Chapter 5
CB Reconnaissance, Monitoring, and Survey: Planning, Conducting, Recording, and Reporting

Chemical and Biological (CB) reconnaissance, monitoring, and survey may be divided into two main categories; chemical and biological operations.

Location of Chemical Agents

Chemical downwind hazard prediction in Chapter 3 provide a means of locating probable chemical hazards. Before units can avoid chemical agents, they must know what type of agent is present and where it is located. Nonpersistent agents are present as a vapor hazard (except in and around the shell crater). Persistent agents are present as both a liquid and vapor hazard. Liquid agents are usually found in the attack area. Vapor hazards are in both the attack and hazard area.

Vapor hazards are the most difficult to predict. They may arise from an agent delivered as a vapor or from evaporation of a liquid chemical agent. The chemical downwind hazard prediction, described in Chapter 3, outlines the largest area vapor could travel. Within that prediction, there are both clean areas and areas where chemical agent vapor still linger. Although computer modeling of the terrain and weather conditions would provide a better picture of where chemical agents may go, it does not preclude sending a soldier to that specific location to verify whether or not the agent in question is there. To accomplish this, units may use the Automatic Chemical Agent Alarm (M8A1), the Chemical Agent Monitor (CAM), and the M256 Samplers/Detectors to locate vapor hazards. FM 3-4 describes in greater detail how weather and terrain affect where chemical agent vapor will exist.

The location of liquid chemical agents is much easier to predict because wind and terrain do not affect their location. It takes significant weather such as a heavy rainfall to move liquid chemical agents. They decompose through weathering; liquid agents usually will evaporate from exposed areas and collect in sheltered areas. Units use ABC MS or M9 Detector Paper to detect liquid hazards. Recon, monitoring, and survey methods are used to locate liquid and vapor hazards.

Reconnaissance

Recon is searching for chemical hazards in an area before a unit moves into or through the area. All units use reconnaissance to locate chemical hazards. CB recon techniques are similar to conventional recon techniques.

Before moving into or occupying an area, units check the area for enemy activity and the presence of chemical hazards. When in a static position, units recon areas around their positions. The recon team or element may have an Automatic Chemical Agent Alarm, CAM, M256 Series Detector Kit, ABC M8 Paper, M9 Paper, M272 Water Test Kit, and M34 Sampling kit. Division recon elements may also be equipped with the M-93 NBC Reconnaissance Vehicle (FOX).

Procedures

Recon procedures are the same regardless of who conducts them. The purpose of CB recon is to find the boundary of contamination and/or routes around or through a contaminated area.

Recon teams determine the following information:

- Are there chemical agents present?
- If an agent is present, what type of agent is it?
- Where and when was the agent first detected?
- What are the boundaries of the contaminated area?
- Is there a clean route through the area?

The unit commander then uses this information to form a picture of what chemical agents are in the area of operation. This is used to plan future operations.

Prior to leaving the unit area to conduct the recon, the recon team prepares its equipment and determines areas of priority. Areas of priority include possible movement routes and possible unit locations. The unit commander designates an area for the recon team to return for decontamination.

The recon method used depends on the tactical situation and the need. The following paragraphs describe recon procedures and what decisions must be made. Units adapt these procedures to fit their own need.

The first step is to plan the recon. The unit commander indicates areas of priority and determines approximate distances between recon checks. The

distance depends on the tactical situation, time available, and future use for the area. Distances are less in areas that the unit might move through or occupy. Figure 5-1 shows an example of how priority areas are designated.

Initially the recon team conducts checks at 500-meter intervals. They concentrate on areas where chemical agents will collect: low spots, small valleys, and sheltered locations. For more information on where agents may collect, see FM 3-6.

The recon team uses the CAM and the M256A1 Series Chemical Agent Detection Kits to detect vapors and ABC M8 or M9 Detector Paper to check for liquids. When time is critical, use sampler/detectors only when necessary. If the CAM and M256A1 samplers/detectors are not used, commanders must realize there is a risk of contamination and units must conduct liquid tests as they move through the area.

When the team detects chemical agents, they change procedures. They mark the area (unless ordered otherwise). Then they move back to a clean area.

They then move laterally for a predetermined distance (usually 500 meters), then move forward again. This procedure is followed until they reach the unit boundary or find a clean route through the contamination.

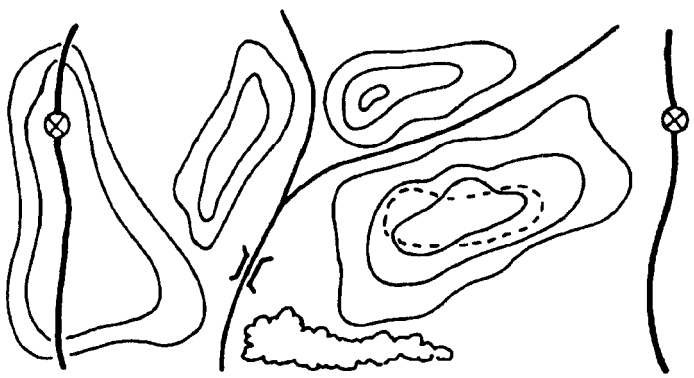


Figure 5-1 Areas of priority for recon operations.

Recording and Reporting RECON Information

The method the recon team uses to report information depends on how urgently the information is needed. If time is critical, the information is passed over the radio using the NBC 4 Chemical Report format:

Standard Format
NBC 4 Chemical
H Nerve, V
Q LB195300, Liquid
S 201050Z

If time is not critical, or if radio assets do not permit passing the information over the radio, the information is recorded and carried back to the unit. The chemical data sheet is used to record and transfer recon information. Figure 5-2 shows a completed DA Form 1971-2-R (Chemical Data Sheet-Monitoring or Survey).

Monitoring

All units use monitoring to determine if a hazard is still present. Monitoring can be done on personnel, equipment, or terrain. Basically it is a recheck to see if a contamination hazard, identified by a recon team or in detecting an attack, still exists. The purpose of monitoring is to enable the commander to decide the protective posture of the unit. If monitoring reveals no hazard, then the units may lower their MOPP level (depending on the threat workload). The M256A1 Detector Kit is the primary piece of equipment used to monitor for chemical agents. This kit, supplemented by the CAM, M8A1 Alarm, and ABC M8/M9 Detector Paper provide the monitor with the necessary equipment to detect the presence of chemical agents. If monitoring reveals that the chemical agent is still present on equipment, decon operations may be required.

Surveys

Chemical surveys are required when the commander needs detailed information on the size of a contaminated area. Unlike radiological surveys, the intensity of chemical contamination cannot be determined. Learning the extent of contamination within the area of interest and along specific routes is the primary interest.

Recon elements find the contaminated areas. The unit conducting the chemical survey usually knows the general location of the contamination and what type agent to expect. It may also know how the agent was delivered. This helps when planning the survey.

For example, an area contaminated by an artillery attack usually is smaller than an area contaminated by a spray attack. This information determines the number of recon teams needed and the amount of time needed to conduct the chemical survey.

Time is a major factor in planning and conducting chemical surveys. Each detection test requires time. The primary concern in surveys is to determine areas contaminated by persistent chemical agents, so the majority of the testing done during a survey is with M8 or M9 Detector Paper. Periodic tests are done with the M256A1 Detection Kit to ensure that only the chemical agent being tested for with the detection paper is present.

CHEMICAL DATA SHEET – MONITORING OR SURVEY

For use of this form, see FM 3-3; proponent of this form is USACMLS

DATE	PAGE NO.	NO. OF PAGES
14 July 86	1	1

UNIT: B Co 2/31 Inf

MONITOR OR SURVEY TEAM NUMBER: #B2

MAP USED: Karlsbode

MONITOR OR SURVEY TEAM MEMBER (Print Name): SP/4 Moyer

LOCATION/TIME OF TEST OR INDICATION	TYPE DETECTOR USED			AGENT DETECTED
	PAPER	ALARM	KIT	
NV521678/100600Z		✓		NERVE
NV521676/100625Z	✓			V.
NV521674/100636Z	✓			V.
NV521672/100647Z	✓			V.
NV521670/100715Z	✓			V.

SAMPLE

REMARKS

DA FORM JUNE 86 1971-2-R

Figure 5-2. Completed DA Form 1971-2-R for Monitoring.

