

CHAPTER 3

CONTAMINATION AVOIDANCE

Contamination avoidance measures are critical to the sustainment of fixed site operations under NBC conditions. Most fixed sites cannot avoid being targeted due to the nature of their mission and geographical location. Therefore, it is important that fixed sites adhere to the principles discussed in this chapter.

PASSIVE MEASURES

Basically, passive measures are those actions a commander must accomplish before an attack occurs to reduce the effect of an NBC hazard.

DISPERSE

Avoid presenting a more lucrative target than what already exists. Ensure population on the site is spread out within the site (for example, work areas and rest and relief areas). Unfortunately, dispersion will not reduce vulnerability, as in the case of a tactical unit. A commander should consider dispersion of like items, such as ammunition, to different storage areas. Also, the commander should consider dispersion of critical assets and provide concealment using a combination of man-made and natural foliage.

COVER SUPPLIES AND EQUIPMENT

Supplies and equipment can be protected from liquid contamination through the use of buildings and field expedient methods (for example, tarpaulins, pallets, packing materials, dunnage, and plastic). Protection wraps and covers are the best obtainable items to provide long-term protection. The NBC protective cover (NBC-PC) is a currently available example of this type of long-term protection. It provides a 24-hour barrier to liquid agents; it is a lightweight, throwaway plastic on rolls; and it is available as a common table of allowances (CTA) item. This measure should be viewed by the commander as critical because it will reduce the need for decontaminating equipment and supplies.

PLAN AHEAD

Just as tactical commanders must consider task accomplishment while in MOPP4 and plan courses of action to deal with it, fixed site commanders must develop their own courses of action for these similar problems. Perhaps the best way for preplanning site operations is through the use of standing operating procedures (SOPs). An SOP enables the commander to effectively plan what must be done before an NBC attack and how the site will react during the attack. Key considerations are: command and control, communications (use messenger system as a backup), shelter management, personnel management, area damage control, and entry and exit routes through the fixed site. This measure is critical when deciding how much warning is needed in order to react to an NBC hazard. For example, determine the amount of time needed to increase MOPP level, to disconnect radios, to cover supplies, to buildup a smoke screen, and so forth.

PROVIDE WARNING

Because a fixed site is unable to avoid NBC attacks and implementing a comprehensive detector network may not be feasible due to cost, the commander must ensure detector arrays are tailored to the site needs. For off-target attacks, the arrays should be oriented based on the prevailing wind direction. This will provide maximum early warning of downwind contamination hazards. For on-target attacks, the hexagonal arrays can be deployed only in the area of high value activities to provide automatic detection of agent vapors resulting from an agent rain attack, and to aid in locating contaminated areas. The advance warning will allow personnel to adjust MOPP levels and activate collective protection shelters before being exposed to militarily significant levels of agent hazards.

USE PREVENTIVE MEDICINE

FM 3-3 stresses the following preventive medicine programs when defending against biological agents: immunizations, area sanitation, personal hygiene standards, rest, and nutritional needs of personnel. It is important that the commander establish and maintain these programs.

INSTILL DISCIPLINE

As in tactical units, the commander of a fixed site must instill discipline and confidence in their ability to survive if his site personnel are to overcome the shock of an NBC attack and continue to operate effectively. It will be necessary for site personnel to be conditioned physically and mentally to wear and function in MOPP gear.

SEEK PROTECTION

Fixed site personnel must become familiar with collective protection systems and where these systems are located on their particular site. If personnel cannot reach a protective shelter or if a site does not possess that protective capability, personnel should know that any overhead cover, such as tents, tarpaulins, and ponchos, offers some protection from fallout and liquid chemical agents.

LIMIT EXPOSURE

Commanders should ensure that their plans cover the rotation of personnel who must work in a contaminated area. These personnel should rotate in and out of a rest and relief area to prevent prolonged exposure to NBC contamination. This is particularly important when operating in radiological contamination. Site personnel should know that marking contamination lessens the spread of contamination and that there are places where NBC contamination hazards can accumulate (for example, an air filter).

PREVENT SPREAD OF CONTAMINATION

Limit the number of personnel and the amount of equipment entering an area within the site, or onto or off of the site already contaminated. This

involves marking contaminated areas and decontaminating personnel and equipment before allowing them into a clean area. Preplanning site operations will aid in this measure.

CONTAMINATION CONTROL

For fixed facilities, contamination control is the key principle for avoiding contamination once it is introduced on the site. By exercising control, the commander can maintain a current knowledge of the NBC status of the entire site and apply that knowledge to varying routines and schedules.

