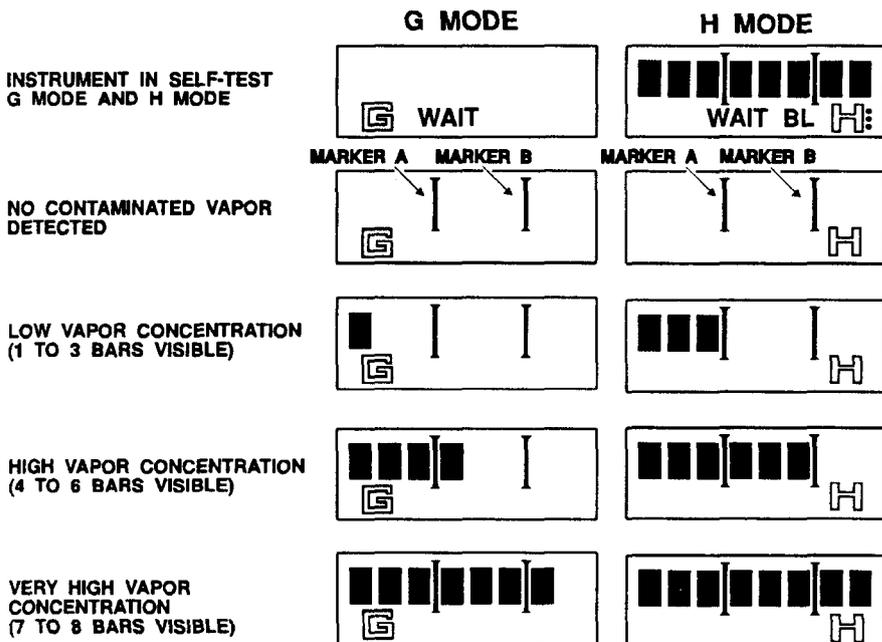


Figure 1-21. Description of CAM displays.