When conducting a chemical survey, there are several Possibilities that must be considered: what type agent is known to be present, is there a chance for a mixture of agents, and how much time is available to do the survey. The most important aspect is to do a thorough job. If a hazard is missed, the unit could sustain casualties when they occupy the area. Figure 5-3 gives an indication of how long surveys take.

The size of a contaminated area is important, in determining the number of teams needed to conduct the survey. Use the following table to estimate the size of the attack area for planning purposes.

Attack area radii for different type munitions.

Type Munition	Attack Area (radius)
Artillery, bombers, and morters.	≤ 1 km
Missiles, bombs, unknown munitions, and multiple rocket launchers.	> 1 km to < 2 km
Aircraft spray or rocket spray	> 2 km

Example: 1/4 - kilometer target radius

Use M256/M256A1 kit for initial test only 16 minutes

Use detector paper for five minutes at four locations 20 minutes

Walking a total of approximately 2,500 meters 60 minutes

Total time for a four - man team 96 minutes

Figure 5-3. Time required for 1/4 - kilometer radius chemical survey (four man team).

Techniques

Three techniques are used to conduct chemical surveys. They are route, point and area surveys. Routes and specific points may be surveyed if that information is needed. If conducted, the survey team goes to a specific point or points along a route and test for the presence of liquid contamination with ABC M8 or M9 Detector Paper.

The area survey is used to determine how large an area is contaminated. This information is used to determine whether to bypass or cross through the contaminated area. Area surveys can also be used to find relatively clean areas or clean routes within a contaminated area.

Figure 5-5 shows the basic concept used for conducting en area survey. In this illustration, the attack has a 1-kilometer target radius. The basic procedure applies to any target radius.

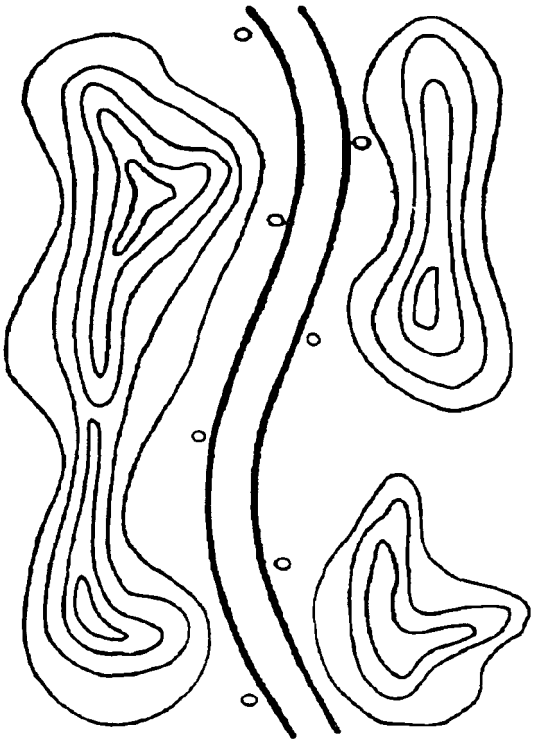


Figure 5-4. Route chemical survey.

If the agent identified by the detector kit is also detectable with ABC M8 or M9 Paper, perform all subsequent tests with detector paper. This will reduce the time required to perform the area survey.

The NBCC provides each survey team with an overlay showing the area to be surveyed. It also shows the initial test points for each survey team. Figure 5-5 shows the initial and subsequent test points for one survey team. The Figure also shows how teams 1 through 4 are equally spread out so that the chemical survey teams cover one forth of the survey area. Each team tests with the detector kit at the initial testing point. Detector paper tests are taken every 200 meters until the agent reacts with the paper or until each team member comes to within 200 meters of the attack center. All team members will exit the area by the route used by the vehicle operator.

If only one survey team is used, the survey team repeats the above procedures for each sector. If more then one team is used, the NBCC identifies each team's starting points (SP).

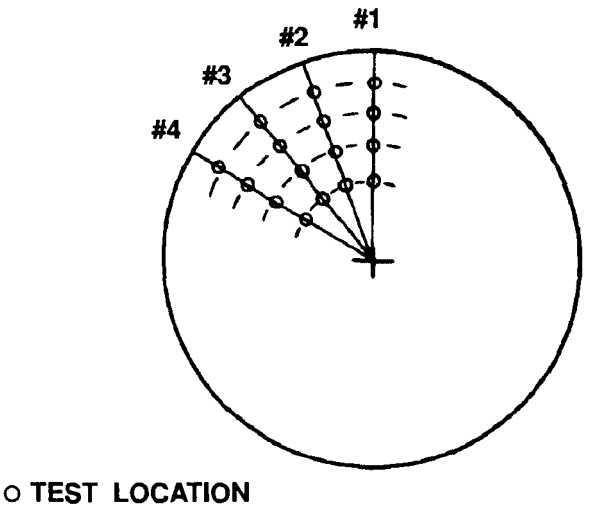


Figure 5-5. Area chemical survey.

Recording and Reporting Procedures

Record results of a chemical survey on a DA 1971-2-R Chemical Survey Data Form. The important information is the type of agent, the location where it was detected, and the type of test taken. Figure 5-2 shows a completed Chemical Survey Form.

The method used to report the chemical survey results depends on the situation. Since chemical survey reports are lengthy, the information usually is not transmitted back to the NBCC. The completed data sheet is carried back and handed to the NBCC. If time is essential, the information can be sent over the radio net. If this is done, the information is transmitted in an NBC 4 Chemical Report format.

Operational Aspects

Recon locates contaminated areas, monitoring finds contamination on personnel and equipment, and surveys confirm and define contaminated areas. These areas must be marked as contaminated. Use the NBC Contamination Marking Set described on page 5-9. Once located, the coordinates of the contamination areas are plotted as an overlay on the situation map. Units use this contamination overlay to plan operations. Commanders determine routes and unit positions, and plan tactical operations based on where the contamination is located. If unable to avoid the area, commanders determine routes of least contamination and determine what protection is required. They also choose locations for individual and unit decon sites on the other side of the contamination area.

Information on where NBC contamination is located is passed from one unit to another using the NBC 5 Chemical Report. It usually is sent as an overlay. Figure 5-6 shows an NBC 5 overlay with required marginal information. If time and distance do not permit, it can be sent as a NBC 5 Chemical Report. Figure 5-7 is an example of an NBC 5 Chemical Report.

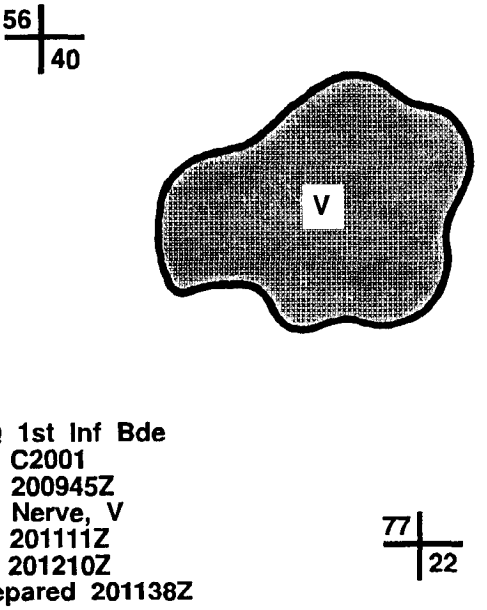


Figure 5-6. NBC 5 Chemical Overlay.

STANDARD FORMAT	USMTF PROGRAM
A C2001	NBC5
D 200945Z	MSGID/NBC5//
H Nerve, P, Air	NBCEVENT/CHEMICAL//
S 201111Z	ALPHA/2001//
T 201210Z	DELTA/200945Z//
X LB197306	HOTEL/NERVE, P/AIR//
LB19229Z	SIERRA/201111Z//
LB200310	TANGO/201210Z//
LB205303	XRAY/LB197306/LB192292/
LB205303	LB200310/LB205303/
LB207293	LB207293/LB207298/
LB207298	LB195300/LB197306//
LB195300	
LB197306	

Figure 5-7. Sample NBC 5 Chemical Report.