The commander will give his guidance and concept of the operation to the intelligence officer who will translate that guidance into intelligence requirements and establish priorities. Intelligence requirements and priorities are expressed in terms of PIR and information requirements (IR). Therefore, the commander's PIRs will determine how and what intelligence will be collected (see Figure 3-1).

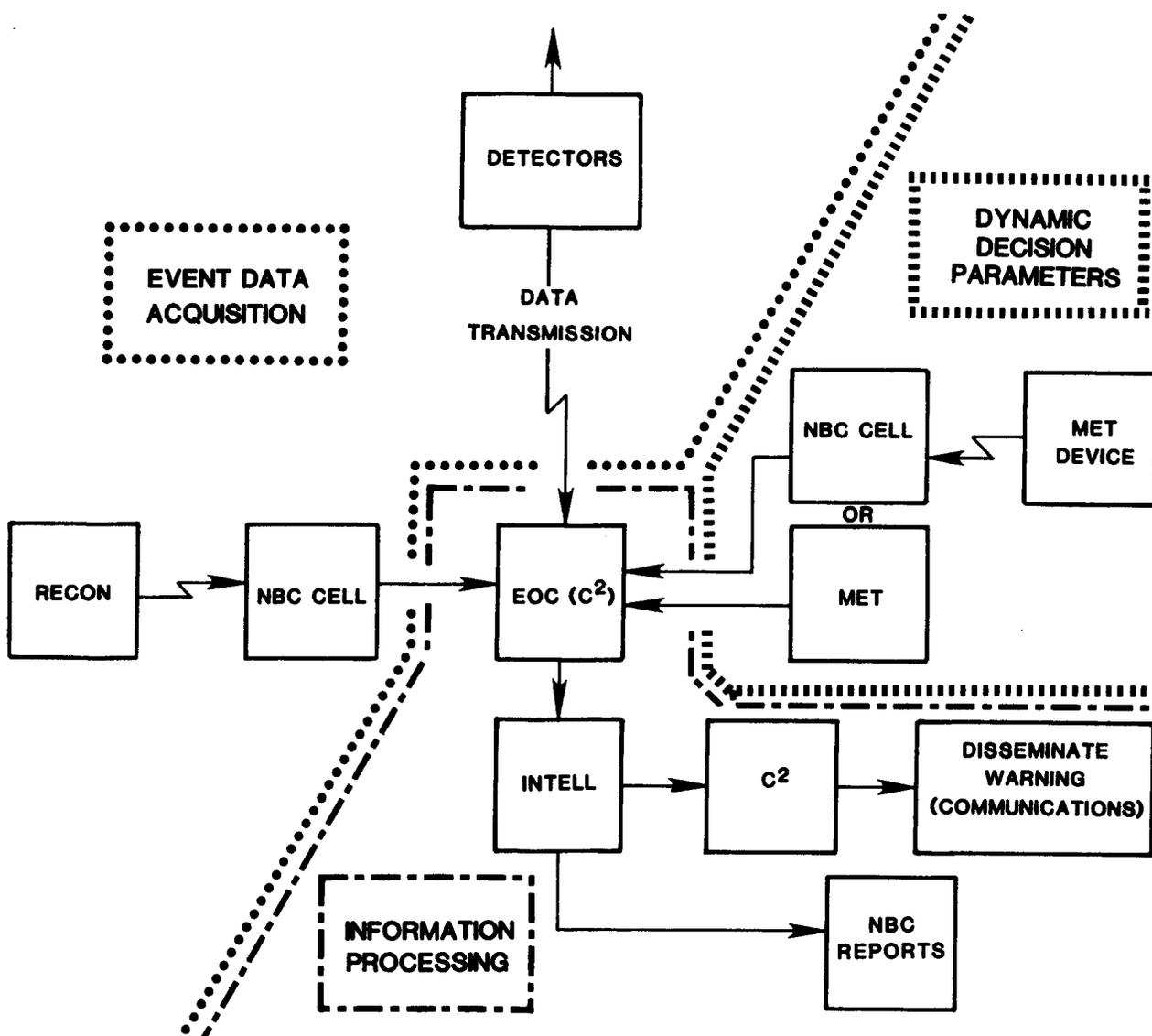


Figure 3-1. Contamination control.