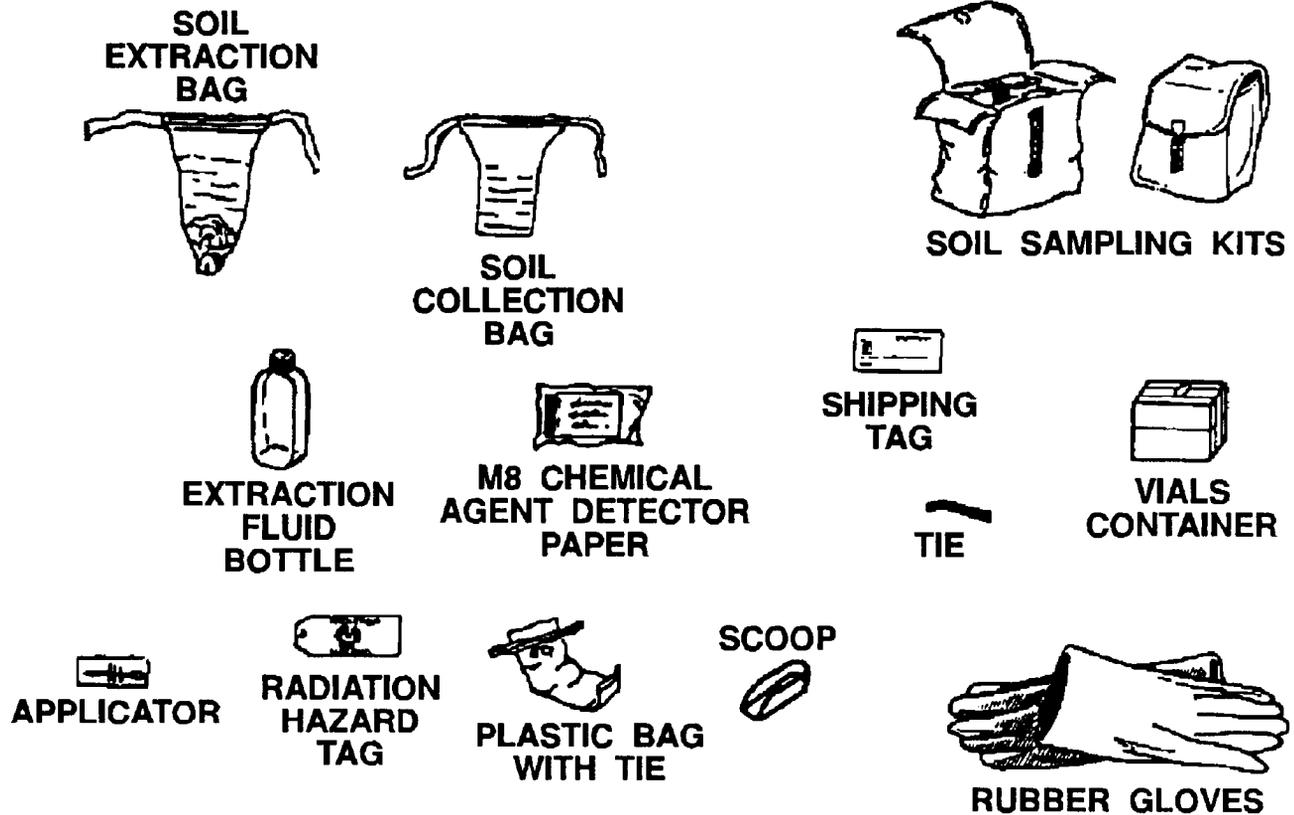


Figure 1-22. M34 soil sampling kit.

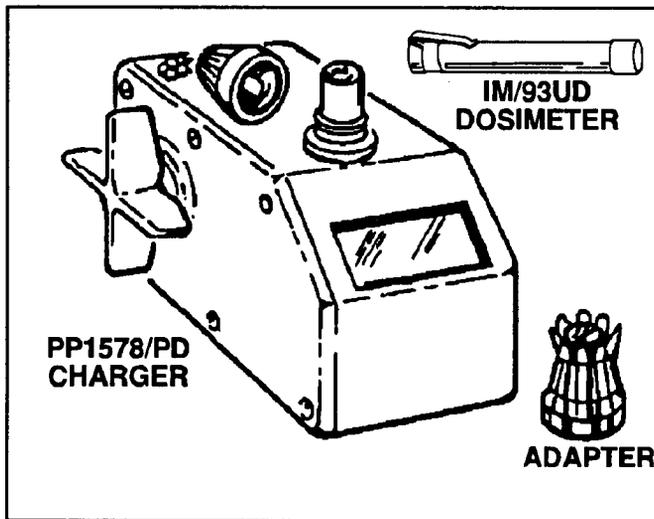


Figure 1-23. IM93/UD dosimeter and PP1578A/PD radiac-detector charger.

capabilities:

- It detects, measures, and displays level of gamma radiation dose rate from 0.01 uCyph to 100 Gyph.
- It detects and displays level of beta particle dose rate from 0.01 uGy to 5 cGyph.
- It measures, stores, and displays accumulated dose from 0.01 uGy to 9.99 Gy.

The AN/VDR2 will replace the IM174/PD and the AN/PDR27 as the standard radiac instrument. See TM 11-6665-251-10 for further information.

### IM174/PD Radiacmeter

The IM174 series (Figure 1-26) is a portable tactical survey instrument designed to measure gamma radiation dose rates from 0 to 500 cGyph. The IM174 series is primarily used by NBC personnel to determine gamma radiation levels from radioactive contaminants while performing survey and monitoring tasks. Procedures for using the IM174/PD are discussed in FM 3-3. TM 11-6665-213-12 provides further information.

### AN/PDR27 Radiac Set

The AN/PDR27 (Figure 1-27) is designed to detect beta radiation and measure and detect gamma radiation. The AN/PDR27 is used as a point source instrument to monitor low levels of radiation contamination on personnel, supplies, and equipment. It is portable, watertight, lightweight, and rugged. It is issued on a one per divisional company-size combat and combat support unit and as required for medical, maintenance, and bath units and water supply points.