Note: The coordinates in line Xray must be sent and plotted sequentially. If line XRAY's beginning and ending grid coordinates do not match, this means you have an open area of contamination.

Another method used to pass information about a chemical attack is the NBC 6 Chemical Report. It is especially useful for a unit just arriving in an area of operation because it gives a summary of the chemical activity in that area. Figure 5-8 is an example of an NBC 6 Chemical Report.

STANDARD FORMAT	USMTF FORMAT	
IMMEDIATE	NBC 6	
NBC 6 Chemical Report	MSGID/	NBC6//
	NBCEVENT/	CHEMICAL//
A C2001	ALPHA/	C2001//
D 200945Z	DELTA/	200945Z//
E 200950Z	ECHO BC/	200950Z//
F LB200300, Actual	FOXTROT/	A/15RLB200300//
G Artillery	GOLF/	Artillery//
H Nerve, Airburst	HOTEL BC/	Nerve, V/Air//
I 20 Rounds	INDIA/	20 rounds
K Mostly small houses and barns, elevation 600 meters	KILO BC/	Farmlands/elev 600//
M Attack received as counter-fire, enemy bypassed on right flank of attack area	MIKE SIX/	Attack received as counterfire, enemy bypassed on right flank//
Q Liquid ground sample taken by detection team in attack area	QUEBEC BC/	LB200300/Liquid tested with M9 paper//
S 201005Z	SIERRA/	201005Z//
T 201110Z	TANGO BC/	201110Z//
X LB195300	XRAY/	LB206302/
LB 197306		LB209298/
LB198292		LB199301/
LB200310		LB199299/
LB205303	YANKEE BC/	0090 DEG
LB207293		Grid/010KMH//
LB207928	ZULU B/	Only attack in our
LB195300		area//
Y Downwind direction 0090 degrees, wind speed 010 kmph		
Z This is the only chemical attack in our area to date		

Figure 5-8. Sample NBC 6 Chemical Report

Point Surveillance, Area Surveillance, and Reconnaissance

The following chemical surveillance measures and reconnaissance techniques may be recommended by the staff chemical officer to support the scheme of maneuver:

Point Surveillance

The point surveillance mission is conducted for a specific period of time, oriented to key terrain. It is typically conducted to ensure that time sensitive or critical operations can be conducted without unwarned encounters with chemical agent clouds or transfer hazards resulting from a munitions event. For example, use an M8A1 alarm or an XM21 on a ridgeline oriented upon a bridge or on a other identifiable choke point up or down a valley. The principle advantage of this employment technique is that it capitalizes upon the strengths and minimizes the weak points of the detector. The XM21 is best used where a heavy agent vapor concentration of short-to-medium size will be seen within the entire field of view of the detector.

Area Surveillance

The goal of the area surveillance mission is to provide a tailored detection capability in those tactical situations where it is impractical to employ remoted point samplers, such as the M8A1 system. This would be done when the need for operational security, emplacement/recovery time/workload requirements, and some operational risk is acceptable. The mission may be conducted while mounted in the M93 Reconnaissance Vehicle or dismounted (using the XM21 Remote Alarm, M8A1 Alarm, and the M256A1 kit) configuration based upon the situation and the support unit.

Reconnaissance (NBCRS Mounted)

The reconnaissance mission is conducted to reduce the time required to perform NBCRS primary mission or to increase confidence that an area is uncontaminated. In a typical mission supporting NBC reconnaissance, an additional team may be used to monitor a portion of a route, that has been previously checked and classified as uncontaminated by the NBCRS. While the NBCRS is checking an adjacent route, a task organized team equipped with an M8A1 Alarm, XM21 Alarm, CAM or ICAD may overwatch the area just checked to report if a munitions event occurs following recon and prior to use of the route by the maneuver force.

Division NBC Center

At the Division, brigade mission support request are received by the NBCC and compared with division requirements to ensure that there is no redundancy. These request for support are weighted against the Division Commander's concept of the operation and a priority is assigned. The Division Chemical Officer then provides a proposed course of action to the G3 designed to accomplish hazard avoidance for the division.

Mission Management

Mission management is the direction and control of hazard avoidance operations. It involves identifying and planning necessary actions for satisfying each identified requirement. Mission management at the division level is accomplished by the NBCC. This section prepares the division hazard avoidance plan and coordinates it with the division reconnaissance and surveillance plan that is developed by the G2.

Contamination Marking

Once contamination is found, mark the area and-report to higher headquarters. Marking contaminated areas and equipment warns friendly units and helps them avoid the contamination. Marking a contaminated area merely indicates the presence of a hazard. The extent of a

hazard is determined by a detailed survey.

Standard Signs

Signs used for marking contaminated areas are standard throughout NATO in color and size. This permits easy identification. The color of the sign indicates the type of contamination. The primary or background color indicates the general type of hazard. The secondary color gives specifics as to what the hazard is. Figure 5-9 (page 5-8) describes the various signs, their colors, and required data.

In addition to color, signs are also a standard size and shape. The sign is a right-angled isosceles triangle. The base is approximately 28 centimeters (11-1/2 inches) and the sides are approximately 20 centimeters (8 inches). The signs can be made of wood, plastic, metal, or any other available material. Place the signs with the point of the triangle facing down.

For biological contamination and for persistent or semipersistent chemical agents, you need the type of agent (if known), date and time of detection.

The United States marks contaminated areas with the NBC Contamination Marking Set. It contains everything needed to mark a contaminated area - flags, ribbon, crayons, mounting stakes, and a carrying container. TM 3-9905-001-10 describes the kit and its use. Figure 5-10 (page 5-9) shows the kit and its major components.

If units do not have this kit available, they can make the signs out of available metal, plastic, or wood. These field expedient signs must be of standard shapes, sizes, and colors.

Marking Procedures

Marking warns friendly troops of contamination. Therefore, the signs are placed where they most likely will be encountered by friendly units. In rear areas the entire circumference of the hazard area may need to be marked. Individuals who find the contamination place the signs. They are placed where the contamination is detected. Adjacent signs should be within sight of each other (25 to 100 meters apart depending on terrain). This prevents units from missing the signs and entering a contaminated area. Recon elements mark the area at the point of entry. Unit survey teams are then responsible for determining and marking the extent of the contamination.

Some areas may contain more than one type of contamination or hazard. Mark these areas with the appropriate signs placed near each other. For example, if an area is both chemically and biologically contaminated, both signs are used and placed near each other.

For rear areas, in, around, and behind the Division Support Area (DSA), and while in open terrain (i.e., desert, plains, rolling hills . . . etc) it is possible to raise these contamination markers on poles. These poles may be camouflage support poles, extra tent poles or any other such material. The intent is to raise the contamination marker up high enough so that it can be seen for at least 200 meters. This is done so that follow-on forces and support troops can be aware of the hazard.

In these rear areas, "clear areas" or "lanes" may also be marked for easy identification. One method of marking this lane is using the CB Contamination Bypass Marker depicted in Figure 5-11 and 5-12 (page 5-10).

NOTE: Placing markers on poles, or using the bypass marker in forward areas is considered tactically unsound and should be avoided. It would only provide a roadmap for the enemy.

Marking Contaminated Materiel

Special procedures are used when marking and handling contaminated materiel. Materiel is marked to keep personnel from accidentally becoming contaminated. This means that markers placed on materiel have to be visible from any angle. The disposition of the materiel depends on the situation. If it can be left in place to weather, that might be the best solution. If contaminated materiel is collected in a holding area, then the area has to be marked and monitored for residual hazards. Since vapor hazards are additive, several pieces of like contaminated equipment together could create a serious vapor hazard when located near each other. This could be a problem in areas such as maintenance holding areas.

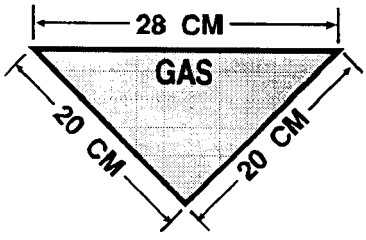
Since residual hazards can collect in inaccessible places, contaminated vehicles and equipment must be marked or identified. Otherwise, maintenance personnel could be injured by hidden contamination. One way of doing this is to attach a marker to the outside of the vehicle.