The following is a list of PIRs and their related IRs that would be important to fixed site operations with respect to contamination control:

PIR NBC status	IR agent existence agent type amount (extent of contamination) location
Weather	temperature windspeed humidity temperature gradient
Terrain	observation concealment and cover obstacles key terrain avenues of approach

An NBC warning and reporting system will need to be initiated. This is part of the intelligence collection effort of recording, evaluating, and analyzing that makes up the IRs used to support the commander's PIR. There are two important steps in this warning reporting effort. The first step is an observer report, and the second step is a monitoring, surveying, and reconnoitering report used to determine extent of contamination. The commander must also be kept abreast of the current weather condition.

The purpose of contamination control is to limit the spread of contamination. This is done by the implementation of detection and warning, identification and marking, and passive measures (see Figure 3-2). As you read through this chapter, you will see how these three principles enable the commander to control contamination and obtain the overall goal of continuation of mission-essential operations during and after an NBC attack. Essentially, contamination control is integrated into all site operations such as supply and maintenance.

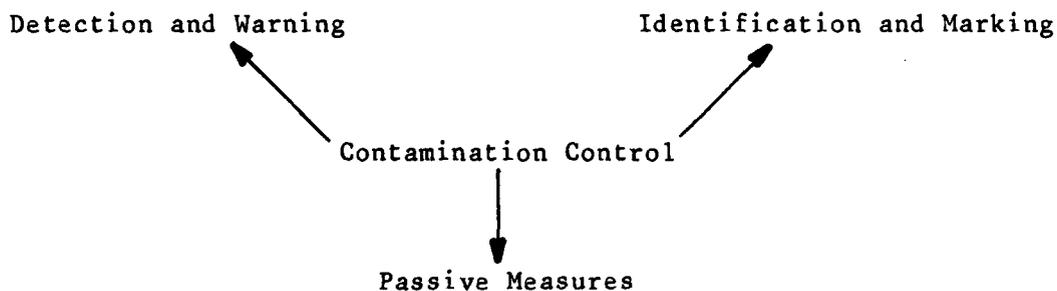


Figure 3-2. Implementation of contamination control.

DETECTION AND WARNING

Warning personnel first will be of primary importance, especially for unprotected personnel. Therefore, commanders will need to take advantage of early warning systems, such as radar, to give personnel advanced warning of

imminent attacks. Detection devices only confirm the presence or absence of contamination. The commander cannot rely on detection devices to give him all the advanced warning he needs. For example, a current study done by Ball Equipment Systems shows that using current M43A1 detectors will not provide advance warning of an on-target attack. The alarm will sound approximately 58 seconds after agent touchdown. The commander should consider automatic masking -- personnel mask at any indication of a CB hazard and seek guidance to unmask. The current M8A1 alarm system (M43A1 and M42) can only detect vapor hazards of all known nerve agents. The best employment array for the M43A1 detectors is based on the probable threat. If the threat is solely an off-target attack, then the detectors may be emplaced upwind from the area(s) to be protected. If the threat includes an on-target attack, then the detectors should be arrayed in a hexagonal pattern at 250 meter intervals.

The current method for detecting liquid chemical agents is the M8 and M9 chemical agent detection paper. Both the M8 and M9 paper can detect V-type and G-type nerve and blister agents, but the M8 paper can identify the liquid agents as well. M9 paper is the most widely used method of detecting liquid chemical agents. However, it can give a false reading if it is allowed to come in contact with petroleum products and decontaminating solution number 2 (DS2). M8 paper is used whenever chemical agents are suspected. The M9 paper is more sensitive than the M8 paper, and is especially useful in detecting on-target attacks and keeping soldiers from entering contaminated areas.

The M256A1 chemical agent detector kit (containing M8 paper for liquids and detectors for vapors) is capable of detecting and identifying both liquid and vapor of all known nerve, blister, and blood agents. This kit is used primarily to determine the type of chemical agents present and to help the commander provide guidance to personnel on whether to unmask or not. Currently, there is no fielded device for detecting biological agents. Detection is accomplished by using intelligence sources to predict an attack, recognizing a pattern of employment, and recognizing the signatory symptoms, signs, and effects. Monitoring of NBC contamination is incorporated into the detection and warning effort. Monitoring in the postattack phase determines if a hazard still exists and, if so, to what extent or intensity. This information is important to a commander; he will use it to adjust MOPP levels and determine whether to decontaminate equipment or not. The IM174-series radiacmeter and the M256A1 kit are used in monitoring nuclear and chemical contamination respectively.