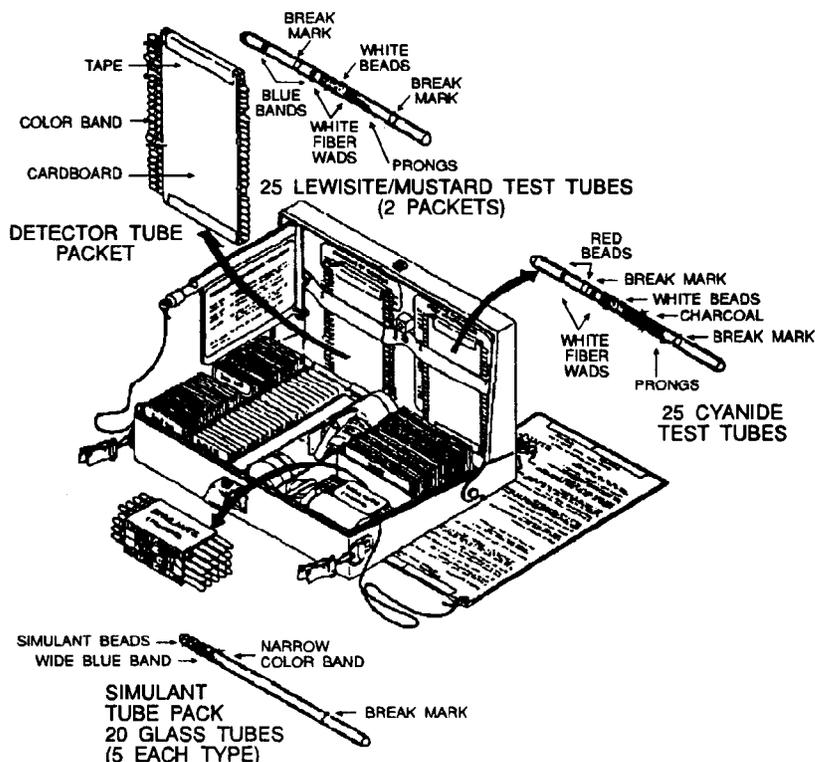


Figure 1-24. M272 water testing kit.

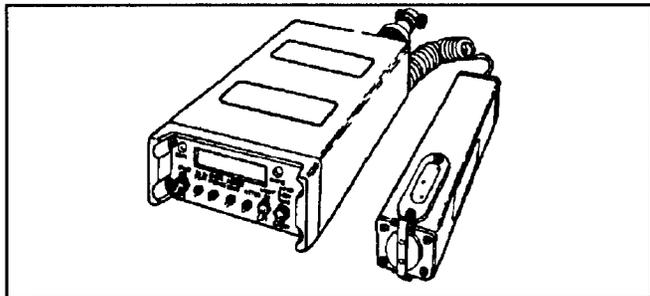


Figure 1-25. AN/VDR2 radiac set.

See TM 11-6665-209-15 and TM 11-6665-230-15 for further information.

### DS2 ABC-M11 Portable Decontaminating Apparatus

The M11 apparatus (Figure 1-28) decontaminates small areas, such as the steering wheel or other equipment that soldiers must touch. It is a steel container with aluminum spray-head assembly and a nitrogen gas cylinder that provides the pressure. It is filled with 1-1/3 quarts of DS2, which is sufficient for covering 135 square feet. The effective spray range is 6 to 8 feet. After each use, refill the M11 with DS2 and fit it with a new nitrogen cylinder, and it will be ready to use again. See TM 3-4230-204-12&P for additional information.

### M13 Portable Decontaminating Apparatus

Use the M13 apparatus to decontaminate vehicles and crew-served weapons larger than .50 caliber. The M 13 (Figure 1-29) is about the size of a 5-gallon gasoline can. It comes prefilled with 14 liters of DS2 decon agent. Decon capability is 1,200 square feet. A hose assembly, pump assembly, wand assembly, and brush are attached to the fluid container for disseminating DS2. The brush allows removal of thickened agents, mud, grease, or other material from surfaces. See TM 3-4230-214-12&P for further information.

### MOPP Gear Sustainment

To meet sustainment requirements for operations under NBC conditions, commanders must apply the sustainment imperatives of AirLand Battle doctrine. These imperatives include anticipation, integration, continuity, responsiveness, and improvisation. An understanding of these imperatives can ensure prompt delivery of needed items.

At present, units maintain two sets of contingency MOPP gear, commonly referred to as the NBC "A" bag and "B" bag of individual chemical equipment (ICE) packs. In most units, the "A" bag is to be with the soldier as part of his initial deployment gear if there is likelihood of an NBC threat. The "B" bag would be provided if needed. Getting this one or both

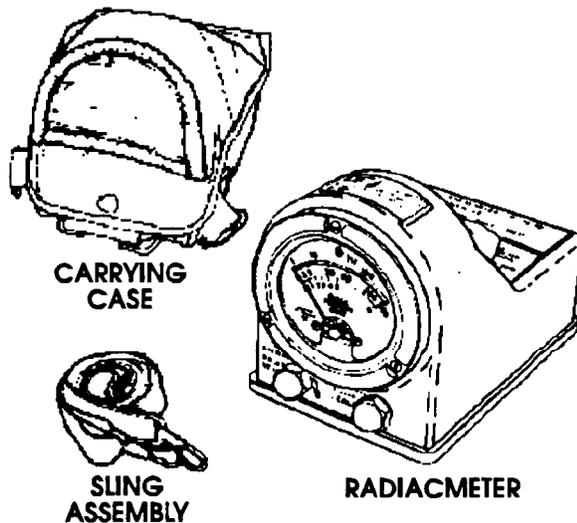


Figure 1-26. IM174/PD radiacmeter.