Biological Sampling

Since the type and amount of a Biological Warfare (BW) agent cannot be determined in the field, properly collected samples, along with accurate background information, is critical for the evaluation of a suspected use of BW agents. A properly collected sample can aid in:

- identifying the agent/confirming that an attack has occurred
- determining the proper therapy for exposed personnel
- estimating the possible number and type of casualties
- determining the time-to-casualties if time of the attack is known
- evaluating an enemy's BW capability

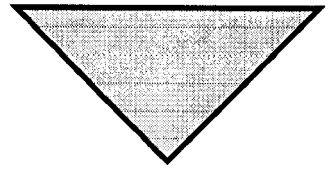
The reliability of evidence that BW agent(s) have been

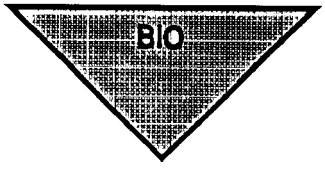


Name of Agent (If Known)
Date and Time of Detection

CHEMICAL

Yellow Background
With Red Lettering

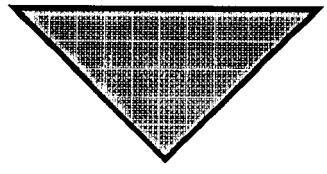


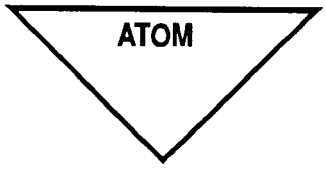


Name of Agent (If Known)
Date and Time of Detection

BIOLOGICAL

Blue Background
With Red Lettering



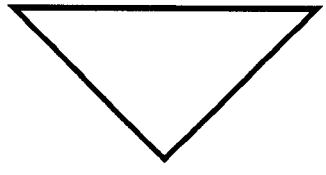


Dose Rate
Date and Time of Reading
Date and Time of Burst
(If Known)

Surface of Marker Facing
Away From Contamination
(Front)

RADIOLOGICAL

White Background
With Black Lettering



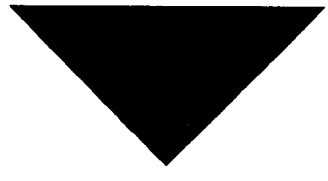
Surface of Marker Facing
Contamination (Back)

Chemical Agent in Mine
Date of Emplacement

Surface of Marker Facing
Away From Minefield (Front)

CHEMICAL MINEFIELD
(UNEXPLODED MINES)

Red Background
With Yellow Lettering
and Stripe



Surface of Marker Facing
Minefield (Back)

Figure 5-9. NBC Contamination Marking Signs.

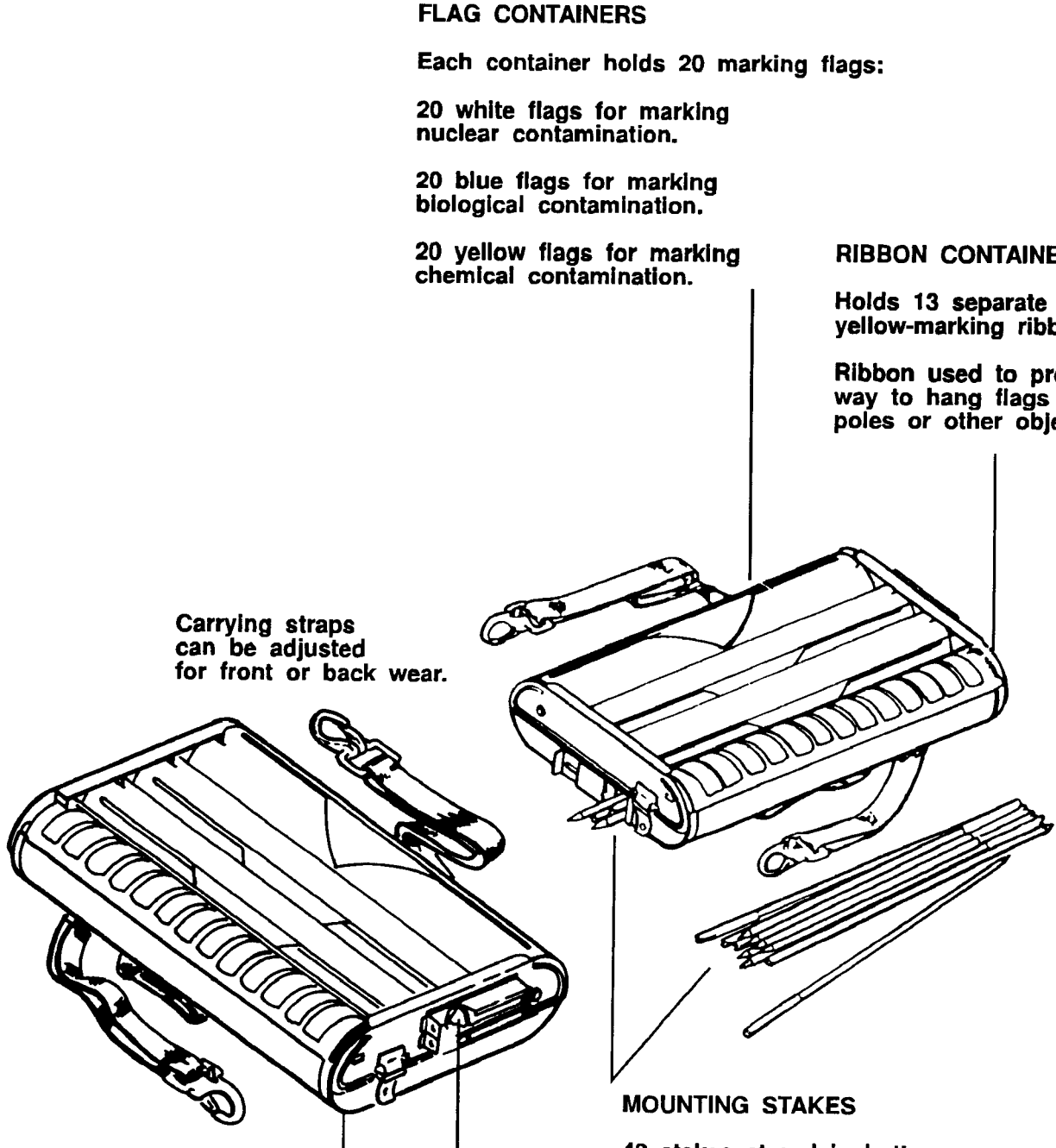


Figure 5-10. NBC Contamination Marking Set.

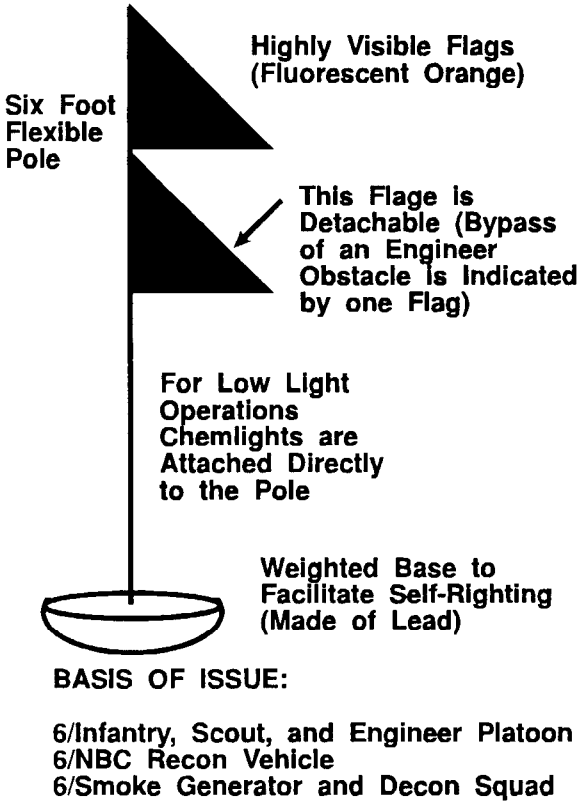


Figure 5-11. Contamination Bypass Marker.