The IM93/UD dosimeter is used to measure the total amount of gamma radiation accumulated by an individual. This piece of equipment is usually issued to one member of a survey and monitoring team. The AN/PDR27-series radiac set is used to measure the amount of gamma radiation on personnel, equipment, buildings, and so forth, and can detect the presence of beta radiation. This piece of equipment can be used for reconnaissance and decontamination operations.

IDENTIFICATION AND MARKING

In addition to the detection and warning capability, the installation will need to identify and mark contaminated areas to lessen the chance of recontamination of personnel, equipment, buildings, and so forth. This is done by conducting reconnaissance to locate the hazard and a survey to

determine quantity, size, and content. The survey provides the commander with detailed information on the size of the contaminated area. Reconnaissance detects the presence of contamination and finds the boundary of radiological or liquid chemical contamination and/or routes around or through a contaminated area (see FM 3-3 for complete discussion). Once the presence of a contaminating agent is confirmed, the identification of it takes place. Identification of the agent determines the approximate duration of the hazard, the limitations of the agent (route of entry into the body and weather effect on it), the type of treatment necessary, the type of symptoms to look for, and any additional protective measures needed. The current method of identifying a biological agent is through sampling (obtaining a large amount of agent relatively free of interfering material) using the M34 NBC agent sampling kit. Conduct sampling when an attack is indicated and then directed by the NBC cell. Thus, identification and marking of NBC contamination helps reduce the spread of this contamination.

METHODS

The commander must consider equipment and personnel assets available and required to implement contamination avoidance measures at the fixed site. Personnel must be diagnostically evaluated to determine training shortfalls for operation and maintenance support of equipment. Personnel and/or manpower requirements will be directly proportional to the equipment assets required to provide detection and early warning. Commanders with predominantly civilian work forces may encounter much more extensive training program requirements. Commanders should first consider standard, type-classified equipment items (such as M8A1 alarms, M256A1 detector kits, and M8 and M9 detector paper) to meet equipment asset requirements. Next consider field expedient means (overhead cover construction, planning for uncontaminated soil for covering ground contamination, and so forth). Perform a site analysis to determine the best entry/exit routes through the site. Make strip maps to reflect this analysis and to include decontamination points and water points.

The C³I center will be the focal point for all fixed sites; it is here that the commander will make the critical decisions for continued site operations. In the far term, the use of a central computer that collects and processes data from an extensive array of automatic detectors will give the commander the ability to effectively work around contamination and minimize its effects. The detectors will have the ability to detect and monitor all NBC contamination and gather pertinent weather data. However, this capability will depend on the needs of the site which will be determined as you work through the matrix (see planning). The C³I center will also be the focal point for the management of warning and monitoring of imminent and current NBC hazards. This task will be accomplished through the use of portable detectors and a series of pre-positioned detectors tied into the C³I center. The pre-positioned detector array is placed on the perimeter of the site, in heavy populated areas, or in critical site function areas, such as railheads. The portable detection and warning systems will be needed for work, rest and relief, and remote areas. Examples of these are guard posts, storage areas for ammunition and supplies, entrance ways of collective protection systems, and decontamination sites. Depending on the complexity of the detection array, the whole system may be able to assist in identifying and marking contaminated areas. Figure 3-3 illustrates this overall concept of the fixed site detection and warning system defense against contaminating agents.

Lastly, identification and marking will be an integral part of the site operations as well. To accomplish this task, the installation should be able to conduct reconnaissance operations.