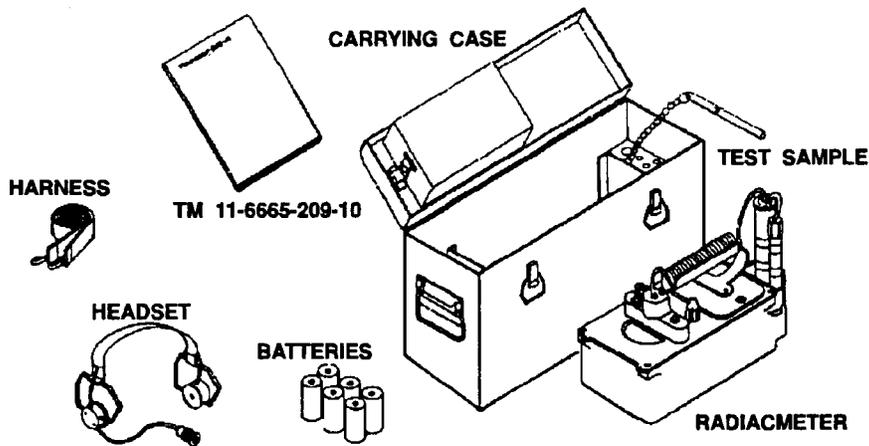


Figure 1-27. AN/PDR27 radiac set and components.

sets of gear to the soldier must be thoroughly thought out and planned for based on the operational situation using the sustainment imperatives as a guide. For your unit's specific quantities check with your next higher headquarters or use CTA 50-900 for specific quantities.

A forward deployed unit, such as an armored cavalry regiment (ACR), may require both sets of MOPP gear be immediately available based on the threat. The "A" bag is carried by the soldier as part of his individual

field gear. The "B" bag can either be part of the troop trains or squadron trains. This is again based on the threat. Other methods can be devised based on unit policy.

Given a low NBC threat situation such as Operations Urgent Fury, deployment to Grenada in 1983, and Just Cause, deployment to Panama in 1989, units deployed at MOPP zero. Unit sets of MOPP gear, including "A" bags, were palletized for immediate follow-on resupply if the NBC threat situation changed.

Resupply of the second set of MOPP gear into combat

configured loads can also be accomplished by palletizing the needed individual protective equipment (IPE). This method can be used by both light and heavy units. The intent of palletizing is to create a "push package" that can either be broken down at an arrival airfield or at a unit trains site for immediate issue to company-level units or for further movement forward to units in the field. The method of palletizing and movement is dependent on the type of unit and how

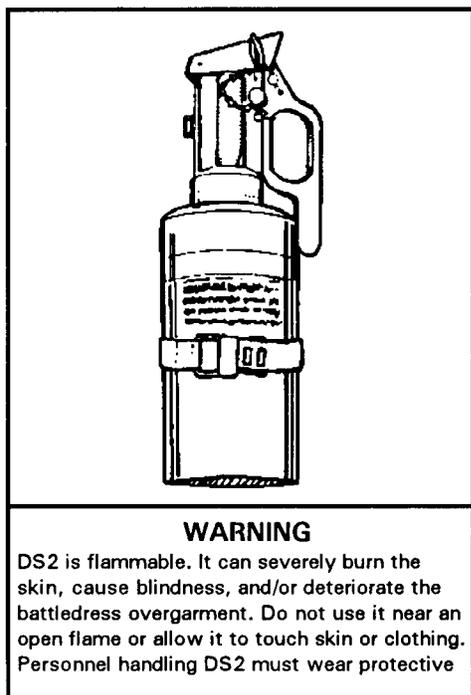


Figure 1-28. ABC-M11 portable decontaminating apparatus.