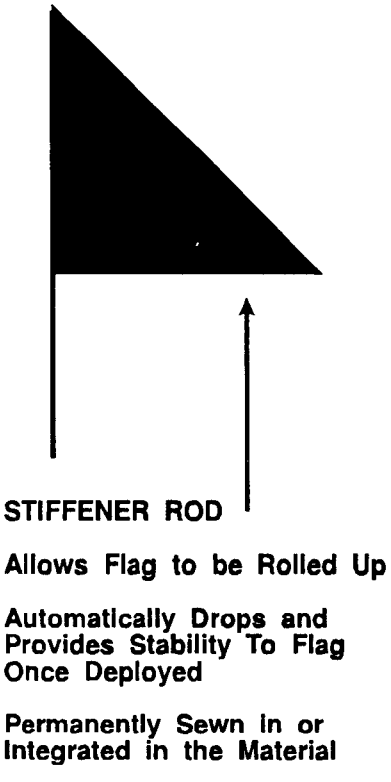


Figure 5-12. Contamination Bypass Marker.

used is extremely important. Therefore, the collection of samples and background information must be as detailed and comprehensive as possible. Information presented by witnesses must be screened to ensure that hearsay is not substituted for accurate reporting.

Sampling is done by trained personnel. These are usually chemical and/or NBC recon personnel. They may be assisted/advised by intelligence or medical personnel; such assistance should be incorporated into SOPs and OPLANs. Trained personnel ensure uniformity, viability, safety, and accountability in sampling procedures. Sampling is not done indiscriminately, but only when an attack has occured. Sampling operations will be initiated only upon the knowledge and consent of the NBCC. Sample priorities are bulk agent and delivery systems, first; environmental (contaminated vegetation, soil, water, and clothing), second; and biomedical (patient or autopsy tissue, urine, and sputum) samples, third. Biomedical samples should be taken only by trained medical personnel. If trained medical personnel are not available it may be necessary to retrieve the entire remains for evaluation.

The standard sampling kit is the M34 CBR Agent Sampling Kit or the Chemical-Biological Agent Sampling Kit (CBASK). These kits contain material necessary to obtain small liquid and solid samples. Directions for use are contained in TM 3-6665-268-10.

Additional sampling operation guidance is as follows:

- If the M34 kit is not available, a field expedient kit can be assembled from like materials with the help of supporting medical units. A list of suggested materials is presented in Table 5-1 (page 5-12).
- Hand-off points (most appropriately the decon point for the recon mission team), sample couriers, special packaging and handling procedures, chain of custody, and diagnostic laboratory delivery points should be coordinated and specified in SOPs/OPLANs. Otherwise, the NBCC will have to coordinate and specify requirements between medical, intelligence, recon, and decon units not previously coordinated (along with any special requirements dictated by the situation).
- Commanders will ensure priority sample transport to diagnostic laboratories.
- Trained medics, intelligence, or chemical personnel should be utilized as sample couriers.
- A strict chain of custody must be maintained. This allows samples to be traced to their origin.
- Sample data must accompany the sample.
- All samples will be in double containers to prevent leakage during transport.

Detailed sampling techniques are further described in

FM 3-19 NBC Reconnaissance.

The following provides general guidance for BW sampling.

Types of Samples

Liquids.

Droplets on vegetation.

Dark stained spots on ground.

Preferred sample - e.g., container of liquid (from storage).

stagnant pools - oily globules/suspended solids.

Streams where dead animals/fish are seen.

Pools of water, ponds, streams, or reservoirs, can be an important source of samples. These samples should be kept in a cold state to enhance preservation of the suspect agent contamination.

Vegetation

Discolored

Withered

Oily droplets

Other unnatural particulates

Vegetation, whether grass, bushes, grain or other growth is a definite medium for sample absorption/adsorption. Quantities of the order of a kilogram or more should be collected in bags made of polyethylene or other relatively impermeable material.

Soil

Discolored

Oily looking spots

Soil, sand or rock in the direct vicinity of dissemination or at least downwind or the event is an important source of agent sample. The sand or soil sample need not be taken beyond 4 cm in depth but preferably more than 100 cm in an area. Include plants, seeds, and debris when present. Even larger samples should be taken if logistically feasible. Glass bottles or jars where feasible, should be used to hold the sample rather than plastic bags, to preclude the possible contamination of the soil sample by the plasticizers from the bag. Samples should then be marked for identification and returned to the laboratory.

Ordnance

Munitions or fragments, whether originally from shell, bomb, rocket, grenade, spent aircraft spray tanks or other field dispersal system can be highly definitive sources of samples. Whole munitions or "duds" are a highly desirable source of sample, but should be handled (disarmed) only by explosive ordenance specialist. Small contaminated objects should be placed in kettles, sealed and forwarded to the laboratory for analysis.

Small animals either dead or dying, especially where a toxic event is indicated, should be collected as a possible source of sample.

Permanent structures such as buildings, walls, paved surfaces or field vehicles are sources of impacted adsorbed/absorbed sample. These can be sampled by scraping, swabbing or even washing (with collection of the wash) and transported in bottles or tubes. Precautions should be taken to avoid unnecessary debris in the extraction fluid.

Priorities

Sampling Priorities.

Samples should be collected that provide objective indications of a biological attack. Sample collection should be planned and executed in accordance with the following general scale of relevance:

- First priority. Biological agents or munitions (including residues or fragments, NBC protective equipment, in particular used respirator canisters and clothing.

- Second priority. Typical samples from the environmental (vegetation, earth, stones, water, etc.) in the vicinity of the alleged attack or incident.

- Third priority. (Collected by medical personnel only). Biomedical samples, either from presumed casualties (samples of blood, urine, etc.) or from human and/or animal corpses.

General Precautions.

Many samples as well as the sampling site may be inherently dangerous. Appropriate individual protection measures must be taken and specific precautions observed in collecting, handling, storing and transporting samples. This is not only to safeguard those individuals handling the samples, but also to preserve the sample itself.

Technical advice and assistance. If munitions are to be handled or are in the area of the sampling site, specific assistance and technical and ordnance advice should be obtained. On-site medical assistance should also be obtained.

Quantities

Liquids - 1 teflon bottle 180 ML or 6 oz desired.

Vegetation - up to a kilogram or more of vegetation should be collected when possible.

Soil. 10 cm x 10 cm and a depth not to exceed 4 cm include plant, seeds and debris when present.

Ordnance: Whole munition intact, no leaks if possible, commonly referred to as duds. Call ordnance disposal units before moving.

Used personal protective and CB warfare equipment.

Package each item separately.

Biomedical - Samples from dead animals. If the organism is small, collect and ship the entire carcass. Efforts should be made to collect the most common species in the area for example, rats from local dwellings, fish or common small birds.

Non-Transportable Items: Samples should then be taken by scraping or rubbing the contaminated surface with dry cotton wool or cotton wool soaked in distilled water. The scrapings and the cotton wool pads shall be carefully preserved in airtight Teflon containers.

Sampling Equipment

Various methods may be used to collect suspected biological samples. For air samples, the XM2 Biological Sampler provides an effective means of identifying biological agents. Commercial air samplers can also be used concentrate air samples for later identification. However, the most common sampling tool is the modular Chemical and Biological Agent Sampling Kit (CBASK). If this kit is not available, a number of items available through supply charnels or commercial sources can be used. A listing of common materials available is presented in Table 5-1.

The XM2 Biological Agent Sampler is a manually operated device that is capable of providing identification of specific biological agents after an attack, when used m conjunction with an enzyme-linked immunosorbent assay (ELISA) test kit. The ELISA tests are agent specific and consist of a cotton swab and a test ticket. Once the air sample is obtained, the cotton swab is placed in the collection vial to absorb a small amount of substance. The swab is then placed in a test ticket for a reading (see Figure 5-13). Depending upon the urgency and the degree of validity required for the identification, the operator will draw one or two samples. Each sample will take approximately 45 minutes for testing with the ELISA test. The sampler, itself is powered by a 120V AC ± 10 percent 60 Hz, 300 watt power source (see Figure 5-14).

The sampler draws 1000 liters of air per minute and separates the particles from the air, 2 to 10 microns in diameter. It then condenses these particulants into a 15 liter per minute stream of air directed into the wet collector, where the particles become suspended in liquid.