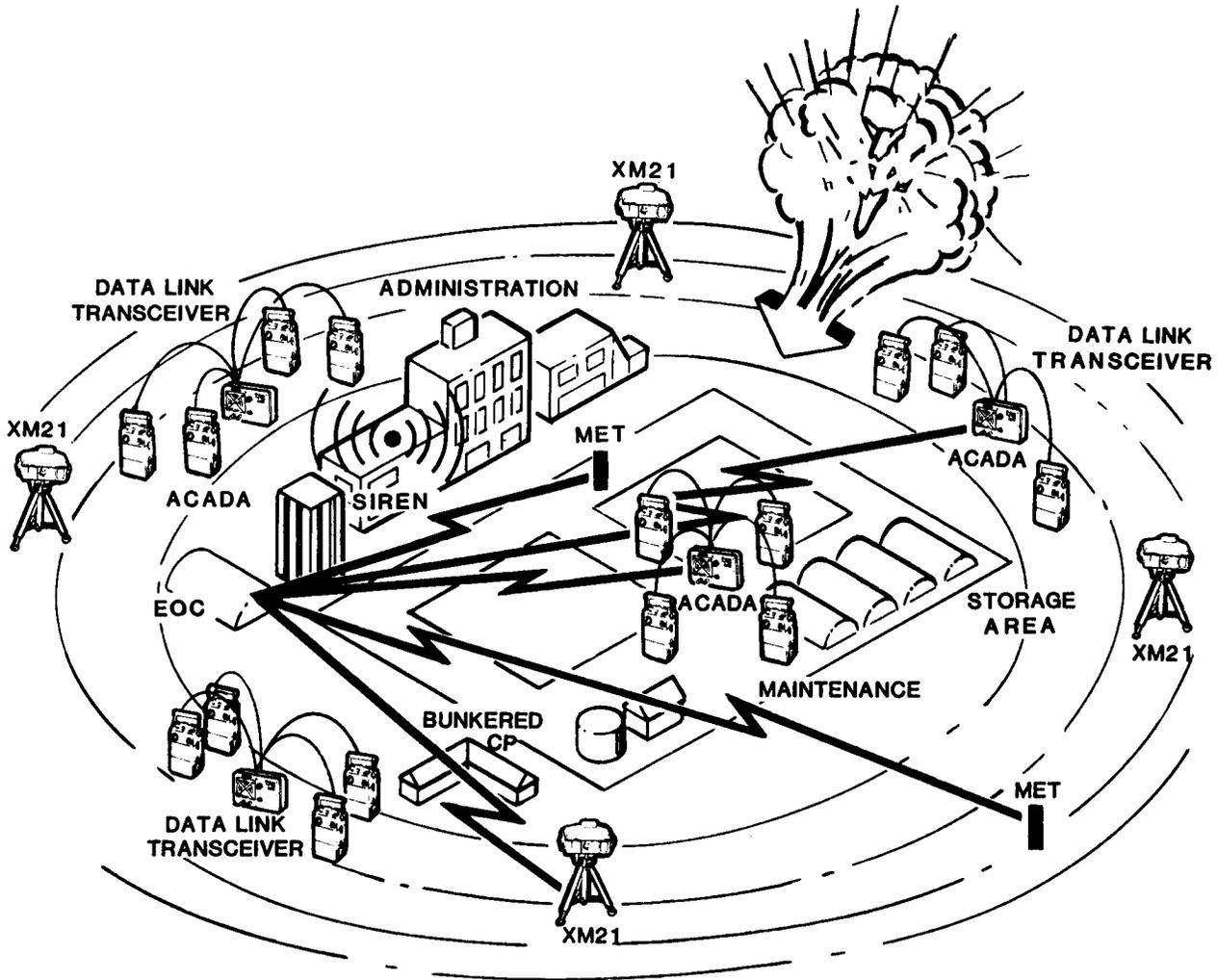


Figure 3-3. Fixed site chemical detection and warning system (FSCDWS).

Through the use of organic assets, the road network and outlying areas of the installation could be successfully reconnoitered. Figure 3-4 shows the various equipment that should be organic to a reconnaissance element. The identification and marking must be further expanded into collective protection and decontamination functions to limit the spread of contamination.

PLANNING

The planning matrix (on page 26) will help commanders determine the amount of early warning needed. Before advancing any further, there are three important criteria a commander must consider. These criteria are --

- The adequacy of the warning system.
- The size of the available area on which to disperse the command.
- The size of the command.