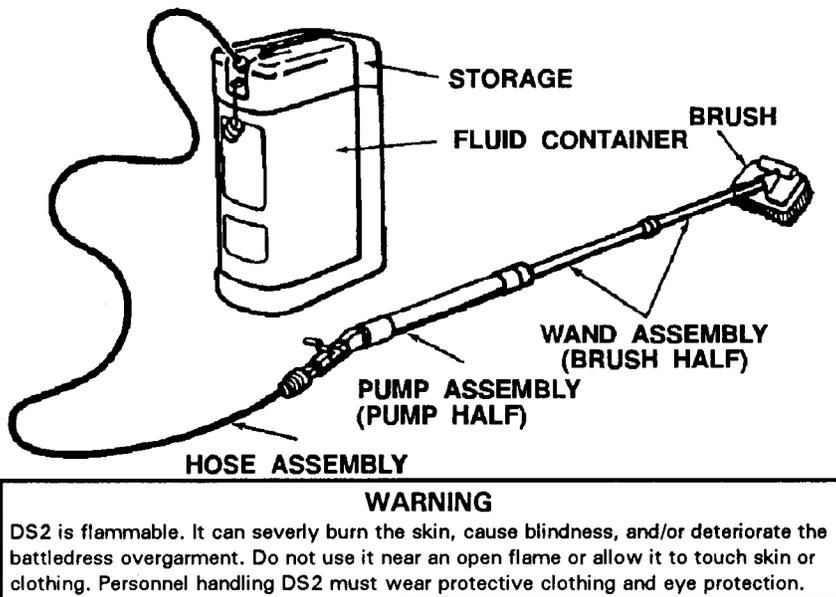


Figure 1-29. M13 portable decontaminating apparatus.

they perform their mission. The configuration of the pallets themselves and where they would be kept while in garrison will be dictated by unit SOP. Space will be a crucial factor. In light infantry divisions, pallets must be configured so as to fit on an aircraft that will be resupplying the units. In heavy divisions, pallets need to be configured to fit on whatever prime mover that is designated to haul the pallets.

A possible palletized configuration for use by a light infantry unit that, based on the expected NBC threat, initially does not deploy with either their "A" or "B" bags could be—

- One pallet with the unit's "A" bags and related IPE equipment: M256-series kits, M8 and 9 paper, M258A1/M291 kits, DS2, and M4 winterization kit.
- One pallet with the unit's "B" bags and related equipment.
- Another pallet containing other unit NBC equipment.
- One other pallet containing STB by itself since for safety reasons DS2 and STB cannot be transported together.

Configurations will vary based on a unit's general deployment plan (GDP) or contingency mission and the likelihood of an NBC threat in their area of operation (AO). All this would be integrated and executed through the logistics channels. These items will be moved based on certain time lines dictated by the operation plan (OPLAN) and on events that are expected to occur during the operation.

## **Chemical Protective Undergarment (CPU)**

**Description.** The CPU is a lightweight two-piece undergarment made of a nonwoven fabric with activated charcoal. The jacket has a zippered front with velcro wrist attachments. The trouser waist has an elastic band for a snug fit to the body. The undergarment weighs two pounds, 11 ounces. **NOTE:** The CPU primary basis of issue indicates that it will be issued to Special Forces and Combat Vehicle Crews.

### **Protection Capabilities.**

The CPU provides excellent protection against all known chemical agent vapors, liquid droplets; biological agents; toxins; and radioactive alpha and beta particles. The CPU is not a stand alone garment. The CPU is worn under standard duty uniforms such as the

Battle Dress Uniform (BDU) or the Combat Vehicle Crewmen coverall. The CPU is not designed or intended to be worn under the BDU or CPOG. The CPU is donned when soldiers are directed to go from MOPP0 to MOPP1. When the CPU is used at MOPP3/4, the protection afforded is equivalent to that provided by a MOPP3/4 ensemble using either the BDU or CPOG. Following exposure to a liquid chemical agent at MOPP3/4, soldiers should exchange their uniform and CPU within 12 hours. Further, CPU the should be disposed of if the exterior uniform has been exposed to a liquid chemical agent.

Do not remove the undergarment from the bag until it is ready for use. When the undergarment is removed from its vapor-barrier bag and worn, its protective qualities last for a minimum of 15 days. The protective qualities for the CPU begins to decline following 15 days; however, any specific decrease in CPU effectiveness has not been determined through test and evaluation. The wear time for the CPU begins when it is removed from the sealed vapor-barrier bag, and stops when the CPU is sealed back in the vapor-barrier bag. If the original vapor-barrier bag is not available to the soldier for undergarment storage, use a replacement storage bag that, as a minimum, is water resistant or water repellent. When any packaging leaks are discovered, seal or repair them with tape as soon as possible.

The CPU can also be laundered once during its 15 day utilization period (**Note:** During testing, the CPU was only laundered once; it is not known if repeat washing will decrease CPU effectiveness.) and retain its protective qualities. The CPU can be hand-washed in fresh water, or laundered by a quartermaster laundry and bath unit. **NOTE:** Follow the CPU laundering instructions outlined on the size and care labels

### **Serviceability.**

The CPU becomes unserviceable if it is ripped or torn; however, it can be repaired by following instructions that are provided in CPU use and care manual or TM 10-8400-201-23. The CPU remains serviceable if the vapor-barrier bag suffers damage (i. e., pinholes, rips, tears), provided the undergarment has not been physically damaged or exposed to chemical agents. The CPU comes in a sealed vapor-barrier bag that protects against rain, moisture, and sunlight. The CPU is resistant to rust, rot, and petroleum.