The remaining 985 liters is transferred to the cooling drawer and control module. Due to the large volume of air drawn in, additional filters may be necessary to filter out dust, sand and dirt particles (NOTE: silt sand average particle size is approximately 62 microns in diameter). This sampler, when in the transit case weighs 240 pounds. (Therefore, because of it's size and power requirements, the XM2 cannot be used for reconnaissance purposed). Although, with some difficulty, a vehicle could move the XM2 from one pre-planned sampling point to another.

Table 5-1. Current Sampling/Packaging Equipment

Description	
labels, paper, pressure sensitive	7530-00-577-4376
Edmont Wilson gloves 8-8	8415-00-J02-2902
Edmont Wilson gloves 9-9	8415-00-634-4639
tape, pressure sensitive adhesive 1"	7510-00-582-4772
pliers #47 5"	6520-00-543-5350
screwdriver, flat tip 1/4 inch	5120-00-596-8653
tongs, teflon tips	AF 15-202-5
micro spatula with teflon ends	AF 21-401-50A
scissors, universal type	AF 08-951-30
sterile sampler scoops 2 oz	AF 14-241-10A
spoon spatula with teflon	AF 14-356-10
knife, pocket	5110-00-526-8740
PFA sample bottles, 6 oz	CP J-6103-50
pipet, jumbo transfer type	AF 13-711-7
pipet, graduated transfer type	AF 13-711-9A
insulated bag, type 1	AF 01-814-8
insulated bag, type 2	AF 01-814-10
whirl/pak bag, 6 oz	AF 01-812-6B
ph paper, non-bleeding plastic strip	SW S-65271
SEP-PAK C18	
syringe, hyp 50 or 60 ml	6515-00-168-6913
R3602 clear laboratory tubing	AF 14-169-3B
marking pen, waterproof	AF 13-381
Tenax tubes	EC ST-023
blade surgical knife detach no. 21	6515-00-660-0007
blade surg cs 21 150S	6515-01-009-5297
igloo type container	
ice pack	CP TR-6345-20
pad non-adherent 3 x 4 100s	6510-00-111-0708
pad cooling chemical 4S	6530-00-133-4299
piglette	
tape, antiseizing	8030-00-889-3535
personal air sampler	LSS G4980 +
methanol	GJ4981
distilled water	
matches, waterproof	
Mylar bags	
Field Expedient Packing Materials	
Tin foil	
Saran wrap * polyethylene without plasticizers	
Thermos bottoles	
Pressure sensitive tape	
Cool Paks	
Butcher Paper	
newspaper	
Igloo cooler	
Canteens	
Mess kits	
Glass bottles	
packing material	
Teflon plumbers tape	
Medical supplies	

Commercial Air Samplers

Many different styles and types of commercial samplers exist. These samplers are used by industry to monitor for air pollution and airborne hazards compounds. Each sampler has its own unique characteristics and should be employed in the same manner as the XM2.

When handling the sample respiratory protection desired. DO NOT handle the sample. If the sample has

IF THE COLOR IS...		THEN THE REACTION IS...
Not Visible	○	Absent
Very Faint Pink	☾	Weak
Distinct and Uniformly Pink	●	Moderate
Very Distinct and Dark Red to Purple	●	Strong

Reactions may appear in any shape (i.e., rings, crescents, dots) and should be interpreted for color intensity only. Any colored shape in the test spot of greater intensity than the negative control spot, should be interpreted as a positive result.

Figure 5-13. Elisa Test Spots

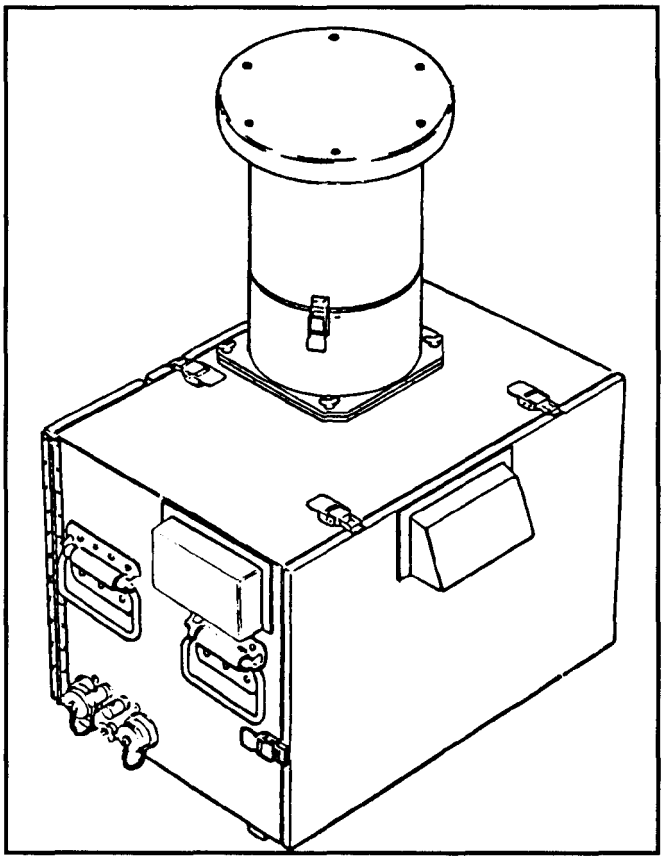


Figure 5-14. XM2 Sampler.

to be handled neoprene gloves should be used.

Have the individual who has control of the sample, place the sample in mylar bag or substitute (i.e., tin foil, saran wrap.)

** NOTE: If sample is in a glass container with a lid seal lid with pressure sensitive tape and triple wrap the container first with tinfoil then saran wrap.*

Employment

Employment considerations are more dependent on the cloud parameters, climate and method of dissemination than anything else, until agent specific cloud parameters are made available. The XM2 will be employed at preplanned point sampling sites within theater or area of operations. These sites will be designated by the theater or operational commander and are to be associated with high probability targets. These targets may be large urban areas, politically sensitive areas, logistical centers, port facilities, airfields, large command and control centers . . . etc. Due to the characteristics of BW agents, until a sample is obtained, the collector operators do not know if the agent is chemical or biological in origin. The correct placement of an air sampler is depicted in Figure 5-15a.

Modular Chemical and Biological Agent Sampling Kit (CBASK).

The equipment in this kit can be used to bring back samples of solids, liquids, and gases. Three colors are used to tell you which piece of equipment can best be used for sampling solids, liquids, or gases. These are:

GASES. Use equipment such as the air pump and adsorption tubes. (YELLOW)

LIQUIDS. Water cartridges, pipettes, and syringes will be used to take samples from water or directly from chemical liquids. (RED)

SOLIDS. Scoops, spatulas, knives, and bags will be used to take solid samples such as dirt or chemical powders. (BLUE)

The kit contains four packs, three of which are in nylon bags. Use these packs for solid and liquid sampling. The other pack cannot be removed from the kit. This pack contains equipment for taking gas samples. It also contains a small cooling box to hold things which might rot or disintegrate. Colored circles on certain equipment will help you identify its use. For instance, yellow is for gas sampling.

Safety

Each kit comes with two pairs of butyl rubber gloves. These gloves should be used at all times when you are sampling for possible agents. Further, wear the protective mask when safety conditions are unknown (which is most of the time).

Where to Take Samples

The officer or NCO in charge will tell you where to take samples and the types needed. Generally, you will

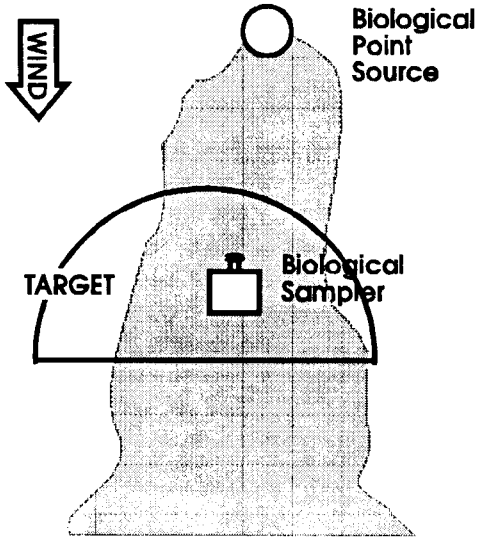


Figure 5-15a. Correct Placement of Sampler.