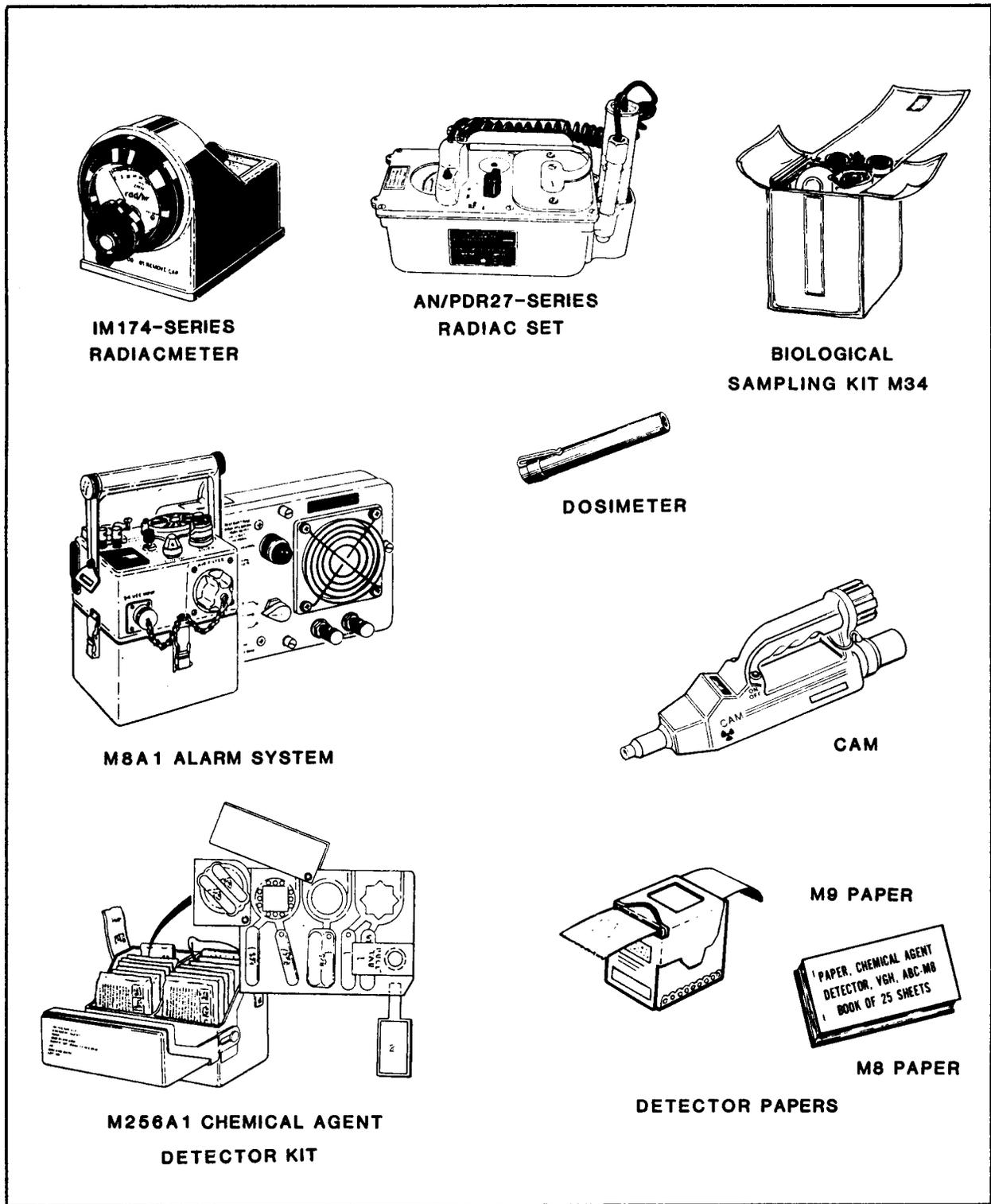


Figure 3-4. NBC reconnaissance equipment.

The three criteria coupled with the matrix should determine the appropriate detector array for your particular installation. The matrix (on the next page) is designed to keep cost requirements for a site to a minimum.

PLANNING MATRIX

Let us analyze each step of the matrix (Figure 3-5). The first step determines the target priority of the site as viewed by current Soviet doctrine. The second step assesses the replacement value of the site. Here we are looking at the importance the site has in supporting the US allied forces, that is, any unique capability that cannot be duplicated in-country. The last step looks at the NBC threat for the site. If you have reached this far in the planning matrix, then we assume that you have significant NBC threat. According to the fixed site chemical detection and warning system (FSCDWS) operational and organizational (O&O) plan, the NBC threat is compartmented into two areas: on-target and off-target. The commander needs to determine next whether his site would most likely have an on-target or off-target attack. A site considered to have an on-target threat would expect to see the enemy use every delivery means available (such as air-delivered weapons and missiles). A site considered to have an off-target threat would expect to be located near an adjacent site with a probability of an NBC attack. As discussed in Chapter 1, commanders were to consider an off-target attack when analyzing the NBC threat. When analyzing an off-target attack, the commander must first determine the predominant wind direction. Now enter the matrix and determine your detector array requirements.

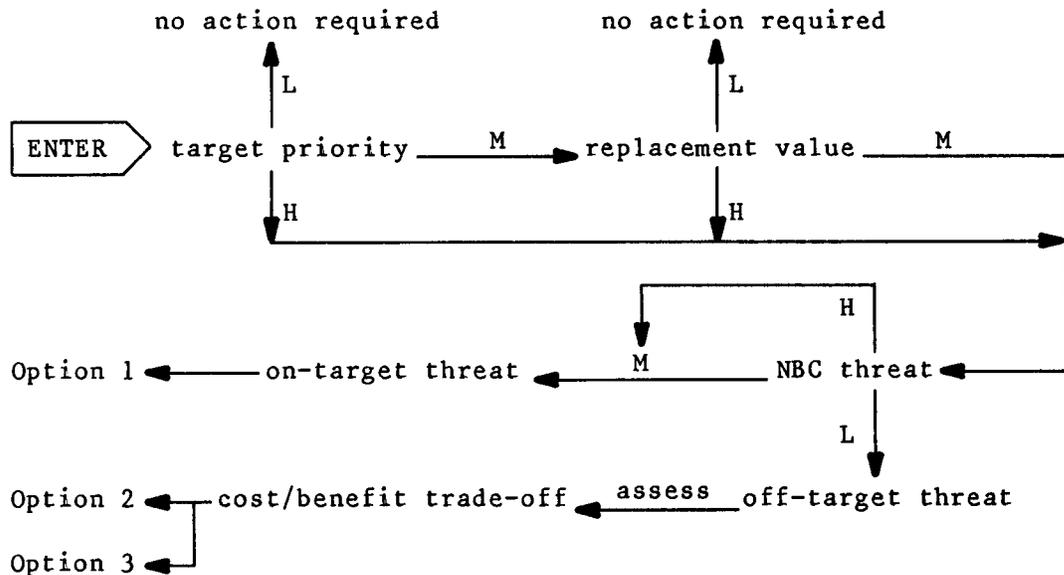


Figure 3-5. Planning matrix.

Target Priority

Low (L) -- Site is in lower section of enemy target priorities and would be a secondary target for air-delivered systems.

Mid (M) -- Site is higher on enemy target lists, but it may not be of sufficiently high priority to use scarce, expensive weapon systems (for example, missiles) on the target.

High (H) -- Site is very high on enemy target lists and would receive priority consideration for all means of attacking the target.

Replacement Value

Low (L) -- Site destruction has little immediate or elayed impact on force effectiveness.

Mid (M) -- Site destruction has significant indirect or delayed impact of force effectiveness. Redundant capabilities exist, although loss of this site may result in a reduced mission capability.

High (H) -- Site destruction has significant direct impact on force effectiveness or significant delayed and/or indirect impact. No redundant capability exists.

NBC Threat

Low (L) -- NBC threat is from a probable off-target attack.

Mid (M) -- NBC threat is from a probable off-target, possible on-target attack.

High (H) -- NBC threat is from a probable on-target attack.

Option 1: On-target and off-target protection is provided by a hexagonal array of point detectors spaced 250 meters apart over the entire facility or for densely populated areas.

Option 2: Off-target protection around entire perimeter.

Option 3: Off-target protection around the perimeter of the predominant wind direction only.

Cost will vary for each fixed site based on the last two criteria. Regardless of the option, the commander can include hardwiring, cables, transmitters, and so forth into his detector array.

In option 1, the optimum detector mix is a combination of an advanced chemical agent detector alarm (ACADA), an automatic liquid agent detector (ALAD), and a remote sensing chemical agent alarm (RSCAAL). The required spacing for point detectors (ACADA and ALAD) is one per 200 to 400 meters, depending on desired probability of detection. Depending on the site geography, the outside detectors in the on-target array may provide off-target protection. The RSCAAL has the potential to detect a chemical agent before intrusion into the site. However, the RSCAAL requires a clear line of sight for acceptable performance. A site survey is required to determine if and where the RSCAAL can be of use. In addition, if the commander is not satisfied with the recommended solutions in option 1, he may choose a less expensive option, depending on the risk he wishes to take. An off-target array would provide additional warning but would not reduce casualties. Another possible solution to reduce the cost is to consolidate all critical functions in one area. However, this would increase the site's vulnerability from a nuclear attack.

For options 2 and 3, the point detectors are required at least 200 meters upwind of the populated area boundary and spaced 200 to 400 meters apart.

ACTIONS

Once a recommended course of action is determined from the matrix and approved by the commander, equipment items should be identified and field expedient measures begun. The commander must then consider support documentation. This includes revisions to the table of distributions and allowances (TDA), table of organization and equipment (TOE), or common table of allowances (CTA) for authorization of personnel and equipment items determined to be essential for fixed site detection and warning implementation.