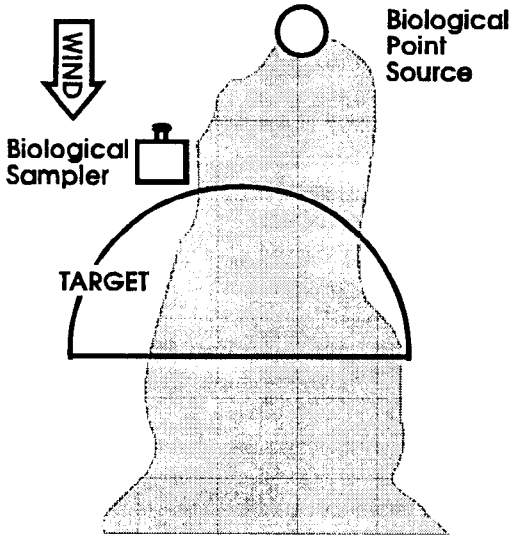


Figure 5-15b. Incorrect Placement of Sampler.

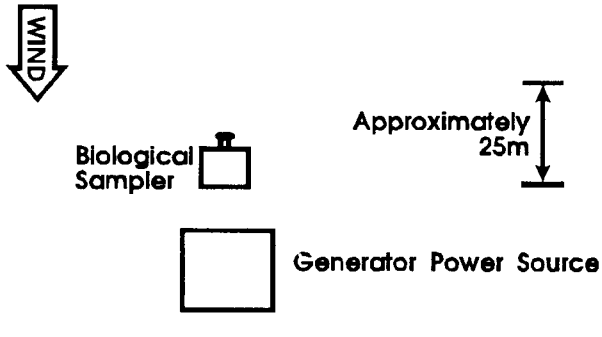


Figure 5-15c. Correct Placement of Sampler With A Generator Power Source.

take solid samples in an area where agent drops are suspected. You also need to take solid samples a short distance away from the actual suspected area. These are for comparison. LABEL everything with a number and write down the coordinates of the area from which you took the sample. Otherwise, write down a description of the area so it can be located on a map. You have labels and marking pens for this very important part of sampling.

How to Sample

GASES - Unbagged Pack

Remove the equipment marked with YELLOW circles for gas sampling. The battery powered air pump is connected to the clear tubing. This, in turn, is connected to one of the adsorption tubes (either end), which is stored in the glass tube. The pump is turned on (small switch on front). If you have trouble turning on the switch with gloves on, use the small screwdriver to push the switch on and off. It is already set for large volume flow. Place the pump and tube in the area to be sampled. About 20 minutes is enough. After this time, disconnect the tube and place it in the steel tube holder. A small piece of Teflon tape can be placed over the end of the tube before you screw the cap on. Tighten the fitting (nut) with the pliers. Place a label with an ID number on the tube. The sample is now ready to bring back.

This kit also contains the cooling box. If you collect leaves or samples which might rot (or obvious agent powders), place them in the box. You are given two cold bags to cool the samples down. Squeeze them and place them in the box with the samples. Put the box lid securely on. Connect the batteries to the cooling unit. Place labels on the box lid with ID numbers on the samples, or on containers, if you used them to contain the samples. The samples are ready to bring back.

LIQUIDS - Unmarked Packs

All equipment to be used for liquid sampling is marked with small red labels. To sample water which may contain agent, you need three items: The plastic 60 mL syringe, a three-way valve, and a Sep-Pak cartridge. Remove the tip protector from the syringe. Also remove the three protectors from the three-way valve. Connect the three-way valve and the syringe so that the green cap of the valve is pointing away from the syringe. The small handle on the valve lets you pull water up into the syringe and send it off in a second direction. Now, connect the Sep-Pak (short end) to the green tip end of the three-way valve. You need to prewash the Sep-Pak before sampling. Do this by setting the valve handle 90 degrees to the aligned syringe, valve, Sep-Pak system.

Place the tip of the open end of the Sep-Pak into the bottle containing **methanol.** Draw the contents of the bottle into the syringe. Now, place the valve handle in line with syringe, valve, Sep-Pak system, and eject the methanol out the side opening of the valve. Do the same thing with the bottle containing **water.** You are ready to sample. Do this by pulling the sample up through the Sep-Pak (valve 90 degrees to system). Eject the used sample by changing the valve setting (valve in line with the system). Label the Sep-Pak with ID number on either white tape or label, along with the pH number (see below). Place the Sep-Pak in one of the small plastic bags.

Check the pH of the water from which you took samples before you leave the sampling area. Do this by placing the tip of one of the pH indicator strips into the water. Compare the color of the strip with that on the box. Write the pH number on the label of the Sep-Pak sample.

To sample possible liquid agents or other liquids, you are supplied with small plastic pipettes. Draw the liquid into the pipette then expel (squeeze the bulb) the liquid into one of the small plastic, white bottles. Screw the cap shut and place this bottle into the next largest sized plastic bottle. A piece of Teflon tape can be placed over the grooves of the bottle before you screw the cap shut. This gives a better seal to the cap. If there are any spills on the outside of the bottle, wipe them with the gauze pads and discard the gauze. Label this bottle with an ID number. This bottle and others can now be placed in the large plastic bottle for safe transport. If you don't find any liquid agents, these plastic bottles can be used for solid samples.

Solid - Unmarked Packs

To sample solids, including contaminated dirt, you can use the plastic scoop, tongs, or the plastic spatula. A pair of scissors and a knife are also available for cutting samples. Place the solid samples in plastic bags and label each of the bags with an ID number or other information. If you have empty plastic bottles, these can be used for solid samples.

General Packaging Procedures

Packing of environmental samples. Samples should be double wrapped or bagged.

Place the Mylar bag or glass container containing the sample into a corner of a second mylar bag. Remove excess air and twist the neck of the bag until it forms a tight coil with the bag snug around the sample bag or container. There should be no air pockets. Make a gooseneck in the bag by folding the coiled neck in half and wrapping it tightly with tape. Mark bag with identification numbers of samples within.

Collectors should be encouraged to collect the samples in quantities that do not exceed 10 cm in diameter and 14 cm in length to facilitate subsequent handling and storage in the laboratory. In addition, excess bagging by collectors should also be discouraged. However, DO NOT break down and repackage samples to meet the above requirements.

Place any breakable containers in more rigid containers, with protective absorbent material (vermiculite, styrofoam, excelsior or charcoal-impregnated wadding) to protect them from puncture or breakage.

Preservations and packing for transport.

In general terms, the lower the temperature, the longer the life of chemical or biological warfare agent samples. Samples must therefore be at least refrigerated, whatever their nature.

If all the samples cannot be chilled, priority should be given to cooling samples of vegetable and biological materials.

In the field, insulated boxes having a polystyrene interior with compartments to hold flasks may be used, with bags being loosely laid in them.

A sufficient quantity of pre-chilled refrigerating packs (camping-type bags containing polyethylene glycol) can also be placed in the box. Empty spaces should be filled with vermiculite, styrofoam, excelsior or charcoal impregnated wadding.

Labeling.

Tags or adhesive labels should be affixed to each sample container. On each should appear a code number which clearly refers to the accompanying sample data sheet that documents the nature and circumstances of collection.

Sampling

LA* = 850115-002-JD
LA = Sample was acquired by collector in Laos
850115 = Sample obtained on 15 January 1985
002 = This is the second sample obtained on 15 January 1985 by the collector
JD = The sample was collected by John Doe
* See Annex B for country codes

Place the sample in a zip-lock bag if available.

Place sample in a metal can. Line inside with absorbent packing material. The can helps absorb shock from rough handling during shipment.

Ice Chest.

Standard polyethylene or metal ice chests are the most easily procured items which can be used for tram-world shipment of BW samples. The most easily used size is about 24 inches long by 18 inches high by 15 inches deep. This size permits the sender to ship two or three

sizes of pound metal cans in each chest with sufficient coolant to maintain freezing temperatures for about four days. Additionally, each chest remains at a weight which can be handled by a single individual.

Coolants.

The best coolant available in most areas is dry ice. It maintains low temperatures for several days and can be handled easily. Blue ice, a plastic-containerized refrigerant, can be used if available but will not maintain freezing temperatures for as long as dry ice. Standard ice should only be used as a last resort because of its rapid melting rate and the possibility that melted ice may contaminate samples.

Internal Insulation.

Even though a commercial ice chest provides good insulation of both the samples and the coolant, extra insulation and cushioning should be placed around the metal cans inside the chest. Newspapers, plastic bubble wrap and foam rubber may all be used with almost equally good results.

Label Ice Chest:

Commander Chemical Research Development and Engineering Center ATTN: SMCCR-OPF Aberdeen Proving Ground, Maryland 21010

The Commander, CRDEC will notify the Commander of the Technical Escort Unit. This unit controls transportation of the samples to their final destination. They will intercept the samples upon arrival at a CONUS Airport.

WARNING

Under no circumstances should suspected toxic samples or munition systems be shipped to CONUS technical centers or intelligence agencies without prior approval by the recipient. * NOTE: OCONUS pick-up by technical escort personnel may be possible.

Witness Interview

The witness interview may play the most important role in sample acquisition. Information received can aid in the identification of the sample. Interviewers should insure that testimony accurately describes scientific reality and not a social or political “truth”. Interviewers should also avoid yes or no questions. Below is a list of questions that could be asked during an interview:

Name:

Where can you be located in the future?

How was the sample obtained?

Where was the sample obtained?

Were you present during the attack?

Explain what happened if yes.

Describe your symptoms during the attack (durations, how severe, other people affected?)

Any problems with your - head?, eyes?, breathing?, skin?

These questions are designed to allow an interviewer to note MOST relevant details of testimony given by personnel associated with alleged use of chemical or biological warfare agents. Do Not consider the questions to be all inclusive.

Acquisition Reporting

An electronic report should be forwarded by the collection team upon acquisition and shipment of samples to report information that has been obtained. Information should be forwarded through the nearest diplomatic or consular post, intelligence agency, or if neither are available, through the nearest U.S. military unit having secure radioteletype communications.

The team should insure that the acquisition message has been properly classified.

The acquisition report should include the following addressees at the minimum:

SECSTATE WASHDC
SECDEF WASHDC//OSD-ISA//
JCS WASHDC//J-3/J-S
CIA WASHDC//OSWR-STD-LSB//
DA WASHDC//DASG-PSP, CDR, USAMRDC FT DETRICK MMD//
DIA WASHDC//DT-3B/DT-5A//
DIR AFMIC FT DETRICK MD//AFMIC-CR/AFMIC-SA//
DA WASHDC//DAMI-FIT/DAMO-NCC/SAUS-C//
CMDT USACMLS FTMCCLELLAN AL//ATZN-CM-CC//
CDR CRDECAPG MD//SMCCR-OPF//
CDR FSTC CHARLOTTESVILLE VA//AIAST-FM/AIAST-CW//

The action addressee is:

Cdr, CRDEC, APG MD//CBATEB//

An acquisition message will contain the following information:

The sample identification number will be a part of the subject line if only a single sample is referred to in the text. Otherwise, the sample number will be referred to within the message body with its background information.

The date the sample is to be shipped, the mode of transportation, courier identification, air bill of lading number, flight number, destination and estimated time of arrival will be included if the sample is to be shipped immediately.

Background information surrounding the sample.

If the circumstances surrounding acquisition of a sample were questionable, appropriate information must be included.

If a portion of the sample or information concerning the sample has been shared with a nation or an agency not shown on the message address, or if another country or agency has acquired a sample from the same event or area, this should be indicated in the acquisition report.

A recommended priority and rationale for analysis should be included in order to guide the analysis center as to the team's assessment of the potential value of the sample.

All details which relate to the acquisition of the sample should be included regardless of how insignificant they may seem to the collector.

Disposition of samples should be made according to their physical category.

Evacuation of Samples

Biological samples must be evacuated to the appropriate laboratory facilities for confirmation of a biological attack. Under normal circumstances labs will be established in the theater of operations to minimize confirmationtime. CONUS labs will also be utilized to verify the results of the theater labs. This information will then be disseminated to subordinate units to insure that adequate protective measures are implemented for protection of both civilian and military personnel. Confirmation of an enemy biological attack will also be reported to the National Command Authority (NCA) for a decision concerning the appropriate military and diplomatic response. Figure 5-16 shows the standard chain of custody for the evacuation of biological samples.

Suspected
Biological
Attack
Bio-Medical
Environmental Sample
Unit S-2
Technical Intelligence Foreign Materiel Intelligence Unit
Tech Escort
In-Theater Labs
CONUS Labs

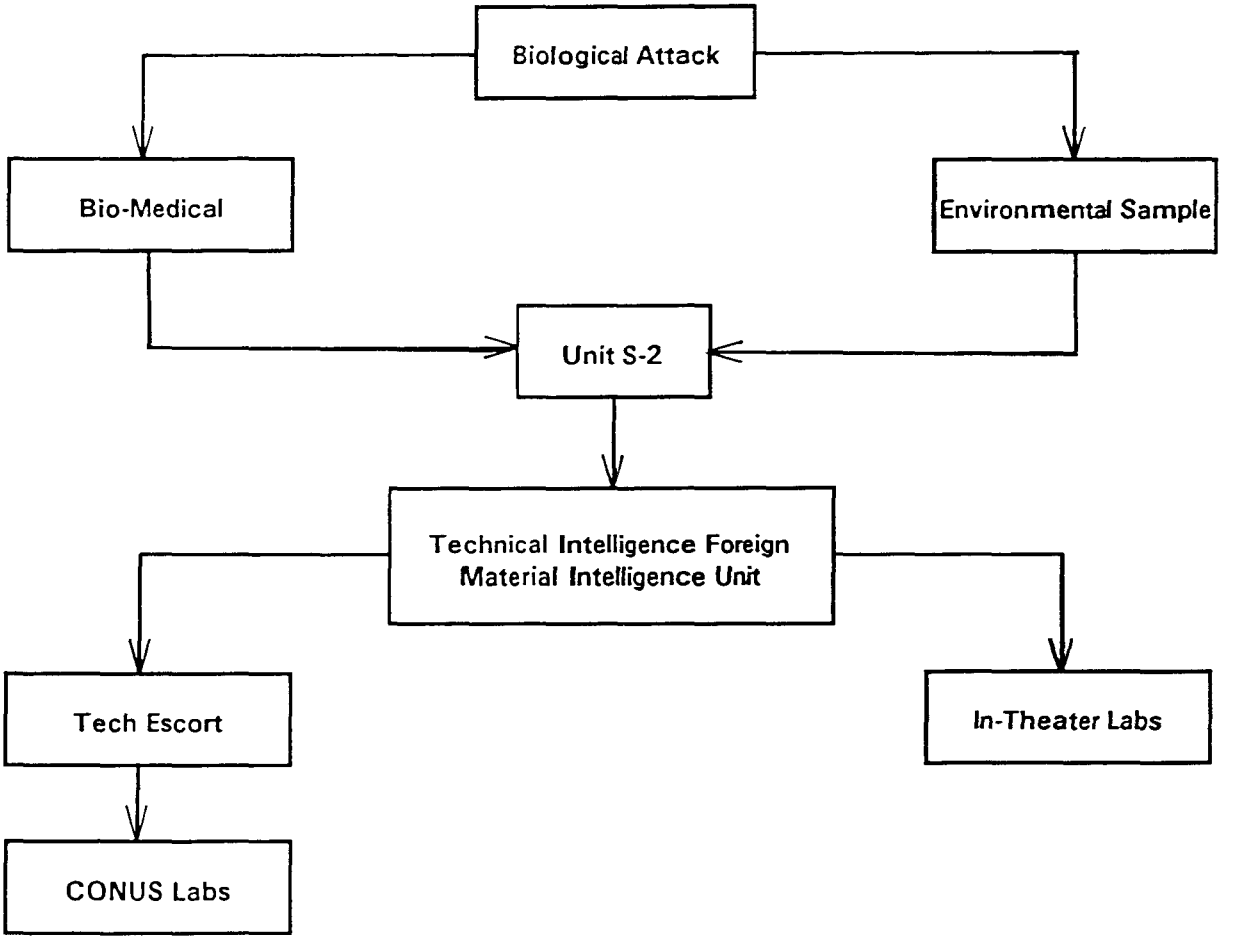


Figure 5-16.