Dividing a plan into three time increments, (near term -- 1 to 2 years, mid term -- 3 to 4 years, and far term -- 5 years and beyond) is a systematic way of assisting the commander in developing a long-range fixed site defense plan. Table 3-1 is an example of developing a long-range plan. The analysis that went into Table 3-1 is as follows: Near term is 15 months, mid term is 37 to 38 months, and far term is greater than 60 months.

For our example, we have chosen a typical ammunition depot. In the near term, the sites current detector array is upgraded with currently fielded M8A1 alarms, and detector paper is used to detect any liquid hazard existing or remaining. Additionally, the M256A1 kit is used to identify or confirm the hazard; at decontamination sites it is used to check completeness of decontaminating (off-gassing). A single meteorology (MET) station is emplaced in the populated area of the site giving significant weather phenomena, temperature, humidity, and atmospheric conditions. This information is needed when constructing a chemical downwind message. Additionally, field expedient means are utilized as required in each of the areas mentioned above.

In the mid term, the detector array (M8A1 alarms) and MET station are interfaced with a personal computer located in the C³I center using hardwiring or cables. Communication links are upgraded (radio and telephone). The portable M8A1 alarms not in the detector array are interfaced as well with a communication linkup.

In the far term, the M8A1 alarms are replaced by an advanced chemical agent detector and an automatic liquid agent detector as they become available. Remember, the liquid agent detector will be needed only for sites that have an on-target threat. RSCAAL will be added to the detector network if the site survey indicates sufficient line of sight exists for it to be of benefit. Replace M256A1 detector kit with the chemical agent monitor (CAM) at the decontamination sites for improved detection (faster identification and confirmation of a hazard).

In this example, the detector array is concentrated around the administrative and railhead area. This is both a heavily populated area and a critical function area. A detector array can be positioned in a populated area, the entire site area, or on the site perimeter depending on adequacy of the warning system.

Table 3-1. Detection and warning.

NEAR TERM	MID TERM	FAR TERM
<p>1. Administrative and Railhead Area</p> <ul style="list-style-type: none"> • Emplace M8A1 alarms. • Emplace detector paper (M8). • Emplace single MET station. 	<p>1. Administrative and Railhead Area</p> <ul style="list-style-type: none"> • Integrate detector and communications network. • Coordinated by personal computer. • Integrate MET detector/warning readout. 	<p>1. Administrative and Railhead Area</p> <ul style="list-style-type: none"> • Upgrade detector array with ACADA, ALAD, and RSCAAL as they become available. • Similarly upgrade communication components. • Basic system remains the same.
<p>2. Bunker Storage Area</p> <ul style="list-style-type: none"> • Portable M8A1 alarms (work teams carry). • Emplace detector paper (M8) augmented by work teams supply. • Two-way radio and telephone amplifier box. 	<p>2. Bunker Storage Area</p> <ul style="list-style-type: none"> • Portable M8A1 alarms with direct communications linkup. • Two-way radio linkup. 	<p>2. Bunker Storage Area</p> <ul style="list-style-type: none"> • Upgrade depending on use.
<p>3. Ammo Repair and Storage Area</p> <ul style="list-style-type: none"> • Portable M8A1 alarms as needed. • Emplace detector paper (M8). 	<p>3. Ammo Repair and Storage Area</p> <ul style="list-style-type: none"> • Same as bunker storage area. 	<p>3. Ammo Repair and Storage Area</p> <ul style="list-style-type: none"> • Upgrade depending on use.
<p>4. Isolated/Transient Work Area</p> <ul style="list-style-type: none"> • Same as bunker storage area. 	<p>4. Isolated/Transient Work Area</p> <ul style="list-style-type: none"> • Same as bunker storage area. 	<p>4. Isolated/Transient Work Area</p> <ul style="list-style-type: none"> • Upgrade depending on use.
<p>5. Decon Sites</p> <ul style="list-style-type: none"> • Same as bunker storage area. • Employ M256A1 detector kit. • Two-way radio links. 	<p>5. Decon Sites</p> <ul style="list-style-type: none"> • Same as bunker storage area. 	<p>5. Decon Sites</p> <ul style="list-style-type: none"> • Integrate chemical agent monitors (CAMs).

Note: For all near term actions, field expedient means are used as required.